A LEARNING COMMUNITY THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY:

CHARACTERISTICS OF SUCCESS IN A CONTRIBUTING PRIMARY SCHOOL

A thesis submitted as partial fulfilment of the requirements for the degree of Master of Education Administration, Massey University, Palmerston North, New Zealand

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DECLARATION

I declare that this thesis, A learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School, represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

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ABSTRACT

This thesis seeks to identify how institutionalised teaching and learning practices and processes - 'the way we do things around here' - have led to successful teaching and learning with information and communication technology (ICT) at a large contributing New Zealand primary school. The research findings are considered against the backdrop of the international literature, historical trends, and current educational conditions for New Zealand schools in relation to ICT. Consideration is also given as to whether elements of teaching and learning with ICT at the case study school can be correlated with the Key Characteristics of Effective Schools identified by Sammons *et al,* (1995).

The research is conducted in three stages. Stage One considers national requirements for ICT teaching and learning and how the school has fashioned its operating guidelines to ensure the school-wide implementation of ICT. The ICT perceptions and experiences of staff, students and parents at the case study learning community are also presented. Stage Two examines actual ICT teaching and learning practices and processes throughout the school and in five selected classes in particular. Stage Three is a reflective review of the school respondents' views and experiences of teaching and learning with ICT.

The research establishes three important questions which must be asked (and answered) if successful school-wide implementation of teaching and learning with ICT is to be achieved: *Why* does the school believe it should teach and learn with ICT? *What* student learning with ICT is proposed to occur? *How* can the processes and practices of teaching and learning with ICT be put into place?

The research questions are designed to uncover the elements of teaching and learning with ICT at the case study school. However, these questions lead on to others concerning funding for, and research into, teaching and learning with ICT in New Zealand schools. A major contention of this research is that Government funding for ICT in schools should be linked to demonstrable improvements in student learning outcomes. The research also contends that immediate adoption of 'practised and proven' approaches already existent in some New Zealand schools would help many other schools improve teaching and learning with ICT in their respective learning communities.

Outcomes of the research identify and emphasise: an agreed school-wide philosophy on teaching and learning with ICT; focus on ICT pedagogy; a student-based approach; school responsibility for teaching and learning with ICT; shared leadership and management through a specific and responsive 'human infrastructure'; a sound technological infrastructure; school-based and student-orientated teacher professional development; confident and competent staff; and regular review of school and student performance/achievement in teaching and learning with ICT.

The thesis concludes by noting that change, and how this affects people, presents the greatest challenge for schools attempting to implement teaching and learning with ICT. It is the hard work, determination and coordinated efforts of the people in the learning community that will bring about successful learning with ICT for students.

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This thesis is the product of 27 years of challenges, frustrations and successes experienced as a teacher in New Zealand schools. These experiences have been shared with a range of students and, in most instances, a highly skilled and dedicated group of teaching colleagues.

The successful implementation of teaching and learning with ICT has eluded and continues to elude many schools. The main reason for this is that the role of ICT in teaching and learning has, in my opinion, often been misrepresented or hi-jacked by people in industry, 'supporting' educational agencies and those in positions of influence within Government and the Ministry of Education. These people have generally sought to serve their own business, personal or political interests. Furthermore, all too often these 'fountains of knowledge' have had only the most tenuous of links with the 'real world' of education. Thus, they have never been required to implement their own doctrines and bring about school-wide change in teaching and learning with ICT. This study focuses on New Zealand students and what we as New Zealand teachers already know and can do in our learning communities. It is time for the voices of schools to be heard and acted upon.

My thanks go to the many teachers I have had the opportunity to work with and learn from, and in particular to the staff, Board of Trustees and wider community of Papatoetoe Central School for having the collective foresight, backbone and commitment to focus on the provision of learning opportunities and experiences for every student in our learning community.

I also wish to acknowledge the advice and support of the Research Review Group throughout the research. My special thanks go to Anna Shere for her many hours of assistance with data collection, constructive criticism and absolute support. I also wish to thank Dr Mollie Neville for her supervision and for 'just being there' at times when it really mattered. I also appreciated the advice and guidance received from Dr Ken Ryba in relation to the preparation of this research and for his supporting supervisory role.

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Chapter One

Introduction

New Zealand schools have invested strongly, over the past decade in particular, in the tools of information and communication technology (ICT). For many schools this investment in ICT has been substantially larger than that allocated to any other teaching and learning programme or associated resource. Unfortunately, this enthusiastic embracing of these new teaching and learning tools has occurred in association with a marked reluctance throughout the education sector to provide any indication of a return on the investment. Indeed, the researcher suggests that, in terms of successful student learning with ICT, New Zealand schools are only marginally ahead of where they were 10 years ago.

The purpose of this thesis is to identify elements that could facilitate the successful implementation of teaching and learning with ICT in New Zealand schools. The thesis considers the past and current situation in New Zealand schools in the light of international findings in order to delineate a set of conditions for teaching and learning with ICT that schools could reasonably aim for and achieve. Of particular importance is the presentation of a case study that, through the work of a participatory researcher, identifies the interacting and complementary elements in practice that enable the people in the school to successfully teach and learn with ICT.

Central School, the school involved in this case study, has a national and growing international reputation for achievement through teaching and learning with ICT. The researcher has extensive experience in New Zealand schools and in ICT. The relationship between the case study school and the researcher is considered to be a significant advantage in terms of identifying the contributing elements that bring about successful teaching and learning with ICT throughout the school.

It is also the researcher's intention to identify the waste of effort, time and money, for the most part with no demonstrable return, that has been and continues to be a feature of ICT teaching and learning in New Zealand schools. It is the researcher's hope that the findings of this thesis will help New Zealand schools identify for themselves a range of actions they can take to bring about whole school development in successful teaching and learning with ICT for all of their students.

1.0 General Background

In the mid-1970s, a revolution in school resourcing began with the advent of computers in New Zealand schools (ERO, 1997). While initially a subject of interest and source of excitement for only some teachers, the role of computers in schools rapidly expanded over the ensuing years to the point where schools lacking computers accessible by students came to be considered unusual. The latest figures available through the Telecom Education Foundation (1996) indicate that New Zealand now has approximately one computer per 17 students. When these figures are considered in terms of school sector groups, there is now one computer for every 19 and 10 students at New Zealand primary and secondary schools, respectively.

Introduction of computers into the classroom initiated arguably the greatest resourcing reform undertaken in New Zealand schools. This reform occurred concurrently with other major reforms of school administration (Lange, 1989) and the curriculum (Ministry of Education, 1993a and 1993b). However, while the major reforms in school administration and the curriculum were entirely state-determined and state-funded, the resourcing of computers up to the latter stages of 1999 was school-determined and funded from a variety of sources. These sources included state-funded school operations grants, local school-raised funds, supermarket promotions, and other business sources such as Telecom and Clear Communications.

Thus, for different reasons and with varying sources of funding, computers began to pour into New Zealand schools. Furthermore, this phenomenon continues today, with some schools already moving into their second and third generations of computer hardware. Indeed, computers have been identified as schools' single largest purchase item over the past two decades. But while schools have been pressured to introduce and implement administration and curriculum reform according to carefully rationalised, documented, compulsory requirements of all state and integrated schools through the Ministry of Education, these same schools have been left to devise - independently and unchecked - their own substantial resourcing of computers.

The state's investment in its prescribed reforms has been and continues to be critically reviewed through the independent Education Review Office. Conversely, schools' investments in computers have not been so rigorously reviewed. Indeed, schools have been able, within a policy of self-management, to devote substantial direct purchasing funds as well as indirect technical support and staffing funds to computer resourcing with very limited rationalisation of why and how they are performing in this area.

These questions - that is, *why* and *how* schools are performing with regard to their investments in computers - need to be asked. Even more importantly, they need to be answered.

1.1 Rationales for the Use of Computers in Schools

Key questions for schools could be: *Why are schools resourcing themselves with computers? What are schools setting out to achieve through the use of computers?* Possible answers would likely include reference to the enhancement of teaching and learning. The rationales developed by Pelgrum and Plomp (1993), and summarised by Brown (1997), are as follows: vocational, economic, commercial, marketing-related, cost-effectiveness-related, social, 'transformational', and pedagogical.

1.1.1 Vocational Rationale

The vocational rationale stems from the belief that computers are a key source of employment-related options in a competitive and skilled market place. There is continued clear expectation that schools will provide workers who are confident and competent in the skills and applications of ICT.

1.1.2 Economic Rationale

The economic rationale recognises New Zealand as part of a global economy in which ICT literacy is a core and critical component in a competitive environment. Furthermore, the requirement that workers be familiar with the most recent developments in ICT dictates the need for people to constantly update and adapt their skills in this area.

1.1.3 Commercial Rationale

The commercial rationale relates to the immediate and long term financial interests of the commercial sector being served. It includes the direct sales of ICT materials and support to schools while also identifying students as the technologically literate users, and therefore the market, of the future.

1.1.4 Marketing Rationale

The marketing rationale recognises the importance for schools to be 'seen' to provide ICT tools for learning. In an environment in which schools must 'compete' for students, access to ICT within the classroom is perceived by parents, students and the schools themselves to be a necessary component of a modern and successful school.

1.1.5 Cost-Effectiveness Rationale

The cost-effectiveness rationale is predicated on the belief that computers can markedly decrease the cost of vote education by rationalising staff while improving efficiency. A number of established and ongoing demonstrations of this rationale are evident in New Zealand. For example, the Cantatech Project has demonstrated the beneficial effects of ICT in distance learning techniques for rural students.

1.1.6 Social Rationale

The social rationale relates to the understanding that today's education system must prepare today's students for tomorrow's world. Importantly, it has been suggested that schools are failing to keep pace with even current technological developments, let alone what may happen in the future.

1.1.7 Transformation Rationale

The transformation rationale is based on the assumption that ICT will change the nature of schooling as we have come to know it. Not only is it proposed that ICT will dramatically change the content base of curriculum learning, that is, what is learned, but also that the transformation will challenge the very existence of current school organisational structures.

1.1.8 Pedagogical Rationale

The pedagogical rationale asserts that the applications through ICT will afford unparalleled opportunities to enhance learning and raise student achievement across the curriculum. It is believed that ICT will influence not just what we learn but also the processes of learning as we understand them today.

1.2 Conflicts between Rationales

The conflicting and competitive nature of the rationales listed in section 1.1 is perhaps best revealed by asking the question: *Whose interests are being served?* This critical theorist perspective reveals that the student's learning interests are not necessarily the primary motivation for implementing ICT in schools. Clearly, however, there are existing and growing expectations about the place of ICT and indeed what ICT may lead to for all participants in today's and tomorrow's worlds. It is important to examine the rationales for use of ICT in schools with an eye to establishing *why* we are implementing ICT in schools, *what* it is that we hope to achieve, and *how* we might go about the process.

This thesis examines issues relating particularly to the pedagogical and social rationales and how schools need to consider the related elements associated with each of these in terms of a course of action. However, given that the research presented in this thesis represents the findings of a case study of an actual school in operation, all of the rationales listed above must be considered. This is because all of these rationales have an impact, rightly or wrongly, on the successful implementation of ICT teaching and learning in a primary school.

1.3 Expectations - Responsibility - Actions

Debate continues over the success or otherwise of the two major areas of education reform - school administration and the curriculum - conducted over the last decade. Such debate is a healthy process which fosters review, reflection and change. The debate is well grounded on actual and gazetted requirements of schools promulgated in the Education Act (1989), National Education Guidelines (Ministry of Education, 1993a), the New Zealand Curriculum Framework (Ministry of Education, 1993b), National Curriculum Statements, and respective school charters. State and integrated schools have a legal obligation to implement these requirements and their performances in this respect are monitored by self review and by the Education Review Office. Thus, informed debate can focus on both required and actual practice.

Despite the wide acquisition of computers in schools and their associated costs, very limited information exists to promote informed and reliable debate on the efficacy or otherwise of ICT teaching and learning in New Zealand schools. In terms of the rationales summarised in section 1.1, it is entirely probable that only the commercial and marketing rationales could be seen to have achieved any measurable and acceptable success, if indeed such successes as have been achieved in these areas could be considered acceptable!

The paucity of Government requirements of schools in terms of ICT is matched by its scant reference to ICT teaching and learning within gazetted documents to date. As self-managing organisations, schools have essentially been left to themselves wrestle with the realities of implementing ICT, and all of its resulting complexities. The only contribution made by the Ministry of Education, which has had no choice but to recognise the impact of ICT on schools, is the development of a variety of support opportunities for schools.

Advisers in ICT for schools have been installed in the Colleges of Education since 1989. The booklet "Using Computers in the Writing Process: A Guide for Teachers" (Ministry of Education, 1992a) was one of very few ICT resources provided for all schools. Teacher professional development between 1992 and 1996 enabled 7000 teachers to gain access to, and engagement in, ICT. However, provision of such supports for schools has been undertaken in a piecemeal fashion and at no time has been associated with any requirements of schools. It is not unreasonable to suggest that cost has been the determining factor in the Government's lack of national action in ICT teaching and learning (Rivers, 1994).

If progress is to be made, identification of actual and reasonable expectations for student learning through ICT must be addressed not only at the school level, but also at wider community and national levels. The rationales of Pelgrum and Plomp (1993) contain a number of assumed expectations. The Government could also have expectations in the social, vocational, economic and cost-effectiveness rationales. The private sector in turn could have expectations in the social, vocational, economic, commercial and cost-

effectiveness rationales. Parents could have expectations in the social, vocational, economic and marketing rationales. Students could have expectations in the social, vocational and pedagogical rationales. Finally, schools could have expectations in the social, vocational, marketing, transformation and pedagogical rationales.

And yet, despite the expectations of all parties involved in the implementation of ICT teaching and learning in schools, debate is stifled. Is it a case of no one knowing what to do, no one wanting to do anything, or perhaps a combination of both? There have been increasing calls from a range of sectors for national coordinated action (ERO, 1997; ITAG, 1998; McMahon *et al,* 1998; Gerritsen, 1997; Hotere, 1998). Moreover, it is apparent that responsibility will in future be shared between the Government (Budget, 1998) and schools at a greater and more purposeful level.

Indeed, there have been some promising signs in the Ministry of Education's ICT strategy for schools (1998). At the same time, this initiative was characterised by two major omissions: (1) the lack of any clearly defined expectations for student learning with ICT and (2) the fact that there is still no requirement for schools to act. A further important Government initiative occurred in June 1999, whereby substantial ICT-tagged funding was made available to schools on receipt of a detailed application from schools by the Ministry. Schools whose application was successful received a 'one-off' sum for 1999, followed by a reduced annual sum starting in 2000.

This ICT-tagged funding (Ministry of Education, 1999) represents a major step forward in that the criteria for funding approval force schools to focus on: the provision of ICT tools for students and teachers; considering how ICT can be integrated across the curriculum; identifying teacher development needs; and the role of infrastructure. Schools will at last be accountable for their implementation of ICT through the three-year cycle of external reviews carried out by the Education Review Office. This overdue but significant Government support is to be congratulated, particularly in the light of the muddled actions of the past.

It must be noted, however, that this funding and related ICT implementation criteria will not bring about change within schools. The responsibility for such change, that is, the elements concerned with the successful school-wide implementation of teaching and learning with ICT, rests with the schools themselves.

Having addressed the issues of expectation and established some ill-defined but nevertheless identifiable lines of shared responsibility, it is now reasonable to consider what actions can and need to be taken.

1.4 School-Based Action

If the contention is that ICT teaching and learning can be implemented in schools to create achievement and successful learning outcomes for students, then it follows that schools as learning communities must play a major role in the process. Irrespective of all other issues, if the school is not implementing a coordinated and considered plan of action, there is little chance of any consistent success. If a school is haphazard in its approach to implementing ICT teaching and learning it is certain that the results will be confused at best. If the school is coordinated and considered in its approach, the possibility of success grows accordingly.

Schools often ostensibly promote the concept of students taking responsibility for their learning and in so doing becoming lifelong learners. Given the expectations that abound in the world of learning through ICT, surely the school should take responsibility for its role in developing a culture that incorporates the processes and structures for successful learning through student access and engagement? Moreover, given the promotion of a 'knowledge economy' by successive Governments, surely some specific national direction through the Ministry of Education, compelling schools to act in the area of ICT teaching and learning, should be considered a logical imperative?

One of the concerns that has emerged from the two major education reforms of the past decade is the reality that schools, as self managing operations, have had to 'reinvent the wheel' on occasions when this simply should not have been the case. The resultant costs in terms of time, staffing, resources and finances have led to increasing frustration and inaction. But now the same problem has arisen with regard to ICT teaching and learning in schools. National direction through a Government imperative would ease this concern for schools and encourage them to assume a manageable level of responsibility while developing successful ICT teaching and learning.

This thesis offers one school's declared and operating solution to the problem. Having accepted its responsibility, formulated a careful plan and taken appropriate action, the school is now able to offer successful learning outcomes for students using ICT tools in the classroom.

1.5 Statement of Purpose

As noted previously, this thesis presents a case study of an actual school in operation. It attempts to tell a series of stories through the experiences of its participants. It will take the reader on a journey of exploration and discovery, identifying the features which have made ICT so much part of the school's culture that:

" ... *learning and operating through the tools of ICT is now a critical part of the way we do things here.*" Teacher Y.

In providing an interpretive account of how ICT teaching and learning has been initiated and implemented in this case study school, the thesis will also reveal the extent to which the various levels of this ICT teaching and learning have been institutionalised. The case study research uses both qualitative and quantitative processes. Much of the research deals with school-wide and inclusive experiences. To achieve a greater richness of account, certain experiences or processes will be considered in more detail within a cross-sectional representative group taken from the school.

The intention is to provide schools with a set of characteristics likely to help them achieve their intentions for ICT teaching and learning in their own school settings. It is hoped that the detail outlined in the three stages of research will provide schools with further insights which will help them create a synergy between their practising experiences and the identified characteristics of success.

1.6 Organisation of the Thesis

This thesis is organised and presented in accordance with the general Guidelines and Procedures for Thesis Preparation from Massey University. Chapter One introduces the topic and examines issues that have contributed to the background significance of the research. Chapter Two considers the related research literature, including the 'Effective Schools' research and relevant international and key New Zealand research on ICT in schools. Chapter Three presents the specific research questions and associated considerations. This chapter also outlines issues concerned with the selected case study methodology. Chapter Four provides an outline of the research stages, the respective content within these stages, and the processes used in data gathering. Chapters Five, Six and Seven present the research findings of each of the three stages and provides a summary statement of the main outcomes at each point. Chapter Eight concludes the study with a summary of the main findings and implications of the research relating to the identified characteristics of success in developing a learning community through ICT.

Chapter Two

Literature Review

2.0 Introduction

This literature review begins with a brief outline of an inclusive definition of the term information and communication technology (ICT). The characteristics of effective schools are then reviewed. A contention of this research is that the identified characteristics of effective schools could provide a basis for formulation of characteristics required for successful implementation of ICT teaching and learning in schools.

This review also examines the available research and commentary on the implementation of ICT teaching and learning in schools. A variety of contributory elements related to this implementation are presented, including:

- **Social factors**, that is, issues that concern people in a learning community.
- **Infrastructure factors**, that is, issues relating to equipment, installation, access and technical support.
- **Pedagogical factors**, that is, issues relating to teaching and learning.
- **Teacher education factors**, that is, issues concerned with professional development of teachers.
- **Whole school factors**, that is, issues concerned with leadership, management of access and engagement, responsibility and consistency.

2.1 Towards a Definition of ICT

A review of research in the field of computers and education over the past decade reveals that the terminology used in this area of study has undergone considerable evolution. Ten years ago the term 'microcomputer' was commonly used to describe what is now more simply termed a 'computer'. In the early 1990s, however, the term 'information technology' (IT) became more prevalent.

While the term IT is commonly associated with computers, this term is not in fact confined to the functions of computers alone or indeed to electronic media. Morgan (1994) outlines the development of IT, which he argues includes stone tablets and chalk boards, together with electronic mail (email) and the World Wide Web (WWW). Brown (1995) also proposed the following definition of IT:

The design (and evaluation) of an artifact, environment or system as a solution to a human problem with either the structure or function of information.

2.1.1 Information - Communication - Technology

Information can be defined as communicated or received knowledge. Knowledge, however, can be considered as a construction put on information. The processing, in human terms, of this information is reliant on the sensory intake from each of our worlds. This intake affords us the opportunity to construct meanings. It is these constructed meanings that, through interpretation, become knowledge.

Communication employs one or more of our senses and is concerned with the sharing of information. This may take the form of sending or receiving information, instruction and ideas. It can include listening, speaking, reading, writing, viewing and presenting (Ministry of Education, 1993b).

Technology may be defined as the scientific study of the development, adaptation and evolution of elements that assist people in their living. Technology is concerned with seeking solutions to barriers and challenges, and with creating new horizons. It is the development of products, systems or environments and takes place in social contexts (Ministry of Education, 1995).

2.1.2 A Shared Definition

For the purposes of this research, the definition of ICT set out below has been applied. This definition incorporates the ideas described in the previous section together with those included in the National Curriculum Statement, *Technology in the New Zealand Curriculum* (Ministry of Education, 1995), and in the Government's strategy document for schools, 'Interactive Education: An Information and Communication Technologies Strategy for Schools' (Ministry of Education, 1998). Thus, the following definition of ICT blends the understandings discussed in section 2.1.1 into a New Zealand education framework and perspective:

Information and Communication Technology (ICT) describes items of equipment such as: computers, scanners, digital cameras, phones and faxes, electronic networks (hardware); database storage programs, interactive multimedia and the World Wide Web (software). Such equipment allows us to access, collect, retrieve, store, organise, structure, manipulate, present, communicate, design, invent, explore, enquire, create and problem solve through electronic means.

The definition of information and communication technologies is therefore focused on accessing and processing information and the facilitation of communication through the use of technologies available to schools in New Zealand today. Such technologies commonly include computers, associated software, modems for email, Internet access, television and video, telephones and facsimile machines. These allow for interaction with a range of data sources in a range of formats that include digital information, graphics, sound, video and worldwide personal contact. These interactions have the capacity to build bases of information on which people can construct knowledge.

This research focuses on the practical elements of implementing teaching and learning with ICT at the case study school. To this end, the role of the computer is paramount. Accordingly, for the most part, the computer is the centre of ICT emphasis throughout this research and at the case study school. All of the equipment and processes noted in the definition above involve the computer directly or indirectly. Furthermore, the phones and faxes interface with the computers through the audiographics programs, although they are also treated as 'stand-alone' ICT tools which, like the computer, coexist in a digital environment.

2.2 Characteristics of Effective Schools

It is contended that a set of key identifiable characteristics is present in effective schools (Sammons *et al,* 1995). These can be considered in terms of general school performance or within specific areas such as ICT teaching and learning. The purpose of including these characteristics in this research is, having identified and discussed them, to review them in light of the case study school's implementation of ICT teaching and learning. The question is: can the characteristics of effective schools be used to assist the process of planning for and implementing ICT teaching and learning on a school-wide basis?

Are effective schools a result of haphazard and accidental occurrences or are they a product of considered and coordinated design or could a combination of both explanations be possible? There is debate within the literature concerning separation of the processes of school improvement and the factors of school effectiveness. The case for recognising and establishing a synergy between improvement and effectiveness is made by considering their causal and reciprocal relationships (Reynolds, *et al* 1993).

There is clear acknowledgement (Fullan, 1991; Hargreaves and Hopkins, 1993) that the culture of a school, as determined by its management and organisational conditions and arrangements, can bring about change and development. However, it is critical for schools to identify their destination before embarking on such journeys of change and development. Arguments over whether the processes of school improvement or the factors of school effectiveness are more important, make no useful contribution to the school's overall aim of achieving greater effectiveness in terms of both the quality and quantity of teaching and learning (Reynolds, *et al* 1993).

This section of the review outlines and briefly discusses the key characteristics of effective schools (Figure 2.1). These were derived from an exhaustive international review of school effectiveness carried out by Sammons *et al* (1995). While this review took account of the five areas of research related to school effectiveness identified by Schereens (1992), the focus of the Sammons *et al* (1995) review was on school effectiveness tradition and teacher effectiveness. Thus, Sammons *et al* (1995) also considered relationships between school factors, for example, leadership and culture, as well as classroom processes. An agreed consistency of the identified key characteristics discussed below can be found in further studies by Purkey and Smith (1983) in the USA, and by Ramsay *et al* (1987) in New Zealand. Where applicable, elements of these key characteristics will be revisited in each of the following sections on social, infrastructure, pedagogical, teacher education and school-wide factors.

School effectiveness focuses on the belief that "*schools matter, that schools do have a major effect on children's development and that, to put it simply, schools do make a difference*" (Reynolds and Creemers, 1990).

Characteristics of Effective Schools	
1. Professional leadership	Firm and purposeful A participative approach The leading professional
2. Shared vision and goals	Unity of purpose Consistency of practice Collegiality and collaboration
3. A learning environment	An orderly atmosphere An attractive working environment
4. Concentration on teaching and learning	Maximisation of learning time Academic emphasis Focus on achievement
5. Purposeful teaching	Efficient organisation Clarity of purpose Structured lessons Adaptive practice
6. High expectations	High expectations all round Communication of expectations Providing intellectual challenge
7. Positive reinforcement	Clear and fair discipline Feedback
8. Monitoring progress	Monitoring pupil performance Evaluating school performance
9. Pupil rights and responsibilities	Raising pupil self esteem Positions of responsibility Control of work
10. Home-school partnership	Parental involvement in pupils' learning
11. A learning organisation	School-based staff development

Figure 2.1 **Characteristics of effective schools.**

2.2.1 Professional Leadership

Leadership is a major determinant of school effectiveness (Gray, 1990; Purkey and Smith, 1983). This determinant is concerned with the leadership role, style and management abilities of the people concerned in relation to their knowledge of school improvement and the processes of change. While no one style of leadership has been advocated, a number of consistent elements have emerged as being contributory to successful leadership.

Effective leaders demonstrate the ability to take a considered approach in their actions and are important agents in the process of change. They build teams for purposes and negotiate a shared and discernible direction. They have a clear capacity to manage situations and access resourcing as required (Murphy, 1989). They seek to share, involve and collaborate, and are aware that effective change arises from within the whole school community (Fullan, 1991; Neville, 1992). They have an understanding of the curriculum and the processes of teaching and learning taking place in their school. They are available and obvious.

2.2.2 Shared Vision and Goals

There is unanimity in the literature that a shared vision, based on the critical components of shared norms and values and translated into general aims and more specific objectives, will facilitate a cohesive and functioning learning community. Such a community, having set directions, will develop the joint capacity to manage change and establish institutionalised practice (Lightfoot, 1983; Schein, 1992; Stoll and Fink, 1994). Cohen (1983) has extended this concept of sharing to include a wider public statement of goals. Established consistency and coordination of curriculum provide students and teachers with clear and achievable goals. This in turn contributes to the expectations set by the school (Rutter *et al,* 1979). It is clear that through shared ownership of a school's vision and plan of development, individual and collective responsibility for the successful attainment of the desired goals by students and teachers can be established.

2.2.3 A Learning Environment

Effective schools conduct managed operations in task-oriented environments (Rutter *et al,* 1979; Lightfoot, 1983). Students are encouraged to take responsibility for their learning. Reinforcement of achievement further enhances the development of learning behaviour. In addition to the processes of learning, Rutter *et al* (1979) have noted that not only the physical state of the school's buildings, but also the state and repair of its resources and equipment, contribute importantly to the effectiveness of a learning environment.

2.2.4 Concentration on Teaching and Learning

The focus for schools should be on teaching and learning. While that appears to be a simple and obvious concept, the fact is that schools that are not effective have allowed their focus to shift elsewhere. The key elements are the quality, capacity and effectiveness of teaching (Cohen, 1983). The time spent on tasks and in the meaningful pursuit of learning continues to be a major determinant of learning achievement. On this point, an interesting finding reported by Sammons *et al* (1994) was that teachers can have difficulties managing learning when such learning involves several ongoing different curriculum areas at one time. Thus, while learning related to social studies, for example, will likely include the curriculum areas of reading, writing, viewing and speaking, the focus at that particular time must always be on what the school is aiming to achieve by teaching social studies.

2.2.5 Purposeful Teaching

The processes of teaching need to be considered, reviewed and developed in terms of both the school's and the teacher's needs and aims. Teachers need to be clear about the content and purpose of their programmes of work and the learning opportunities or experiences being presented. It is important that students know what is happening, why it is happening, and how the programmes relate both to previous learning and to their world. It is also important, where possible, to be aware of different learning styles and to adopt appropriate strategies (NREL, 1990).

2.2.6 High Expectations

High expectations have been identified as a *"crucial characteristic of virtually all unusually effective schools described in case studies"* (Levine and Lezotte, 1990, cited in Sammons *et al*, 1994). Conversely, low expectations for particular student groups have been identified as reasons for underachievement (OFSTED, 1993). Murphy (1989) asserts that high expectations are more effective in a school culture which places high demands on everyone, as exemplified by high expectations made of principals on their teaching staff and vice versa. Students in turn need to be challenged, stimulated and encouraged by more complex questions and to use their creative capacities and problem-solving strategies.

2.2.7 Positive Reinforcement

In a review of teaching method studies by Walberg (1984), positive reinforcement of student performance was considered to be the most important factor in effective schools. Such reinforcement was valued when the feedback was immediate and in particular when it was school-wide (NREL, 1990).

2.2.8 Monitoring Progress

The assessment and evaluation procedures that result in specific monitoring throughout schools help raise expectations and provide opportunities for positive reinforcement. For students, such processes focus attention on goals and objectives, the degree to which these are being achieved, the manner in which learning experiences can and should be planned for them, and the fact that staff and parents are taking specific interest in their achievements. While a mixture of formal and informal monitoring processes can be utilised, documented record keeping is considered to be an important characteristic of effective schools. From the school's point of view, assessment and evaluation procedures facilitate the acquisition of broad-based information and allow more detailed analysis when the data gathered is consistent, coordinated and related to actual learning. Schools need to review how successful they have been in achieving agreed and set goals. Such information serves to inform further goal setting and has clear implications for staff development.

2.2.9 Pupil Rights and Responsibilities

High individual and collective student self-esteem have been shown to have an empowering effect on student achievement, particularly when students are included in the planning of their learning and encouraged to share in the responsibility for their own learning (Bandura, 1992). Good relationships between students and staff foster trust and involvement. Students who are able to assist others and assume responsibilities within the operation of their school can develop greater independence in their learning.

2.2.10 Home-School Partnership

Just as students can increase their responsibility for learning and thereby their prospects of learning by being included in the planning, process and assessment of their learning, so too can parents assist their child's learning by becoming similarly involved. As critical participants in the learning community, parents value involvement in the learning process. They like to be aware of what their children are doing, how they are performing, and the achievements their children are attaining. As Coleman *et al* (1994) have emphasised:

> "*It is the relationship between the individual teacher and the parent that is critical in enlisting the home as ally, or rendering it the enemy of the educative (or not) activities of the classroom*".

2.2.11 A Learning Organisation

Effective schools, as learning organisations, share a community of practice in which all participants are continuing and active learners. The learning is school-wide. The accent on teacher education through on-site and school-based professional development is widely acclaimed as being a major determinant of improving teaching and learning processes and outcomes, particularly when it is planned and shared on a collaborative and collegial basis (Purkey and Smith, 1983; Hallinger and Murphy, 1985; NREL, 1990; Stoll and Fink, 1994).

2.2.12 Summary

The characteristics of effective schools noted above are interrelated and often mutually dependent. They are applicable across education sectors. Different characteristics will receive varying degrees of emphasis in any one school setting. What is critical and of major significance to this research is that the identified characteristics and related factors are concerned with whole school processes. Success in schools is determined by, and reliant upon, the identification of these characteristics on a school-wide basis together with recognition of their importance as school improvement processes which further enhance the school's effectiveness.

This review of effective schools does not attempt to identify which teacher style is more effective. Rather it is concerned with showing that teachers, as participants in their learning communities, must be clear about their directions, be flexible in their approach, and be prepared to accept the challenge of developing themselves further. Furthermore, while this review is not designed to show that resourcing is a determinant of success, it is worth noting Gray's (1990) comment:

> "*Adequate levels of resourcing ... seem to be necessary but not a sufficient condition for a school to be effective .... in twenty years of reading the research on the characteristics of effective schools I have only come across one record of an 'excellent' school where the physical environment left something to be desired.*"

Much of what is considered in this review of effective schools might be regarded as merely 'common sense'. The response to this is, 'So it should be!' But it is important to know that what we are doing is based on sound research, or, if it is not, that this can be corrected.

2.2.13 An Effective ICT Teaching and Learning School

This research attempts to show how one school that is using ICT effectively for teaching and learning is achieving success in this field. The focus of the research is on the school's key practices and processes, its culture in relation to ICT implementation, at the time of the research.

2.3 Social Factors

> "... *(T)he development of information technology will greatly extend the range of learning opportunities for all New Zealanders. This will break down the barriers of time and location which historically prevented people from learning. It will change how learning occurs as well as when it occurs.*" (Ministry of Education, 1997a)

2.3.1 A Social Rationale

The ICT learning environment is a focal point of this research. This environment is influenced by a range of external and internal factors. External perspectives relate to political, social and economic issues. Industry has expectations and is in a position to exert substantive influence not only on the equipment used but also the operational processes in schools (Sullivan and Patten, 1996; Papert, 1996). Political forces also create pressures, both in schools and in the wider community, although they provide limited specific direction and even less effective financial assistance (Ministry of Education, 1993b; Ministry of Education, 1996). Prior to the release of the Ministry of Education's Strategy for ICT in schools late in 1998, only broad intentions for schools had been promulgated. Furthermore, these intentions were based on suspect planning advice and led to conservative recommendations regarding allocation of funding to ICT by schools (Ministry of Education, 1996). Further advice was given to Government by Butler (1996), with the support of the then Minister of Information Technology. But the question is, who is taking actual responsibility for ICT teaching and learning in schools?

According to the IEA study of computers in schools (Pelgrum and Plomp, 1993), schools, and in particular their principals, view the social rationale as the most important reason for including computers in schools. The social rationale argues that schools must prepare their students for the future by ensuring that they are computer literate. Given their acceptance of this rationale, it is important that principals take charge of their situations and consider what they can do and how they might do it in regard to implementation of ICT in their school-wide learning environment.

The learning environment at school is the key area in which change can be effected. Pelgrum and Plomp, (1988) have developed an excellent model of a school learning environment in the form of an ecological system. Their interdependent system shows the interactive relationship between the computer, the teacher and the student, and how this impacts on a range of subsystems. Brown (1995) has further adapted this model to depict a computer, or ICT, learning culture. The model emphasises the important relationship that exists between the computer, the students and the teachers. Each element of this relationship introduces a further range of components that interact with a school's teaching and learning culture. If a school is intent upon achieving school-wide development of teaching and learning with ICT, it must develop an inclusive approach that accounts for and promotes each of these elements and components.

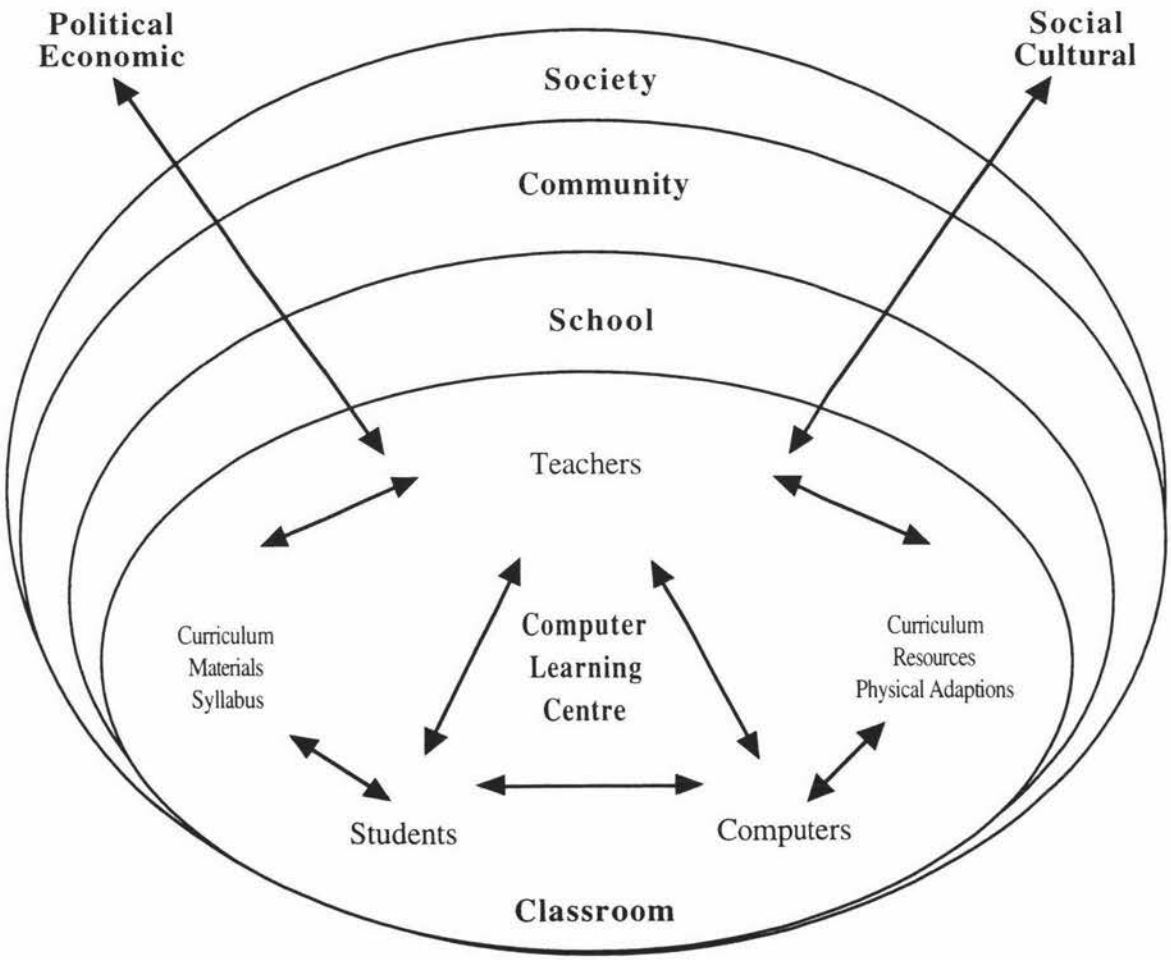


Figure 2.2 **Ecology of the learning environment.**

2.3.2 ICT: A Focus of Negative Social Concerns

Schools should be aware of the following negative concerns raised by critics of learning through ICT:

• *Learning through ICT can foster a mechanistic approach to schooling.* In fact, schools have generally moved away from computer-assisted instruction software in favour of more open-ended software that enables the student to learn with computers.

• *Learning through ICT can have a detrimental effect on human interaction and relations.* In fact, the observed trend in schools has been that the use of ICT has resulted in increased interaction through collaborative and cooperative learning (Ryba and Anderson, 1990; Scarlett, 1995).

• *The teacher will be replaced by the technology.* Interestingly, there is an expression used by many educators which states that *"any teacher who could be replaced by technology should be."* The changing roles of the teacher, as noted in section 2.5.1, have arguably developed through the influence of constructivist theory using an interactive teaching style (Biddulph and Osborne, 1984). The model of 'engaged learning' (Jones *et al,* 1994) and the 'Strategies for Better Thinking' outlined by Mason (1996) identify teachers as absolute necessities in the facilitation of students' learning through ICT. Others make similar claims regarding the need for teachers in this setting (Fullan *et al,* 1988; Tobin, 1988; Pelgrum and Plomp, 1993; Brown, 1995; Scarlett, 1995; MacPherson, 1996; Williams, 1996).

2.3.3 Schools as Society's Product

Schools have been slow to implement ICT into classrooms. As Kneller (1965, cited in Maddux *et al,* 1996) has pointed out, changes in schools generally follow changes that have already occurred in the culture at large. He argues from a positivist perspective that the role of the school is to replicate or transmit the culture of a people to its children. Such positivist influences, which include strong political and economic forces, are powerful determinants of the realities in our schools. Even the Boards of Trustees elected to govern schools are likely to be made up of more 'mainstream' citizens who are keen to see that their children and their school fit in to the existing framework of society. Furthermore, if the education system alone were to attempt to bring about change in society, it would first need to influence forces such as as business, Government, religion and the media.

Strong public support for computers in schools came about only after the implementation and institutionalisation of computers in business, the military and within consumer appliances (Maddux *et al,* 1996). It is vital that the public is kept informed about how teaching and learning with ICT benefits students; how it helps them to live in today's technological world while assisting achievement of successful learning outcomes. If the

public is not informed and convinced of the efficacy of learning through ICT, it will be less likely to continue funding the very high costs of implementation and integration of ICT in the classroom.

Maddux *et al* (1996) believe it is critical that computer-using educators:

> "*(1) make reasonable claims about what computers in education can accomplish and (2) provide evidence that promises about computing benefits are being fulfilled.*"

With regard to the latter point, these authors have noted that failure to deliver on inflated claims, particularly with respect to other electronic learning media such as 16 millimetre film and educational television, has already caused a public backlash. Fortunately, the growth of ICT in our society to the point where it is now a critical facilitator of the way we all do things has meant that schools will not be able to dismiss ICT as a passing fad. Schools will have to get used to ICT and get on with the processes of making it work as a tool for teaching and learning.

2.3.4 The Widening Gap Between 'the Haves and the Have Nots'

There is a growing recognition of the social implications of the distinction between 'the haves and the have nots' in terms of access to ICT. Families in the higher socioeconomic groups are more likely to have access in their homes to ICT. Indeed, teachers and principals nominate lack of access to ICT in their schools as the major barrier to the implementation of teaching and learning with ICT in the school setting (Pelgrum and Plomp, 1993; Telecom Education Foundation, 1996). Furthermore, a report from England's Office for Standards in Education (OFSTED, 1997) has identified a widening gap in ICT learning between students from homes that are ICT capable (and who correspondingly attend schools that are properly resourced in ICT) and students from homes and schools with a poor provision of ICT resources. OFSTED noted that the former group of students "*are rapidly pulling ahead of those who lack sustained experience of working with computers either at home or at school.*" OFSTED further pointed out that the dilemma faced by schools without reasonable access to ICT resources is being exacerbated by the rapid changes in technology itself. Nevertheless, much can be done to improve this situation in the areas of pedagogy (section 2.5) and teacher education (section 2.6).

This issue is also discussed by Ramsay *et al* (1997), who have similarly noted that the gap between those who have and those who have not, in terms of ICT, is distinct and growing in New Zealand. These authors argue that the ability to learn and, as a consequence, to apply knowledge are greatly reduced in those on the 'wrong side' of the gap:

> *"All too often when children not so privileged have access [to ICT] at school there are problems with management and meaningful engagement."*

Shrum and Berenfeld (1996) have considered the problems associated with the provision of ICT resourcing and access for teachers and students. These authors concur with the views of Williams (1996), who has advocated the development of communities of learners through the connected environment of ICT. As Shrum and Berenfeld (1996) have noted, ICT, in conjunction with the considered introduction and implementation of telecommunications in our classrooms and schools:

> *"...can make the educational process available to everyone regardless of geographic and socioeconomic circumstances. It enables communities of learners to collaborate and share resources."*

2.4 Infrastructure Factors

This section on infrastructure discusses factors such as technical support, hardware and supporting materials. It considers the problems these factors can present in the context of relevant findings in the research literature. The issues of accountability and responsibility, and concerns over the continuing increase in expenditure on ICT infrastructure by schools, are also discussed.

2.4.1 Technical Support

Technical support is a real and very important issue for schools. Thus, it is encouraging to note the emphasis schools are placing in this area (Telecom Education Foundation, 1996), even if it is difficult to determine exactly where and how this emphasis is being applied. Teacher concerns in a number of ICT-related areas tend to surface as barriers to the implementation and integration of ICT teaching and learning in schools (see section 2.7). Thus, it is important to be aware that, within the normal school setting, there is unlikely to be sufficient technical support for the host of problems that arise from the presence of ICT in schools. Indeed, nothing is more certain than that 'technical difficulties', often caused directly by the user of ICT, will present in the classroom.

While schools do not employ personnel with formal technical expertise, they will often have a designated teacher who becomes an 'in-demand trouble shooter'. Of course, these designated teachers cannot perform tasks that are outside their sphere of expertise, which in turn opens the way for escalating frustration. Indeed, such frustrations are guaranteed direct consequences of having ICT in schools, particularly given the heavy demands made on equipment by young and inexperienced users. These frustrations can result in some teachers being 'turned off' by the technology, which in turn provides them with a reasonable excuse to withdraw from ICT teaching and learning. Thus, it is not merely the responsibility of schools to ensure that ongoing and effective technical support is

available, but rather an absolute requirement for successful ICT teaching and learning.

2.4.2 Hardware and Supporting Materials

The call from teachers and principals both internationally and in New Zealand is for increasing quantities of enabling ICT hardware (computers, network hubs, cameras, telephones, facsimile machines) and supporting materials (network wiring, software, ISDN lines). Only in this way, these teachers and principals argue, can the barriers which impair the integration of learning through ICT in their schools be removed (Pelgrum and Plomp, 1993; Telecom Education Foundation, 1996). This issue is discussed further in sections 2.5 and 2.7.

There is no doubt that there has been a proliferation of ICT equipment within schools (Telecom Education Foundation, 1996). There is also no doubt that this trend will continue. There is, however, no corresponding evidence to suggest that this proliferation has resulted, or will result, in a change in what actually happens in the classroom. We know that exemplary computer-using teachers already exist (Becker, 1992; Pelgrum and Plomp, 1993; Brown, 1995). If still greater levels of ICT infrastructure are required to achieve results, how then have these teachers managed to be successful to date?

2.4.3 Accountability and Responsibility

The challenge for schools, and in particular for teachers, is to find the solution to the problem of ICT integration themselves. At no stage in the past has anyone else done this for them, and nor will anyone else do it for them in the foreseeable future. Thus, it is crucial that schools and teachers recognise that the answer can probably be found by examining and utilising what they already have in terms of infrastructure. By achieving greater ICT integration across the curriculum to support and facilitate student learning, principals and teachers should be able to increase access to infrastructure for both teachers and students. Simply asking for more, when the current infrastructure has not been utilised efficiently, is not the answer.

The governing authority in New Zealand, that is, the school Boards of Trustees, have demonstrated a clear willingness to resource their schools with the best ICT infrastructure possible within their financial constraints (Telecom Education Foundation, 1996). Board members presumably appreciate the reality of the world they and their children live in, and they want their schools to have the best possible equipment available. However, at what point should Boards be asking for evidence that their previous decisions to support purchase of ICT for the school have benefited students' learning?

There are no gazetted requirements of schools to use ICT for teaching and learning or to report on use of ICT to Boards of Trustees. Any such reporting is purely an internal school arrangement. The lack of any gazetted requirement for schools with regard to teaching and learning with ICT also means that the independent review group - the

Education Review Office, which is legally bound to report to the Minister of Education - has no authority to review schools' performance concerning ICT. Given the reality that schools spend such a large proportion of their discretionary funding on ICT, and on infrastructure in particular (Telecom Education Foundation, 1996), at what point should they be held accountable financially to their community? Furthermore, at what point should schools be held responsible educationally to their students?

The Education Review Office (1997) has conducted an independent review of ICT in schools. Its findings correlated with those of a growing body of related ICT research (Pelgrum and Plomp, 1993; Ryba and Brown, 1994), and coincidentally with the then Minister of Education's thoughts (Gerritsen, 1997), namely, that spending large amounts of money on infrastructure will not solve the problems of integrated learning through ICT in the classroom.

Thus, it is becoming increasingly clear that, beyond a certain level, the availability of equipment does not determine successful teaching and learning through ICT (Ryba and Brown, 1994). As has been so clearly pointed out by Ryba (1992), the effects of the teachers and of other people involved have greater significance than the effects of the technology. As Mehan (1989) has commented:

> "*It is not the features inherent in the machine but what people do with the machine that determines how microcomputers will be used in education.*"

2.4.4 Repeating Patterns of Behaviour

The drive to establish computers in schools throughout the 1980s and 1990s is now being complemented by a similar drive to ensure uptake of the Internet. We are witnessing a repeat of a process that so far has not met with universal success. Schools are once again more concerned with obtaining 'connectivity' and with networking their schools than they are with thinking about why they should be doing these things, and what increase in learning they believe will ensue as a result. In this regard, Williams (1996) has emphasised the lessons to be learned from Australia, where a 'teachers first' philosophy, putting what teachers want before what is important for students, has been rampant. As this commentator has noted:

> "*Our history [has] taught us that putting millions of dollars into placing boxes onto school desks and even worse, connecting school buildings to the Internet, is a total waste of time, money and resources.*"

Williams (1996) also comments that the infrastructure logistics of connecting teachers to the Internet is of limited value unless there is a connecting of teachers to the understanding and accessing of communities through the Internet.

2.5 Pedagogical Factors

This section examines widely held views on student 'learning *through*' ICT and moves on to consider the favoured New Zealand approach of 'learning *with*' ICT. The growing view that emphasis should be placed on identifying student learning outcomes is also considered.

2.5.1 A Focus on Students and Learning

Teaching and learning in general should be carefully considered in the light of the new learning that ICT can offer. However, before considering pedagogy related directly to ICT, it is useful to consider a model of engaged learning as it relates to teachers and students in the classroom and those with access to ICT in the wider community. Jones *et al* (1994) outline eight characteristics or indicators of meaningful engaged learning:

Vision of Engaged Learning - Engaged learners are responsible for their own learning (Ryba and Anderson, 1990), self-regulated, and able to define and evaluate their own goals. They are able to learn, to transfer that learning to the creative solution of problems, and they have the skills to work collaboratively.

Tasks for Engaged Learning - Tasks need to be challenging, multidisciplinary and authentic, that is, they should correspond to the tasks of the home and workplaces of today and tomorrow. They should also be collaborative, that is, undertaken in conjunction with communities of people, near and far. Such tasks often require integrated instruction that incorporates problem-based learning.

Assessment of Engaged Learning - The assessment is formative or performance-based; it should be concerned with what the students actually know and do. It involves the learner playing a key role in the actual assessment. The assessment should consider all students equitably and include some indication of their performance relative to others.

Instructional Models and Strategies for Engaged Learning - The models should be interactive, encouraging the learner to construct knowledge in meaningful ways. Students learn from and teach each other through co-construction of knowledge on a problem, project and goal basis. A common element of this interactive learning includes individual and group summarising, exploration of multiple perspectives, building on prior knowledge, brainstorming, interactive discussion, question forming and problem-solving. Examples of this model are further explained by Biddulph and Osborne (1984) and Faire and Cosgrove (1985).

Learning Context of Engaged Learning - The classroom must be conceived as a knowledge-building learning community for developing shared collaborative understandings while valuing diversity and multiple perspectives. This learning community encourages students to ask hard questions, define problems, initiate debate,

set goals and interact by connecting with other communities.

Grouping for Engaged Learning - Learning with and through collaborative groups within, across and beyond classroom boundaries is ideal. Such heterogeneous groups should be flexibly constructed according to the purposes of teaching and learning.

Teacher Roles for Engaged Learning - There has been a clear shift in the role of teacher from that of information giver to that of facilitator, guide and model learner (Faire and Cosgrove, 1985; Ryba and Anderson, 1990; Strack, 1995; Butler and Zwimpfer, 1997). The teacher as facilitator provides rich environments and learning experiences for collaborative learning. As a model learner, the teacher becomes a co-learner and/or co-investigator.

Student roles for Engaged Learning - In the engaged learning model, students become explorers. Their interactions with the physical world and its communities allow skills to be developed and concepts to be discovered. Students are encouraged to observe, apply and to reflect on the thinking processes used by others. Students become teachers and producers of knowledge, able to make contributions to the communities of knowledge.

McNabb (1998) suggests ways in which ICT can provide the medium for engaged learning and makes further comment concerning the connectivity of communities of learners:

> "*Building strong communities for learning is central to the success of systemic reforms advocated by educational leaders [for students] in the 21st century.*"

There is an interesting correlation between the engaged learner model of Jones *et al* (1994) and a model outlined by Mason (1996). Both authors emphasise the importance of teacher facilitation and greater student responsibility for individual and collective learning.

Some Strategies for Better Thinking: How Can Computers Contribute?

Strategy	Purpose and Process
Teacher modelling	To provid instructional scaffolding - for example, the teacher articulates the 'thinking through' process and what is being done with a piece of software.
Coaching	To give clues, hints and advice (again in relation to a piece of software).
Scaffolding through questioning	To support and clarify thinking by seeking responses or actions relating to general or specific questions.
Articulation	To build ideas in a 'shareable' form either through cooperative learning or through peer tutoring at a computer.
Reflection	To describe and respond to processes and achievements. The class or groups meet and review a piece of work or an activity on the computer.
Exploration	To encourage active thinking in order to hypothesise and test systematically to solve problems. Simulation programs such as *Sim City* may be used.
Generalisation	To use strategies in one domain and then apply these to another domain. An example could be generalising between issues identified from *Sim City* when developing the school's own infrastructure.
Cooperative settings	To foster dialogue aimed at identifying, analysing and discussing problem-solving processes, and to validate problem-solving skills in the light of peers' activities in most computer activities.
Reciprocal process	To assist much deeper comprehension of text through the use of CD Rom and the World Wide Web.

Figure 2.3 **Strategies for better thinking.**

In this model of 'Strategies for Better Thinking' (Figure 2.2) Mason emphasises how computers as 'tools of culture' affect the roles of students and teachers, changes in teaching strategies, and social practice. Mason builds on the view of David Kolb (1984, cited in Mason, 1996):

> *"... As the tools of culture change, so too will the course of human development - the laws and limits of human development will never be known."*

Review of the literature relating to this topic shows that the focus of research is on computers in education and, where possible, in a whole school situation. Of particular importance is the move from a 'technocentric' (Brown, 1995) framework to one that places the focus on students in the processes of learning. Taylor's (1980) framework of the tutor, tutee and the tool provide an accepted basis for the modes of ICT use. This research centres on the tool concept, by which ICT facilitates improved, faster and different learning opportunities across the curriculum.

The student is the focus in the process of learning, not *from* but rather *with* the computer (Ryba and Anderson, 1990; Lai, 1992), and within this process becomes an independent rather than a dependent learner (Papert, 1996). Papert (1996) further suggests that the student has the power to cause a shift in the ways schools operate teaching and learning. As a result of their increasing access to computers at home, students are engaging in a new way of learning that will bring pressure to the way schools "do things".

Given this emphasis on learning, it is appropriate to ask how ICT contributes to learning? And in seeking to answer this question, it is important to recognise that learning is not a set of written sequences but rather a set of psychological sequences (Smythe, 1989). It is also helpful to note that Papert (1996) suggests a constructivist approach to the process of learning through computers. Using this approach, learners are able to make greater sense of their world (Biddulph and Osborne, 1984) by building on existing knowledge and constructing further understandings based on the questions they ask. This approach suits many of the 'open-ended' processes offered by ICT tools, for example, being able to ask a direct question of an 'expert' on his/her Web page or through email, which enables students to make progress from their actual level of understanding at the time. Of course, students will still need to learn certain operating skills that relate to these tools of learning, in this case the World Wide Web or electronic mail.

Brown (1995) provides an excellent analysis of the current debate and historical perspectives relating to learning with computers. However, he is forced to conclude that, in relation to learning with computers:

> *"... the research is rarely persuasive and worthy of direct comparison. The judicious answer to the question of whether computers enhance learning, is that it depends!"*

Ryba (1996) reports that active engagement by students in the learning process is associated with learner investigation, collaboration and construction of knowledge. Students can develop a sense of self-improvement with their own learning through information and communication technologies. Macpherson (1996) continues the theme

of learners as information processors in their problem-solving practices through the use of ICT. But just as students are asked to develop their self-reflection and metacognitive understandings, so too are teachers. Johnston (1996) emphasises the need for students to take responsibility in a constructivist environment by: (a) sharing knowledge amongst themselves, and (b) becoming involved with and sharing in the planning and control of the content and processes of learning. In this way, computers provide a vehicle for social development, skills for thinking and strategies for learning.

It remains virtually impossible, and is not the purpose of this review, to identify and substantiate the claimed effects of learning through computers (Papert, 1987). Williams (1996) points to a model that places emphasis on the need for teachers to undergo professional development, affirms the importance of questions relating to curriculum, and does not neglect *"the forgotten component of most technology planning models - the logistics of managing technologies in the classrooms by teachers."*

Brown (1995) also wisely asserts that the effect computers have on learning is dependent on a number of variables. He then examines in detail one critical variable, namely the teacher, and concludes:

> *"... (A) proficient computer-using teacher not only knows how to use a computer, but also has the pedagogical knowledge of how 'best' to use the software in the classroom. We can learn much from this type of knowledge."*

The research presented in this thesis attempts to build on Brown's work.

2.5.2 'Learning with' ICT

The experience of introducing computers into classrooms has shown that it is relatively simple for schools to focus on 'learning about' computers (referred to as the technical model) and then simply add another subject to the curriculum (Pelgrum and Plomp, 1993). However, schools which placed emphasis on 'learning with' computers (referred to as the integration model or functionality perspective) faced not only the difficulty of adapting learning across the curriculum but also the challenge of changing the way students went about their learning. This 'learning with' computers approach was further enhanced by the fact that New Zealand, along with the USA, introduced the widest range of software types in primary schools (Pelgrum and Plomp, 1993). The emphasis in these countries on 'learning with' computers led to students requiring access to a wider range of software that, in turn, opened up an increasing number of learning applications.

New Zealand primary schools, together with similar schools in France, led the way amongst 21 countries researched by Pelgrum and Plomp (1993) in terms of placing computers in classrooms. The investigators in this international study noted that the placement of computers into classrooms and the 'learning with' computers approach strongly contributed to the integration of ICT-related learning activities into the

curriculum. However, the organisational factors and the 'learning with' approach also contributed to increased difficulties for teachers.

The implications for infrastructure (section 2.4) and, in particular, teacher education resulting from the 'learning with' computers approach have been huge. Indeed, difficulties such as ensuring regular student access to ICT (a 'must' with this approach), have undoubtedly contributed to the piecemeal successes in the ICT field enjoyed by New Zealand schools. In the absence of 'living models' to follow, New Zealand schools (the majority of which have adopted the 'learning with' ICT approach) have been left to fend for themselves. The resulting frustrations continue as the failure to provide regular student access to ICT becomes more evident.

Nevertheless, while many principals and teachers pointed (and still point) to problems with equipment and access as issues to be overcome when integrating computers in schools, Pelgrum and Plomp (1993) took a different view. These authors noted that while a 'critical mass' of computers and an adequate variety of software might facilitate far greater integration, they doubted whether this would prove to be the case. And even though advanced technologies such as multimedia could make a difference in this respect, these authors concluded that the problems encountered with integrating ICT into schools were more pedagogical than technological.

Six years later, Pelgrum and Plomp (1993) will take small comfort in having been proven right. In most schools, and despite the gradual increase in computers and the undoubted proliferation of more technologically advanced operating and communicating systems, integration of computers continues to prove difficult to achieve. Fortunately, the functionality perspective is growing and will prove the way for schools in the future (Anderson and Collis, 1993).

> "*Do not ask what computers can do to students but rather what students can do with computers.*" (Ryba and Anderson, 1990)

2.5.3 Outcomes for Students

Brown (1995) has identified the need for "*a clear philosophy and educational theory in relation to the computer learning environment*". If the process of incorporating ICT into schools can be likened to a journey of discovery, the importance of referring to signposts along the way cannot be overemphasised. Only in this way can the direction taken during this journey be monitored. Even more importantly, it is essential that an agreed destination be determined at the outset. Only then will travellers know if they are heading in the right direction and, at some point, whether they have arrived at their destination.

There have been increasing calls in New Zealand for controlling authorities and schools themselves to identify a new literacy, that is, a digital literacy or ICT literacy, for student learning (ERO, 1997; Butler and Zwimpfer, 1997; Beach and Baldwin-Denton, 1998;

Dutton 1998; Gawith, 1998; Moffatt, 1998; Treadwell, 1998; Fyfe, 1998; Hotere, 1998). This emphasis on student learning in ICT includes a focus on the technical model and accentuates the integration models. There is an apparent concurrence within these New Zealand perspectives for:

- Information processing skills - questioning, locating information, selecting and interpreting information, presenting responses, reviewing process/responses.
- Operational skills - ability to select and use the ICT tools.
- Vehicles for learning - application of the skills through ICT-facilitated applications to learn by communicating, inquiring, creating, problem-solving.

The following issues relevant to student learning through ICT need to be considered carefully as schools rush to become connected to the Internet:

- The focus for student learning with the Internet is often on 'looking stuff up' or creating 'slick home pages' for the audience in the sky (Gawith, 1996; Williams, 1996). Furthermore, as Shrum and Berenfeld (1996) have noted:

  "...even when classrooms are wired and students and teachers can telecommunicate, it is not certain that they will or that their efforts will be enriching."

- Gawith (1998) also emphasises the need to achieve information literacy, rather than the meaningless capacity to 'look up' information on the Internet. Williams (1996) notes the need for connectivity in learning through communities of practice on the Internet:

  "We concluded that the most significant element of the Internet is the communities of people and that interaction with these communities of people will be an important way to understand what their country is like."

- Shrum and Berenfeld (1996) make the point that students and teachers are less likely to misunderstand someone through a connected conversation. They further point out:

  "We can now demonstrate to our students that complex problems are not solved in isolation but require mutual respect and cooperation."

- Teachers need encouragement (Handler, 1996) to take on the risks associated with using new tools for learning and enjoy the challenge of learning with students. As Handler (1996) states:

  "Teachers hold the key to helping these students learn to become users of knowledge, learners willing to explore different ways to attack a problem, as well as citizens with a variety of communication skills in our global community."

- Maddux *et al* (1996) also believe that 'telecomputing' presents unequalled potential as a tool for learning. As these authors have commented:

> "*By bringing the world to the classroom, educators are given vast new opportunities to enrich instruction and enhance teaching and learning.*"

There are dangers with these new tools, however. For example, it is possible that teachers who have been print reared and have as yet failed to make the move into the new media of learning through ICT will attempt to place students in their known world of operation (Spender, 1995). This can be avoided only if teachers come to terms with the practices and processes adopted by students reared on this new media (Spender, 1995). The print information that teachers have been accustomed to, and have transcribed on to the Internet, is not necessarily useful for students when (a) it needs to be simplified to a level of understanding that in turn threatens delivery of the intended message, and (b) students have already recognised and pursued the option of contacting the source electronically to construct meaning, based on what they actually know, in an attempt to make greater sense of their world.

Care must also be taken to ensure that teachers are not simply preparing students for the world that they have known. Rather they need to consider what is still relevant, while integrating directions of new learning through new media, for the world that students will come to know. Thus, the emphasis must be to build on what is known to work, but adapt it to a changing environment and, where possible, attempt 'new ways of doing things'.

> "*Too often it appears that we are in the business of transferring previous cultures and traditions to future generations when their culture will be and must be different from ours.*" (Strack, 1995)

The challenge for New Zealand schools is to identify the elements that they believe will contribute to effective and demonstrable learning through ICT. Schooling for the Future (Ministry of Education, 1996) attempts to describe the areas and ways in which students will be learning in the future. Other Ministry of Education documents make reference to general ICT considerations for schools to contemplate when planning and developing learning experiences across the curriculum.

Why do New Zealand schools make things so difficult for themselves? Australian students in the state of Victoria have already set in place general approaches to learning and specified learning outcomes through ICT (Department of Education, 1998). In Vermont, USA, teachers have been developing an ICT plan that specifies what their students must be able to learn and achieve through ICT (Judson, 1995). Solomon (1995) emphasises the need to consider the following questions: How will ICT offer new learning opportunities? How will they fit the curriculum? How do they meet the needs

of our students? How will we know if the learning through ICT is working? These questions address the very issues that New Zealand educators are now beginning to work through.

The literature is clear about the pivotal importance of carefully examining the pedagogical issues relating to the implementation and integration of ICT in schools. The unanimity of educators involved in ICT both in New Zealand and overseas is also clear on these issues. But if New Zealand teachers know what should be done, why are they not doing it? Why must they wait for someone else to take responsibility?

2.6 Teacher Education Factors

> "... *(A)dvances in information and communications technologies will continue to affect the nature of learning and the organisation of schooling, requiring teachers to adapt their approaches accordingly.*" (Ministry of Education, 1997)

It is acknowledged that the teacher is a critical variable in the provision of teaching and learning with ICT in the classroom. When Hadley and Sheingold (1993) conducted a nationwide survey of accomplished computer-using teachers in the USA, three common characteristics of such teachers emerged: (a) high levels of motivation, commitment to their students and their own development; (b) strong support and collegiality when integrating computers into their classrooms; and (c) sufficient access.

Becker (1994) has also noted three distinguishing characteristics of exemplary computer-using teachers: (a) school and classroom environments; (b) personal background and experience; and (c) personal practices and perceptions about computer application. The largest predictor of exemplary practice was the school environment, which included variables such as collegiality, hardware and software availability, support from the school, professional development opportunities and smaller class sizes.

Tobin (1988) believes that the impact of computers is shaped more by teacher attitude and behaviour than by hardware, software and administrative support. Teachers also need time to come to terms with ICT, to get to know the technology, and to adapt to new ways of learning through the technologies while integrating them across the curriculum (Pelgrum and Plomp, 1993). Research also shows that teacher training in pedagogical and instructional aspects of ICT results in greater integration in the classroom (Pelgrum and Plomp, 1993). It is, after all, the teacher who brings about actual change in practice in the classroom (Fullan *et al,* 1988).

While accepting the importance of the teacher's role, Brown (1995) notes that the novelty of the computer may be diminishing for the more proficient computer-using teacher and that the most enthusiastic ICT teachers are to be found among the less experienced teachers, both in terms of teaching years and in use of the computer. Perhaps the initial

wave of computer enthusiasts is now giving way to the mainstream teacher? Brown believes that this second wave of teachers are confident in their ability to create better conditions for learning through the computer.

Of particular significance is the detrimental impact of a lack of school-wide support (Brown, 1995) for establishing conditions for proficient teaching practice. The importance of school-wide commitment to learning through computers has also been emphasised by Ryba *et al* (1992). Given the consistency of these findings and those of Hadley and Sheingold (1993) and Becker (1994) above, it has become increasingly important to identify the characteristics of support in a school that help predict the successful implementation of learning through information and communication technologies. Indeed, it is the intention of this research, using a case study methodology, to do just that.

2.6.1 New Zealand Initiatives

The most recent figures from the Telecom Education Foundation (1996) indicate the following allocation of funding to ICT in primary schools (n = 153 responses):

- Equipment acquisition and maintenance 69%
- Equipment usage (for example, telecommunication charges) 12%
- Teacher development 10%
- Technical support 6%
- Teacher release time 4%

These figures reinforce the findings discussed in section 2.7, that is, that the focus for school staff is on equipment. However, the OFSTED report on Information Technology in Schools (1997) showed that success in teaching and learning with ICT in schools is not necessarily determined by the levels of available equipment. The focus of schools that were enjoying increased levels of ICT integration was on pedagogical issues of ICT and the need for substantive and related teacher professional development. The Telecom Education Foundation (1996) survey also showed that only 33% of New Zealand schools which responded to the survey had a written ICT plan, despite the fact that 93% of the teachers surveyed considered that ICT could enhance teaching and learning.

While schools continue to wrestle with the major problems of obtaining hardware and software, the Ministry of Education has supported professional development in ICT. Unfortunately, this professional development tended to take place off-site rather than on-site. It was tailored to the Ministry's prescribed format and contracted content, rather than designed to be responsive to the direct and actual needs of the school. Moreover, this important and costly professional development focused more on developing the skills of the teacher than on what should be done with students in terms of teaching and learning. Schools generally 'sent' teachers to the courses, although some 'in-school visiting' by training providers also occurred. Of 150 teachers surveyed in 1996, 47%

had participated in an ICT-related teacher development programme (Telecom Education Foundation, 1996). Of this 47%, 23% had taken part in a Ministry of Education programme.

Fortunately, more intelligent use is now being made of the funds available for teacher professional development. In 1998, Information Technology Professional Development (ITPD) programmes were introduced. The significant change in this new Ministry of Education-sponsored version is that schools can apply for funding to conduct ICT-related professional development of their staff in their own school. The emphasis is thus on school-based development with a greater focus on teaching and learning. These ITPD programmes represent a step in the right direction which allows schools to manage changes proactively. Recent budget initiatives will ensure that this option for schools will continue for a further two years at least.

Initiatives from the private sector to assist schools in teaching and learning with ICT have been led by Telecom, currently the second largest funding source for education in New Zealand behind the Government. Examples of such Telecom initiatives in 1996 include:

- A contribution to the establishment of EdCom network to assist schools to access and use ICT in teaching and learning. EdCom has expanded its membership to 1010 schools (figures supplied from EdCom as at November, 1998).
- Support materials for the Ministry of Education's IT planning template.
- Internet teacher tutorials involving approximately 5000 teachers.
- Seakeeper's project for schools - ICT-related learning activities for approximately 1100 registered schools.

2.6.2 Teachers - Understandings and Practice

The literature is unequivocal about the need for teacher professional development in ICT (Pelgrum and Plomp, 1993; Williams, 1996; ITAG, 1997; ERO, 1997). It is equally clear that such professional development must occur in concert with a clear understanding of the related pedagogical issues concerning ICT. The establishment of an ICT learning community also implies that this community is both agreed on the direction it is headed and is facilitating its movement as a group that includes school, local community, Government and business people. Teachers must also be clear about what they are doing, why they are doing it, and how they are to go about doing it. Once again, it is the teacher who is the key player in making things actually happen in the classroom (Fullan *et al,* 1988; Tobin, 1988; Pelgrum and Plomp, 1993; Brown, 1995).

One solution to the problem of bringing teachers 'up to operating speed' in teaching and learning with ICT is to immerse them in the technology through active involvement in a learning community. Williams and McKeown (1996) report examples of teachers becoming connected through the Internet and using this medium as part of a community of learning. In doing so, they are removing themselves from the 'look it up' and 'publish

to whoever' approaches that teachers traditionally see the Internet as offering students. Williams and McKeown (1996) advocate an approach which shuns being part of a community that simply tours a country by looking at its monuments on the World Wide Web. Rather, they suggest engagement in dialogue with the people of the country in order to increase understanding of their culture and way of life. The same authors also reiterate the longstanding call to develop active professional development in ICT by connecting teachers with other teachers, thereby furthering teachers' understanding of the power of the technology to effect changes in teaching and learning (Bigum, 1995; Williams and McKeown, 1996).

How schools go about taking responsibility for this key area will substantially determine the level of successful student learning achieved in their school through the implementation of ICT. Identification of their personnel needs, the questions the schools ask of themselves and the logistics of their particular school situation (Williams, 1996) will give some indication of the level of understanding, practical support and ongoing coaching required.

> "*It is teachers who are motivated and committed to their students' learning and to their own development as teachers that will become conversant with cognitive processes, strategies and metacognitive approaches in learning with computers.*" MacPherson (1996).

2.7 Whole School Factors

It is important to recognise the unique nature of each school. The fact that each school is a social system comprised of and dependent upon people ensures that while similarities between schools will always be found, differences will also always be present. Each school has characteristics that derive from elements such as the composition of its staff; the composition of its students and their families; the nature of the local community and its geographic location; the size and physical features of the school; and its facilities and resources (Reid *et al,* 1987). In the New Zealand context, the influences of national laws and gazetted requirements, Ministry of Education policies, external review mechanisms and Board of Trustees governance must also be considered. As such, operating schools are complex and unique organisations (Chubb, 1988).

2.7.1 Leadership and Conditions for Change

Just as the characteristics and influences described above cannot be considered in isolation, so too must the Key Characteristics of Effective Schools be considered as related and complementary, rather than independent of each other. Leadership from the principal has been demonstrated to be an important element in the integration of teaching and learning with ICT throughout the school (Pelgrum, 1993). Consistent with the findings into effective schools, principals who have favourable attitudes, purposeful

direction, demonstrated participation and professional knowledge contribute significantly to the implementation/integration of teaching and learning with ICT throughout their school (Pelgrum and Plomp, 1993).

Fullan (1991) emphasises that innovation in education depends on the considerations listed in Figure 2.4, that is, relevance, readiness and resources. Additional determinants have been suggested by Louis and Miles (1990) and Fullan (1991). These include the clarity of school policy in terms of agreed goals and objectives; the capacity to manage/coordinate the process; the organisation and implementation of professional development; the establishment of systems and processes for monitoring changes, particularly in terms of teaching and learning; and the supply of ongoing technical support.

Relevance	Perceptions of principals and teachers regarding the usefulness of ICT in schools. Do they believe the innovation will produce valued outcomes?
Readiness	Capacity of the school at the time to develop the innovation. Is the attitude of principals and teachers at a stage where development could proceed?
Resources	Capacity to supply, maintain and technically support ICT.

Figure 2.4 **Innovative conditions required for change in ICT.**

These determinants can be considered within a theoretical relationship which involves four frame factors: exogenous and endogenous preconditions, implementation conditions and implementation outcomes (Figure 2.5, Pelgrum and Plomp, 1993).

Exogenous preconditions include external factors for the school such as financial and training assistance from the Ministry of Education and the business sector (for example, Telecom). Other indicators such as school size, student intake and socioeconomic factors are also considered to be exogenous variables. Fullan's (1991) relevance, readiness and resources are grouped, as second frame factors, under endogenous preconditions. The third frame factor groups the determinants suggested by Louis and Miles (1990) and Fullan (1991) as implementation conditions. The fourth frame factor of implementation outcomes focuses on actual determined student learning outcomes directly related to teaching and learning through ICT.

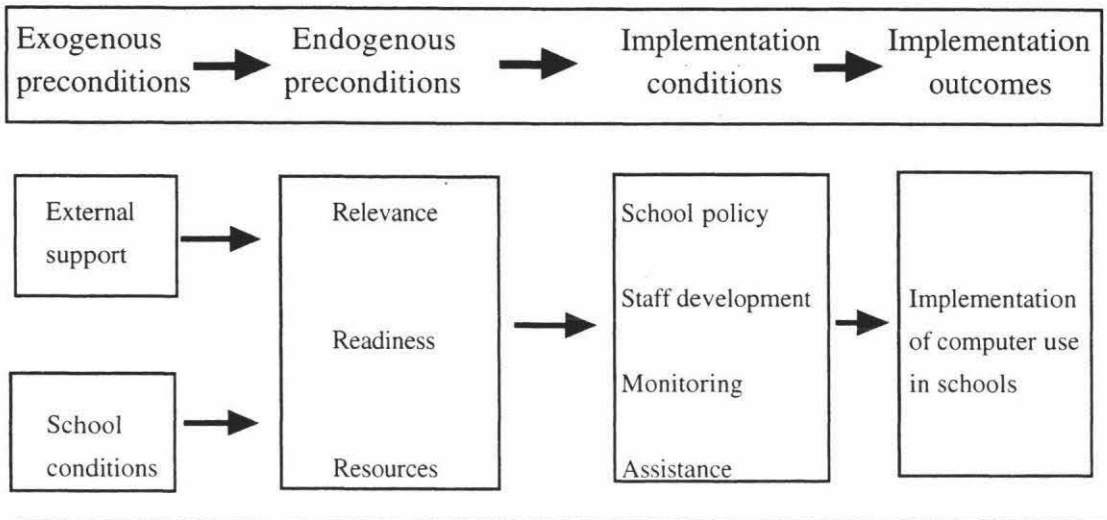


Figure 2.5 **Indicators influencing the implementation of computer use in schools** (Pelgrum and Plomp, 1993).

This as yet unresearched model has been developed as a result of research conducted by Pelgrum and Plomp, (1993). From a school perspective, the model appears to offer useful guidelines for the successful implementation of ICT.

It is important to note that teachers require time to integrate ICT into classrooms. Whole school integration obviously also takes time but the degree of emphasis placed on this within the school determines the speed and effectiveness of curriculum integration (Pelgrum and Schipper, 1992).

There has been and will continue to be a vast array of research conducted on the use of ICT in schools. The proposed and claimed advantages of using ICT in schools to support learning will also continue to be debated. However, while many approaches have been employed to study the effects of ICT in schools, few of these investigations have attempted to identify the characteristics which account for successful use of ICT in a single learning community. Furthermore, much of the focus of studies of ICT in the classroom has been centred solely on computers. While this research accepts that computers are a major element in the application of learning through ICT, it also clearly emphasises the role of the other important elements of information and communication technologies included in the more comprehensive definition of ICT set out in the Introduction to this thesis.

2.7.2 Approaches and Barriers to Teaching and Learning with ICT in New Zealand Schools

It is interesting to note that Pelgrum and Plomp, (1993), in a study of 21 countries, found that the agent which most commonly initiated computers in schools was the controlling school authority. Experiences in this country suggest that this is not the case in New

Zealand. Furthermore, the results for New Zealand in this study showed that groups of teachers were the most frequent initiating authority in this country, and that the second most frequent agent of initiation in New Zealand was an individual teacher. Is it possible that where teachers have been motivated to initiate and implement teaching and learning with ICT in their schools, their results have been better than those observed in schools in which the determination to introduce ICT arose from Ministry of Education sources? If so, perhaps the reason for this is connected in some way with the capacity for teachers to 'just get on with it' despite the barriers in place.

When principals and teachers were asked to rank barriers to computer implementation from a possible list of 28 items (Pelgrum and Plomp, 1993), the nine most important barriers (general areas are included in parentheses) identified were as follows:

1) Too few computers (infrastructure).
2) Too little instructional software (infrastructure).
3) Lack of teacher skill in using computers (teacher education).
4) Limited time to develop computer-based lessons (school management/organisation).
5) Insufficient financial support (school management/organisation).
6) Insufficient training opportunities for staff (teacher education).
7) Too few computer peripherals, for example, scanners, printers (infrastructure).
8) Access to computers (infrastructure and school management/organisation).
9) Difficulty integrating computers into classroom practices (pedagogical).

It is interesting to note the very close correlation between these findings and those of the Telecom Education Foundation survey (1996), which ranked barriers to computer implementation in New Zealand schools as follows:

1) Cost.
2) Access.
3) Not having appropriate equipment.
4) Lack of support for use within the school.
5) Lack of support from outside the school.
6) Low levels of technology training, knowledge and confidence among teachers.
7) Conflicts with other demands and other priorities.

2.7.3 Exemplary Teachers in ICT Use

Brown (1995) has carefully examined the characteristics, both in theory and in practice, of the proficient computer-using teacher. The message from this author is that there is a need for further examination of the efficacy of computer-related pedagogy. Brown (1995) also emphasises that educators must be certain of their goals for the use of ICT in schools, and the reasons that such goals have been identified. As has been noted previously, without these two critically important understandings, it is not possible to confirm whether or not the 'destination of the ICT journey' in schools has been reached.

It is very clear from Brown's (1995) research that proficient computer-using teachers exist in New Zealand schools and their practice is indeed exemplary. However, it is important for research to further consider how these teachers came to be proficient in their use of computers and indeed how their numbers might be significantly increased. Two studies have provided a clear indication of how some schools have integrated computers throughout the school to a greater extent than others. Pelgrum and Plomp (1993) found that the greatest influence on indicators of computer integration was "*internal innovation assistance and teacher competence and readiness*." Similarly, in a study conducted in the USA, Becker (1992) emphasised the impact of school conditions in which "*exemplary teachers teach in an environment that helps them to be better computer using teachers.*"

2.7.4 'Get On with ICT'

Unfortunately, and despite the dramatic increase in ICT at the school level in terms of availability and access to equipment, only relatively few teachers are using this new technology as an integral part of their teaching (Brummelhuis and Plomp, 1992; Pelgrum and Plomp, 1993). Furthermore, while principals and teachers generally believe that greater access to ICT, through increased infrastructure, will solve many of the problems relating to integration of ICT throughout the curriculum, the available evidence suggests that this view is incorrect. Teacher training on an in-school basis, formulation of clear directions about where the school is going with ICT and why, and a constant focus on the pedagogical considerations which determine the actual application and integration of ICT in and beyond the classroom are required (Pelgrum and Plomp, 1993; Brown, 1995). In very simple terms:

> "*It ain't what you got that matters ..... it's what you do with it!*" Mae West.

Hadley and Sheingold (1993) have emphasised the need for a significant change in pedagogy, together with a number of accompanying factors, if ICT implementation in schools is to be improved. According to these authors, the important factors to consider are as follows:

- The key role of the classroom teacher.
- Access to appropriate ICT.
- Awareness of the potential of ICT.
- Solutions to technical and logistical problems.
- Carefully considered and well articulated ICT policies

Brown and Howlett (1994) conducted an extensive review of assumptions regarding the efficacy of learning through ICT and provided substantive supporting research. Their review takes stock of the situation of schools as at 1994. It presents contradictions between conventional beliefs and reality, identifies a number of overenthusiastic and unjustified early assumptions about ICT and learning, and notes the lack of follow-up of

early work in ICT. These authors also emphasise the strength of case study approach in ICT, the number of case studies undertaken and the similarity of the message from many 'voices':

> "*We have identified ways in which IT works well in education. Future research needs to analyse the conditions under which IT works well.*" (Brown and Howlett 1994)

This research seeks to identify such conditions.

2.7.5 From Conjecture to Knowledge

The bulk of the literature identifies what should be done by controlling authorities and schools to increase the efficacy of ICT learning in schools. In addition, as noted, there have been calls from a host of sectors, including business, Government and education organisations, for national guidelines relating to the implementation of teaching and learning with ICT in schools. It is not surprising, based on actual experiences in schools to date, that there now exists a reasoned agreement as to how schools should proceed in their attempts to implement successful learning through ICT. At this point, it is interesting to consider the experiences of English schools. England is one of the few countries which has identified ICT as an actual curricular requirement of its schools. Given its compulsory inclusion in their National Curriculum, ICT has been carefully reviewed by England's school inspectors. Thus, the report of the Office for Standards in Education (OFSTED, 1997) in that country is pertinent to this discussion.

According to this report (OFSTED, 1997), while many teachers in English schools have coped well with ICT, it remains the least well taught subject and much has yet to be done to lift the levels of achievement in ICT in English schools. The report noted a need to improve teacher confidence and to strengthen both the network for and the training of teachers in ICT (which has often been poor). The report also noted that a pedagogy that includes lesson planning, pupil assessment, and methodologies that identify teaching about ICT and across curriculum through ICT is required in English schools. The quality of curriculum planning and learning applications through ICT were considered to be unacceptably low. The report also identified a need for greater national and local support for ICT learning, given that schools had demonstrated a failure to undertake appropriate actions themselves.

The OFSTED (1997) report also noted that more than half of the primary schools inspected failed to demonstrate required achievement in ICT learning. In these schools, teacher competence in ICT was weak. Most schools often had schemes or school-wide education plans of work, similar in style to those used in New Zealand primary schools, for teaching and learning of ICT. The best schemes outlined the contexts in which ICT applications would be incorporated and provided clear guidelines which required teachers to assess/monitor student learning outcomes. When these schemes were translated into

practice by informed and competent staff in schools with adequate management support and resourcing, implementation of successful learning through ICT was evident. The report also emphasised the importance of required student achievement:

> *"Too often pupils' confidence with and enthusiasm for IT are mistaken as evidence of high achievement and pupils' work with IT is recorded simply by referring to items of software or hardware they have used, rather than tracking the skill, knowledge and understanding they have gained."*

Our own Education Review Office (1997) has highlighted the need for Government to provide:

> *"... guidelines for schools' boards on the use of information technology. These guidelines would translate the high level statements in the curriculum documents into specific operational objectives for schools."*

The Education Review Office also noted the need for the provision of other supports to schools, in areas such as purchasing, teacher training, technical advice, on-line help, and distant education. However, while the Government is considering its next move, in which financial constraints will determine the level of possible support, schools must again consider their situations in light of the factors presented in this Education Review Office (1997) report. Waiting for coordinated Government support, while of vital importance, is not an acceptable excuse for further school-based procrastination. There is a need for schools to work with what they already have and know, while taking responsibility for their present and their future.

2.8 Summary

The underlying assumption of this thesis is that a mutually inclusive and dependent arrangement of factors clearly influences the implementation and integration of learning across the curriculum through ICT. The main areas of discussion presented in this review are sources of constant debate in the ICT-related literature. Each has been considered in turn and the relationships between each main area presented and discussed. The Characteristics of Effective Schools have been presented as an important consideration for schools to apply in their implementation of ICT.

This review has not attempted to examine the comprehensive and wide-ranging literature pertaining to actual learning through ICT. Rather, it has focused on those factors (including pedagogical factors) that the literature suggests schools must identify and address if effective teaching and learning through ICT is to become a reality. While many of the main areas discussed in this review have been considered *separately* in the literature, there is also clear evidence in the literature that these areas must be considered *together* in practice. Furthermore, review of the ICT-related literature reveals that there

has been relatively little published research about schools considered at least by themselves, to be successful in terms of their implementation of ICT as a tool for learning across the curriculum. Thus, it is hoped that the findings of the case study presented in this thesis will represent a useful addition to the currently small body of research in this area in the literature. It is also hoped that this interpreted account from a community of practice will encourage further important discussion and proactive behaviour.

Chapter Three

Study Background, Problem and Methodology

3.0 Introduction

The main objective of this research is to identify elements in a contributing primary school that facilitate successful (that is, productive of desirable student learning outcomes) implementation of ICT. Important questions considered in the study are as follows:

- What is the purpose of implementing ICT teaching and learning in schools?
- What outcomes for students are envisaged by the inclusion of ICT in schools?
- How can schools institute processes and practices that will help ensure students achieve the intended outcomes of ICT learning and teaching?

As discussed in Chapter Two, a number of elements - social, infrastructural, pedagogical, teacher education and 'whole-school' factors - contribute to the successful implementation of ICT in schools. Of these, pedagogical and teacher education factors appear to be of greatest importance.

Pedagogical factors are issues that relate to teaching and learning. When examining the role of pedagogical factors in the current implementation of ICT teaching and learning, schools must consider a number of elements and perspectives. These include:

- Current teacher understandings of the role and objectives of ICT teaching and learning.
- Current student engagement and learning in ICT.
- ICT infrastructure (use, needs etc) from a school-wide perspective.
- The need for, and existence of, agreed - and documented - school-wide intentions that incorporate shared understandings of the objectives of teaching and learning with ICT, desired and expected student outcomes, means by which learning experiences will be developed, and teacher planning, assessment and reporting requirements.

Teacher education factors are issues concerned with professional development of teachers. Teachers must be sufficiently confident and competent to implement an approach to ICT teaching and learning which will produce the desired student learning outcomes.

Successful use of ICT in the classroom is possible only after careful consideration of these issues and the subsequent development and implementation of a planned, integrated school-wide approach to ICT teaching and learning designed to produce achievable student learning outcomes. Unfortunately, this is precisely what most schools fail to do, and the major aim of this research is to discover and define a solution to this 'ICT problem'.

In this chapter, a brief background to the research topic is provided, followed by a more detailed discussion of the 'ICT problem' outlined above. The research intentions, and the rationale for their selection, are then outlined and discussed. Next, the major and supporting aims of the study are presented and considered. Finally, the methodology of the case study approach to ICT research in a learning community is considered, together with the rationale for the method selected in this study.

3.1 Background to the Problem

As indicated above, the main problem with ICT learning in schools is that it is not as effective as it could and should be. In addressing this problem, three important questions need to be asked (and answered) if successful school-wide implementation of teaching and learning with ICT is to be achieved:

- *Why* does the school believe it should teach and learn with ICT?
- *What* student learning with ICT is proposed to occur?
- *How* can the processes and practices of teaching and learning with ICT be put into place?

3.1.1 Schools: The Current Status

ICT is available in a substantial and growing number of New Zealand schools. For example, the most recently published statistics (Telecom Education Foundation, 1996) indicated that there was one computer for every 19 primary school students in this country in 1996. The proportion of primary schools that had access to the World Wide Web grew from 6% in 1995 to 37% in 1996. Furthermore, 89% of primary school students and 76% of their teachers had access to a personal email address at their schools in 1996. And yet, despite this high - and growing - level of access to ICT in schools, there is limited evidence to suggest that ICT is having the impact in teaching and learning that it should (see sections 2.4 and 2.5). Furthermore, most principals and teachers continue to perceive lack of access to ICT as the main barrier to implementation of learning through ICT across the curriculum.

In this area, the educational sector has something to learn from other sectors of the community. Business organisations, for example, have made demonstrable progress implementing ICT into their environment. In developing their implementation plans, businesses have identified three areas of concern - getting started, ensuring alignment and personnel (Figure 3.1).

• **Getting started**	Overcoming a general lack of knowledge about what sort of equipment to purchase and the point of purchasing any at all
• **Ensuring alignment**	Between the technology, its operational uses and the goals and objectives of the organisation
• **Personnel**	Developing the skills to make informed decisions about how technology can be used, both now and in the future.

Figure 3.1 **Business concerns in implementing ICT.**

Successful business organisations have identified the challenges of getting started, and have implemented their plans accordingly. Furthermore, they continue to align the technology and its operational uses with the goals and objectives of the organisation. The personnel issues are now being considered.

Experience suggests that schools in New Zealand appear to have limitations in all three of the areas listed in Figure 3.1. As a consequence, students may well be learning less through ICT in our schools than has been anticipated (Brown, 1995; ERO, 1997). At the same time, the fact that access to ICT for teaching and learning varies in New Zealand schools might explain why the local school and wider communities may believe that the quality of teaching and learning through ICT in our schools meets an acceptable standard. This would also help explain why there is little recognition and discussion of factors which impede successful implementation of learning through ICT in schools.

In this context, it is vitally important that schools analyse the human and financial resources they have already invested in ICT, paying particular attention to how such investments actually further teaching and learning with ICT. Furthermore, if, as the literature strongly suggests, the main areas for schools to address relate to pedagogy and teacher education, it is perhaps advisable that schools consider these areas in particular with a greater degree of urgency.

Unfortunately, while there appears to be unanimity of agreement about the features associated with successful implementation of learning through ICT in schools, there is little practical information to aid schools wishing to introduce such features into their schools. The question then is, what exactly can schools do to improve their performance in this respect, given the current status of New Zealand society and its education system?

Perhaps the best way to answer this question would be to examine how schools which are achieving success in teaching and learning with and through ICT in New Zealand are managing to achieve their success. There are such schools in this country. These schools are consistently identified in Ministry of Education literature related to ICT, they are often asked to give presentations at a variety of conferences throughout the country, and they are the destinations for many local and international educators with interests in ICT teaching and learning. Such schools include Oxford Area School, Pio Pio College, St Kentigerns College, Tahatai Coast School, Papatoetoe Central School and many others.

If these schools are deserving of their reputations, what is it that they are doing well? Are they achieving their good results with ICT as a result of some magical process? Is it because these schools have been inundated with ICT equipment? Is it because they have been immersed in teacher professional development? Or is it because they have carefully examined their approaches to teaching and learning and have developed their experiences and opportunities accordingly? Simply agreeing on the general factors associated with the successful implementation of learning through and with ICT is not enough. It is time that an attempt was made to tell the stories of how these schools establish and maintain good ICT teaching and learning practices so that others may be able to learn from them and apply the same strategies. Examination of these schools' approaches to ICT teaching and learning will also be of benefit to the schools themselves (Zuber-Skerritt, 1992), since critical reflection on their own performance is likely to foster further improvements in the way these focus schools use ICT in the classroom.

3.1.2 Teacher Development in New Zealand

The introduction of ICT into New Zealand schools throughout the 1980s was largely dependent on the efforts of local school or community enthusiasts. Prior to the restructuring of education administration in 1989, the then Department of Education carried out a number of ICT seeding projects. The Computer Education Development Unit (CEDU), initially known as the Computer Courseware Development Unit (CCDU), was established in 1984. This small group of dedicated educators was charged with the huge responsibility of coordinating the dissemination of information about software, the purchase of hardware, and the possible uses of ICT in schools and classrooms to New Zealand schools. This was achieved by sending newsletters to schools and by gathering together some of the early pioneers in computing in schools. The latter individuals developed booklets that outlined suggested practices for word processing, telecommunications and other ICT-related operations.

In the latter stages of the 1980s, Department of Education Inspectors began offering inservice courses for teacher professional development in ICT teaching and learning. These courses utilised the skills and talents of both CEDU staff and teachers identified as having expertise in the ICT area. Thus, 'the word' on teaching and learning through ICT began to be spread through schools in New Zealand. In retrospect, given the restricted

resourcing for ICT equipment and teacher education available at the time, the growth in ICT in schools during these years was astonishing (Ramsay, 1989).

Further teacher education in the 1980s also took place through what has sometimes been referred to by the participants at the time as a 'seeding' method, whereby schools were unofficially nurtured in the area of ICT by taking part in official research studies. The intention was to develop and spread ICT teaching and learning expertise in neighbouring schools. Specifically, a series of 24 'Exploratory Studies' were undertaken throughout a range of New Zealand schools and kindergartens (McMahon, 1986). These institutions applied to take part in these studies and, if selected, received direction and assistance from CEDU staff. Monitoring was conducted by the New Zealand Council for Educational Research (NZCER). Some funding through CEDU was also made available for 'Action Research Projects' in 1988. Unfortunately, staffing fluctuations at NZCER and the demise of the CEDU in 1989 meant that reports on these studies and projects were not written in some cases, and those that were written did not enjoy wide circulation. Nonetheless, ICT had made a start in New Zealand classrooms.

Prior to the 'Exploratory Studies' and 'Action Research Projects', most teacher education undertaken at local or district level, either through the Department of Education or by computer resellers, was directed towards acquainting teachers about how to use computers. However, the 'Exploratory Studies' and 'Action Research Projects' placed greater emphasis on learning *with* computers, for example, word processing in the classroom, logo and robotics, use of email. One example ahead of its time, facilitated through an exploratory study, involved a joint learning project between Putorino School and Towie School in Scotland (Ramsay, 1989).

At the same time that the CEDU was split into six District Advisers of Educational Computing in 1989, a survey was conducted on the use of computers in New Zealand schools. This survey was part of the International Association for the Evaluation of Educational Achievement's (IEA) study of computers in education. Amongst other findings, Nightingale and Chamberlain (1991) noted the multiplicity of problems which arose in schools as a direct result of their haphazard experiences with computers and the difficulties of providing appropriate ICT teacher education.

Similar findings were reported in the 'Sallis Report' (Report of the Consultative Committee on Information Technology in the School Curriculum; Ministry of Education 1990). The three recommendations arising from this report were as follows:

1. Major Government commitment to teacher professional development, and for the provision of advice and support for Boards of Trustees in the use of ICT across the curriculum, is required. (A range of options and costings were provided.)
2. The Government should immediately establish a contestable equity fund for the purchase of ICT equipment for schools.

3. National Curriculum objectives should assert the importance of appropriate applications for learning through ICT in school.

The response (in terms of action) by the Government to this report has been piecemeal with respect to the first recommendation, non-existent with regard to the second, and tacit approval only with respect to the third recommendation. It is not unreasonable to argue that the limited response from schools in terms of implementing teaching and learning with ICT across the curriculum in New Zealand schools has matched the Government's responses.

Nevertheless, the level of funding for teacher professional development in ICT through the Ministry of Education has been reasonable when measured against the costs for professional development associated with curriculum reforms outlined in the New Zealand Curriculum Framework (1993b). The approaches to professional development in ICT in schools followed a similar format to those utilised in the Essential Learning Areas (for example, English in the New Zealand Curriculum, 1994b). Contracts were allocated to preferred providers of professional development, based on the Ministry of Education's criteria. In addition to assessing the capacity and credibility of the provider, together with the provider's ability to meet the Ministry's intended delivery contract requirements and style, the Ministry selected providers with a view to obtaining reasonable geographic coverage. Schools then applied to participate with the selected provider in their respective locations and nominated a range of teachers accordingly. In a number of cases, schools looked to put high proportions of their teachers through a contract if spaces were available. The number of teachers from any one school who participated in these 'professional development contracts' varied and was often determined by the popularity of the contracts. In some cases, a maximum of only two teachers from one school could participate.

Unfortunately, while genuine efforts were made by all parties, the delivery of ICT teacher development was again ultimately determined largely by the availability of funds rather than by the needs of schools and teachers. Indeed, meeting the needs of students was not a primary stated aim of these professional development contracts. Furthermore, the strategy of contracting out professional development in ICT to a number of providers and their appointed facilitators presupposed that the quality of their work with schools and teachers would be of a consistently high standard. Given the ratio between the number of schools in New Zealand and the availability of competent providers, such consistency was not always attained. While confidence and competence in ICT teaching and learning were being achieved in some schools, in many others the best that could be said was that teachers were being exposed to ICT.

In his review of the aims and intentions of this model of teacher professional development, Brown (1995) noted that it discouraged teachers from reflecting on how the educational theory underlying the model related to their classroom practice with ICT. Gilmore (1993a, 1993b), reporting for the Ministry of Education, has also evaluated

successful outcomes of this contract system of professional development in ICT and concurs with Brown. Gilmore points to the improvements that have taken place in the ICT contractual delivery models but notes concerns that a lack of theoretical knowledge could influence new pedagogical understandings. The suggestion that the *teacher* is being developed, but that this does not necessarily result in changes in teaching and learning with ICT in the classroom, or in the development of the *learner*, remains a real concern (Gilmore, 1993a).

The teacher professional development contracts awarded by the Ministry of Education required that facilitators made a specified number of visits to teachers' own schools. In addition to this individual school-based component of professional development, larger groups of teachers from several schools would gather together for sessions held on 'cluster group days'. In some instances, teachers were required to develop personal action plans that could impact on student learning through ICT in their respective classrooms. In other cases, schools would develop an ICT plan. These Ministry of Education initiatives in teacher professional development in ICT, limited no doubt by financial considerations, represented a 'hand-up' for schools and teachers. At any given point in the contract process, it was - and was always going to be - the teachers' and the school's responsibility to bring about the desired changes in teaching and learning through ICT.

While teacher professional development was continuing under this contract system, six District Advisers in Educational Computing located at each of the Colleges of Education continued to provide a range of supports to schools. However, it was not unusual for these advisers to be awarded these Ministry of Education contracts as providers of teacher professional development in ICT. Increasingly, the advisers' work focused more on individual teacher development than on whole school development *per se*. Then, following the introduction of the new Essential Learning Area of Technology in the New Zealand Curriculum (Ministry of Education, 1995), these advisers were reassigned by the Colleges of Education to advise and assist in technology. This was an unfortunate development, since there are substantial differences between 'technology' and 'teaching and learning through ICT'.

In 1997, the Ministry of Education changed its approach to ICT teacher professional development and launched the Information Technology Professional Development (ITPD) programmes. The programme is now into its third year, and indications in the Ministry of Education's ICT Strategy for Schools (1998) suggest that this initiative will continue for at least another year.

One feature of the ITPD programme was the placement of an ICT adviser in each of the six Colleges of Education for the duration of the programme. The second and major feature of the programme was the Ministry's decision to award a contract to a single private organisation, which in turn would be responsible for the key areas of administration of the programme, oversight of school selection, general monitoring of the

programme etc. Under the new system, schools apply for funding (up to a maximum amount, as determined by roll size) through the ITPD programme. Selection of schools for funding is prioritised in favour of projects that benefit the greatest number of teachers and students, those that employ a curriculum-specific use of ICT that may be adopted by other schools, and projects that are applicable to a cluster of schools with shared ICT learning philosophies and aims. In addition, projects likely to receive funding are those which increase staff knowledge of ICT, improve the use of existing software and hardware, and develop or access teaching and learning materials which use ICT.

Under the ITPD programme, schools are required to sign an agreement which requires that their Board of Trustees verifies the progress of the project in their school. Schools are also required to monitor and report on their progress via a Web-based monitoring reply form. Random school visits are conducted by ITPD programme-designated inspectors (ITPD, 1998).

In 1998, the Ministry of Education released its ICT Strategy for Schools. Once again, availability of funds would determine the range of this strategy and the extent to which it could be implemented. However, the most limiting factor within the strategy was the continued accent on teacher professional development at the expense of student-based focus on learning with ICT. On the positive side, 23 ICT professional development schools were established in 1999 to assist schools in the implementation and integration of ICT in their learning communities. A second initiative was the establishment of an on-line resource centre that will offer schools a wide range of possible supporting resources and assistance in ICT. While many would argue that the strategy falls short of expected national direction and assistance, it can at least be acknowledged as a start in the right direction.

Such initiatives by the Ministry of Education in learning and teaching with ICT are of particular importance for schools. While other teacher professional development in ICT in New Zealand has been initiated largely by the private sector (notably the Telecom Education Foundation), most teacher professional development in primary schools has been facilitated directly and indirectly through the Ministry of Education (Telecom Education Foundation, 1996). While acknowledging the growing Government commitment in this area, strongly led by the then Minister of Education, the Honourable Wyatt Creech, it is also important to acknowledge the substantial investment in schools and teacher professional development in ICT provided by Telecom. The 1998 strategy encourages and calls for continued and increasing business cooperation in this area.

As access to ICT equipment has escalated, so too has the quantity of teacher professional development in ICT. However, it is important to note that all forms of teacher professional development in ICT have focused largely on developing teachers' ICT skills and knowledge (Gilmore, 1992). This focus has resulted in a relative neglect of pedagogical issues, which in turn has meant that teacher professional development in ICT has not necessarily translated into improved teaching and learning with ICT. The ICT

funding arrangement announced by the Ministry of Education (1999) represented a major step forward for schools and a marked deviation from previous Ministry of Education policy. Schools are now required to submit an ICT development plan that includes reference to an ICT pedagogy, student learning, ICT infrastructure and - of course - teacher professional development. The Ministry must be congratulated for finally providing appropriate direction, albeit without any substance, to schools deliberating over teaching and learning with ICT. However, the only check on how these funds are actually spent will be triennial review by an already busy Education Review Office, and there is still no specific requirement for schools to show that they have achieved any benefits for students. Indeed, indications from many schools late in 1999 point to the funds being expended on hardware and related technical infrastructure.

Despite ongoing concern over the lack of national direction regarding teaching and learning with ICT in schools, many teachers continue to use computers in the classroom. But as Brown (1995) notes, the drive to incorporate ICT in schools:

> *"...arguably ... has fallen short of providing teachers with sufficient 'formalised' theoretical knowledge to make critical reflections that result in new understandings about the teaching and learning process."*

3.1.3 Teaching and Learning With ICT - The Current Status

What changes in teaching and learning with ICT can be observed in our schools and classrooms, and in the skills and knowledge of our teachers and students? According to Gilmore (1992; 1993a; 1993b), Tuck (1992), McMillan (1994), and the Telecom Education Foundation (1996), some successes (for example, getting more teachers to use computers in the classroom) have been achieved as a result of teacher ICT professional development facilitated through the Ministry of Education and the Telecom Education Foundation. More importantly, however, and despite the clear conclusions to be drawn from the available literature, such programmes placed relatively little emphasis on the critical issues of teaching and learning with and through ICT. Indeed, at no point did these programmes acknowledge the need for a clear understanding of the theoretical basis or practical implications of implementing ICT teaching and learning in schools.

Perhaps only in the 'Exploratory Studies' of the 1980s was some attention paid to what schools should actually be doing with ICT in the classroom, namely focusing on actual teaching and learning with ICT. Since then, teachers have undergone little more than personal development in terms of learning how to operate the equipment in an educational setting. While there is an undoubted need for teachers to feel confident and competent in their use of ICT, there is also an equally indisputable - and critical - need for teachers to apply these attributes in ICT within their primary roles as facilitators of teaching and learning in and beyond their classrooms.

Ministry of Education-determined teacher professional development in ICT did not stipulate the formulation of an action plan by participating teachers. Furthermore, the onus of accountability was not passed on to participating schools by the Ministry. While teachers were required to complete an evaluation of the services supplied by the contractor, and contract providers were asked in turn to provide 'milestone' reports, these evaluations were largely for Ministry of Education consumption only. The fact is that only school-determined assessments of progress would have been likely to have had any actual and lasting impact.

It is encouraging to note that the ITPD Web site (ITPD, 1998) identifies some areas relating to teaching and learning with ICT that applicant schools must address. Unfortunately, the information which must be provided by schools here is superficial. Worse still, the ITPD programme fails to emphasise the need for very close examination of issues relating to teaching and learning through and with ICT, and it does not make participating schools accountable by insisting that they demonstrate they are achieving their ICT teaching and learning goals before offering them funding. It is very easy for schools to talk about what they believe they are doing; it is much more difficult to demonstrate that they are actually doing it when scrutinised.

On this point, a review of the ITPD Web site on 8 October, 1998 revealed that of the 505 participating schools to date, 20 had contributed entries to the 'Stories' and 'Feedback' sections. Of those 20 schools, the vast majority made reference to their ITPD in terms of individualised teacher development and only two schools made reference to real issues concerning students and learning with ICT. Once again, on this evidence, schools are continuing, for the most part, to see professional development in ICT as relating to personal teacher skills development only. This approach is possibly considered to be 'the way' to implement teaching and learning through and with ICT in schools and is probably pursued out of ignorance as to what might work better. It seems likely that schools could and would make improvements in their approach if they were able to:

- Avoid having to rediscover on their own, and at their own expense, that which is already known about ICT teaching and learning.
- Obtain practical advice about how to introduce and maintain beneficial changes in ICT teaching and learning within their schools.
- Increase their understanding of the interrelation between social, infrastructural, teacher educational and pedagogical factors (particularly the last two of these factors) in the provision of ICT teaching and learning within a school-wide learning community model.

3.2 Statement of the Problem and Research Intentions

3.2.1 'The Problem'

As key participants in schools, teachers clearly influence the directions taken by schools in many areas. This is particularly the case when the issues to be addressed are those with which teachers feel comfortable and familiar. Thus, teachers generally have little difficulty developing rationales for teaching and learning in non-ICT subjects, for example, and they have also proven their ability to proactively manage change in these subjects when this is required.

Teachers also exert a major influence on the way ICT is used in the classroom (Brown, 1995). However, this influence again generally reveals itself only in relation to the 'easier' issues, for example, deciding what infrastructure to purchase (albeit usually through a process which involves a number of expensive mistakes), or taking decisions to send staff to ICT professional development sessions in the hope of increasing teachers' levels of operating confidence and competence. What is proving elusive for schools is combining these attributes with appropriate teacher education and pedagogy, thereby ensuring that successful teaching and learning with and through ICT can take place. This is 'the problem'.

The question, then, is: How can 'the problem' be solved? Specifically, what should schools be doing to improve ICT teaching and learning, and how can they put the appropriate practices into operation? The best source of this kind of information is schools that are managing this process successfully. It is time to listen to their stories and reflect on their responses to the realities of ICT teaching and learning in New Zealand schools. All interested parties might then be in a position to consider how other schools can proactively bring about changes in 'the way they do things' with ICT.

3.2.2 Research Intentions

The primary purpose of this research is to offer practical advice to other schools. The following general statements are provided as research intentions. Explanatory comments and relevant points immediately follow each statement.

- *The major aim of this research is to identify elements in a selected contributing primary school that have facilitated the successful implementation of school-wide teaching and learning with ICT.*

In New Zealand there is a dearth of practical advice on two major issues confronting schools and their successful implementation of ICT. These two issues - *what* to do and *how* to do it - present discrete problems in themselves and in how they relate to each other in the process of school-wide implementation. Despite the fact that these two problems have not been consistently addressed at a national or school level, New Zealand

primary schools in particular have been increasingly well-stocked with the often expensive hardware considered to be required for ICT teaching and learning. Unfortunately, as is now becoming obvious, being well-served with equipment does not necessary translate into successful learning outcomes for students. Knowing *what* to do and *how* to to do it when considering the processes of implementing teaching and learning with ICT in schools is of critical importance. On this point, one problem for schools is that the variable and often competitive environment in which schools operate does not particularly lend itself to collegial sharing of approaches that ensure is successful use of ICT. Whenever good practice has been observed, however, it has been in those schools that have taken responsibility for their students' learning.

- *The research is restricted to the contributing primary school environment (years 1 to 6 for students aged from 5 to 11 years) and will be carried out as a case study.*

The intention is to identify through illuminative research (see section 3.3.2) in a New Zealand primary school a range of procedures, practices and processes that results in successful ICT student learning outcomes. Most New Zealand primary schools have access to ICT equipment and the capacity to deliver successful outcomes for their students in this area of learning. However, it is important that achievable strategies, which maximise the school's delivery capacity, are defined and applied. While it is likely that aspects of this research will be applicable to other school levels such as intermediate and secondary, the main intention of the research is to present solutions for primary schools and students.

- *The research will attempt to translate gazetted national requirements of schools in general into statements of policy and intent for ICT teaching and learning for the case study school.*

A range of gazetted requirements in the form of syllabuses of work, National Curriculum Statements, charters and the National Education Guidelines (Ministry of Education, 1993a) have implications for school practice. It is mandatory for all state and integrated schools to conform with these requirements and interpret them in terms of programmes of work and wider school policy.

There is no gazetted requirement that relates specifically to ICT. The New Zealand Curriculum Framework (Ministry of Education, 1993b) makes reference to ICT skills in its discussion of Essential Skills, but this document has yet to be gazetted. Moreover, while the national statement, Technology in the New Zealand Curriculum (Ministry of Education, 1995), has some broad relevance to ICT teaching and learning, schools have not been required to implement this national statement prior to 1999. This research will identify how 'general' national requirements of schools, in terms of ICT, link with statements of ICT teaching and learning policy and intent within the case study school.

- *The research will identify how the case study school's ICT policy and intent statements can be related to practices within the classroom and throughout the school.*

Having identified statements of ICT policy and intent within the case study school, it is then important to examine how such statements translate into learning activities/experiences for students. The research will include a focus on teachers' translation of statements about school ICT teaching and learning policy and intent into planning and assessment procedures and processes. The research will also focus on teachers' and students' perceptions of learning with ICT while considering the contribution of these learning processes to the achievements of outcomes identified by the teachers and students. A further intention of this research is to elicit parents' understanding of their child's learning with ICT at school.

3.2.3 Additional Factors - Positive and Negative

All support and infrastructure issues that contribute to or detract from the intended successful ICT learning outcome for students must be considered. Such factors include the availability of equipment (for example, computer hardware, software, telephones, facsimile machines, networks, email), the level of professional support from on-site colleagues, the adequacy of documentation of policy and practice, the finances of the school, and the ease of access to problem-solving and maintenance support. Other less obvious factors include the presence or absence of professional leadership, a climate of teacher and student expectation, the extent to which students are encouraged to take responsibility for their own learning, the strength of parental and wider community expectation and support, the quality of designated and effective staffing support, and the level of intrinsic and extrinsic motivation for both teachers and students to engage in ICT.

3.2.4 The Whole School

There is real need for more intense discussion of the uses of ICT in New Zealand schools. While there has been ongoing debate over, and research into, some of the important issues, such as current developments in ICT learning (Report of the Consultative Committee on Information Technology in the School Curriculum, Ministry of Education, 1990), teacher professional development (Gilmore, 1992), and the characteristics of teachers proficient in the use of information technology (Brown, 1995), these and other similar studies have only added weight to the argument that there are real concerns about the successful implementation of ICT in New Zealand schools. In particular, research conducted by Brown (1995) has emphasised the limited information available about proficient use of computers in classrooms. But, while this author cites the proficient teacher as the critical factor in ICT teaching and learning in primary schools, the importance of the school as a whole must not be underestimated.

Some schools in New Zealand are making substantial and measurable progress in student learning with and through ICT. However, they are doing so despite suspect (albeit well-

intentioned) teacher professional development and the lack of a planned curriculum, a nationally coordinated policy, and support for ICT learning in the classroom. In many other schools, the presence of a number of teachers proficient in the implementation of ICT is insufficient on its own to bring about a change in school culture, a change in 'how we do things around here' (Schein, 1992). Nevertheless, if even one school can show that appropriate implementation of ICT can result in successful and measurable student learning outcomes, other schools will then know that success is possible for them also. However, it is vital that schools understand that a global approach to change is required:

> "*We should assume that changing the culture of our institutions is the real agenda, not implementing single innovations.*" (Fullan, 1997)

3.3 Methodology - Theoretical Perspective and Research Design Framework

The research design takes a qualitative approach consistent with the qualitative paradigm (see section 3.3.1) and applies a case study methodology. Creswell (1994) describes a qualitative study as a process of inquiry that is conducted in a natural setting and reported in terms of both a 'whole world view' and the specific views of the individuals involved.

Developments in research design and associated methodologies have been reflected in the philosophical paradigms of the age. During the 'positivist' era, experimental design was dominated by the quantitative approach. However, the growing popularity of interpretivism and critical theory has been accompanied by greater use of case study, ethnographic and evaluative designs that favour a more qualitative approach to research. These three paradigms, that is, positivism, interpretivism and critical theory, have dominated the nature of enquiry; later developments such as post-positivism, post-modernism and naturalism have generally been ignored (Clark, 1997). Development of the case study approach to research has been influenced by all of the philosophical paradigms but is most closely linked to the naturalistic approach.

The other major factor that has influenced the development of educational research (Habermas, 1971), and therefore impacted substantially on the development of case study research in education, is the combined effect of social, political and economic forces. Enormous changes in education have been witnessed throughout the world over the past few decades, particularly in terms of curriculum reform and the assertion of previously largely ignored feminist and cultural perspectives. Such changes have had major impacts on the design and methodology of educational research, including the development of case study as a research tool. The case study approach has allowed the perspectives of previously mute groups to be given voice.

3.3.1 Assumptions of the Qualitative Paradigm

According to Creswell (1994), whose work is based on that of Firestone (1997), Guba and Lincoln (1988), and McCracken (1988), the assumptions of the qualitative paradigm are as shown in Figure 3.2.

Ontological (what is real)	It is constructed by those participants of the "bounded system"
Epistemological (relationship researcher/ researched)	Researcher interacts with that being researched
Axiological (role of values)	Value-laden and biased
Rhetorical (language of research)	Informal, evolving decisions, personal voice and accepted qualitative words
Methodological (process of research)	Inductive, interdependent shaping of factors, emerging design during research process, context-bound, theories developed for understanding and reliable through verification

Figure 3.2 **Qualitative paradigm assumptions.**

3.3.2 Case Study Assumptions

The reason for choosing a case study approach for this research is that while investigators and theoreticians have identified factors associated with successful implementation of ICT in the classroom, and in particular the important role played by the exemplary teacher in ICT learning (Pelgrum and Plomp, 1993; Brown, 1995), there has been very limited research into how schools can replicate these key factors and exemplary teaching skills within their own classrooms. Since informed theory is not very clear, exploration of the effects of known and unknown variables in the actual and functioning context therefore becomes critical.

Case study takes place over a set period of time and considers one or more variables. Its methodology depends primarily on direct and indirect observation (Adelman, 1976) of people's actions in a social context, the aim being to define the roles of individuals or groups within that setting (Creswell, 1994). By providing a full description of the operations of the social system under study, it should then be possible to draw conclusions from this information (Adelman, 1976), and perhaps extrapolate these findings to other settings. But even when case study findings are not specifically translatable to other settings, it is often possible to formulate general recommendations that can be usefully applied elsewhere.

The assumptions of the case study approach are as follows:

• ***Case study should be conducted in the field***. In other words, the researcher should be present at the actual site of the study, observing and recording participants in action.

• ***Case study should be conducted in accordance with a specific research approach***. For example, the investigation may take the form of an exploratory study in which no hypothesis is proposed for testing and the research technique employed is baseline observation of a 'bounded system'. Case studies may also take an eclectic research approach, as, for example, when attempting to elicit the effects of more than one variable on stated outcomes. In either case, it is usual to employ a number of research techniques, including interviews, surveys, ethnographic questionnaires and direct observation of participants. Case study is also generally considered to be a qualitative approach to research, although it often also includes quantitative research elements. Indeed, the multifaceted nature of the case study method often means that many study findings can be complemented and confirmed internally, that is, within the study itself (Kemmis, 1980). Stenhouse (1981) has drawn attention to the advantages of triangulation (see section 4.3.3, Figure 4.1) for obtaining convergence of results, indicating contradictions, and adding breadth to the study.

• ***Case study should be descriptive***. In both the gathering and the interpretation of data, the researcher seeks to describe the *process*, that is, 'what is happening' in the study setting, and the *meaning* of what is happening to participants in this setting. The researcher also attempts to obtain an overall *understanding* of what is happening. The data is presented largely in study participants' own language, supplemented by the researcher's visual observations of participants' actions. The case study researcher does not create the situation being studied, nor focus solely on a particular element of that situation, but rather observes and studies the entire study phenomenon as it unfolds in its own way (Kemmis, 1980). Thus, the case study approach is in many ways analogous to the naturalistic approach to research. Clark (1997) defines naturalism as referring to a constructed evolving theoretical network, stimulated by physical senses, that unites all in theories of our world as we know it. A global theory of this kind aims to frame and give meaning to each individual's physical and social world.

> "...*(W)e weave the world through our experience and imagination; we imagine reality (as well as the illusory or fantastic). Some of our knowledge is more 'direct' in the sense that we know through our own action in context; other knowledge is more elaborately constructed - we know only through imagination.*" (Kemmis, 1980)

• ***Case study should search for meaning and truth by examining how people make sense of their lives and their world***. Both the philosophy underlying this type of research and the research design are consistent with the concept of

constructivism, in that the researcher, the participants and those who read the findings of this research have the opportunity to make sense of their world by building further meaning on their respective understandings. The degree of success obtained will depend on the quality of the research and its truthfulness; the latter will determine whether readers of the case study will experience what Adelman (1976) describes as 'the shock of recognition'. It is also important to note that the search for truth is empirical, not mechanistic (Kemmis, 1980). This search can also include changes in direction and character based on disconfirming processes (Kemmis, 1980), and seek authenticity through triangulation.

• ***In case study, the researcher is not only the main collector and analyst of the data but also the interpreter and reporter of the case.*** As such, the researcher is the human filter through which, albeit in coalition with the participants, all information is processed and presented. Thus, in this type of research, the human factor is more prominent than in the mechanistic approaches to data collection employed in, for example, experimental research. This, in turn, means that the researcher must strive to remain 'self-aware' and 'self-critical', which hopefully will reduce the likelihood of the researcher simply presenting his or her own assumptions and preconceptions as study findings (Kemmis, 1980).

Other important features of the case study method include the fact that it utilises a methodology akin to that of the naturalistic philosophy of describing and explaining actual human behaviour (Clark, 1997). As a form of naturalistic research, case study has also been characterised as dialectical (Kemmis, 1980). Furthermore, the case study approach sets out to contribute to social life in terms that the readers of the study can identify and understand.

• ***Case study should be empirical.*** The research should be conducted on actual participants in actual situations. The instance in focus is not simulated or controlled and its portrayal is therefore reliant on the integrity of both the researcher and the participants. Adelman (1976) and Creswell (1994) identify questions and plans that can help ensure an equal balance of power between the researcher and the participants, so that the integrity of the research is maintained. Research can be valid only if it achieves agreed aims, but there needs to be agreement between the researcher and the participants about interpretation of data, both before commencement of the study and following its completion. When referring to the social world of the case study, all judgements with that world should be consistent with the experience of any observer. Statements made must be expressed in an 'agreed' language (Kemmis, 1980). While modification of methodology to suit circumstances is acceptable during case study investigation and interpretation, this must be done responsibly, with integrity and rigour.

• ***Case study should provide reliable data.*** Atkinson and Delamount (1985) have listed numerous concerns about the generalisation and interpretation of qualitative research generated by case study and, in particular, illuminative evaluation. These

authors emphasise the need for comparative perspectives. Furthermore, all case study findings should be assessed in the light of the researcher's self-critical awareness (Kemmis, 1980), assumptions, values and bias; the participants' bias and identification of 'facts'; and the possibility that the presence of the researcher brought about social and behavioural changes in the research setting (the Hawthorne studies, cited in Hoy and Miskel, 1991). Thus, it is important that all raw data collected in the course of a case study is carefully collated and retained for subsequent analysis and critique. As discussed in Creswell (1994), such practice helps subsequent researchers in their attempts to replicate findings (Yin, 1989).

• ***Case study should be open to scrutiny***. The case study report should be published in the public domain (Stenhouse, 1981), thereby opening up both the process studied and the case report itself to scrutiny by multiple audiences. Having identified a specific study instance, and then made that instance recognisable, case study attempts to present social truths, as interpreted by the researcher and the participants. It is the role of the researcher to create a reciprocity with the participants. Furthermore, since discrepant and variant perspectives should not be excluded from the study findings, it is possible that numerous outcomes will be reported. Ideally, the researcher will achieve the aims of the research and further build theory, in keeping with Clark's (1977) elaboration of naturalism. The participants, individually or collectively, may apply aspects of the report for development purposes and/or policy making. Ensuring that the research can be accessed by 'other readers' also allows these readers to make their own judgements and decisions. Kemmis (1980) has argued that access to the process and product of research provides justification for the case study approach. Furthermore, the research findings of such case studies are increasingly becoming the basis for social policy and action.

• ***Case study should take an inductive approach***. It is not necessary that the researcher begins the study with a particular theory or hypothesis in mind. Nevertheless, as Clark (1997) has noted, theory has its origins in sensory stimulations, and:

> "*...(I)t is from within our theories that we posit what there is, but what is real is determined by our empirical evidence.*"

Theories are therefore built; they develop as emerging concepts and hypotheses that can be tested against reality and modified as necessary.

• ***Case study should be evaluative, particularly with respect to process***. Data gathering must be followed by reflection and the exercise of judgement on the researcher's part about what is actually happening in the research setting. Such evaluation is considered to be 'illuminative' (Parlett and Hamilton, 1972). The best results are obtained when the researcher is able to gather and evaluate data in a flexible and case-responsive fashion, rather than conduct the study in accordance with predetermined ideas, categories and design (Stake, 1972). The resulting evaluations can then reflect what was actually happening in specific situations. Stenhouse (1981) notes

that adoption of this evaluation style, which represented a move away from a 'test and tell' approach, was driven by political and economic forces rather than any scientific rationale. In retrospect, it appears that the eclipse of positivist research arose less from positivists' re-evaluation of their methodologies as from their determination to procure research funding.

3.3.3 A Practical Approach Through Case Study

The case study approach is not one taken at the exclusion of other research considerations. It is a model which incorporates experimental and naturalistic forms of enquiry within a contextual approach (Brown, 1995). Furthermore, several authors have argued that the case study approach can explore the 'ecology' of ICT in the classroom. For example, as discussed by Brown (1995), Ryba (1989) proposed an ecological perspective that focuses on the social and environmental aspects of learning with ICT. The same author later extended his work by designing a model of the social and cognitive interactions observable in the computer environment. Brown (1995) has also developed an ecological research model which attempts to interrelate all elements in a computer learning environment. Many of these elements are considered in this research case study.

Case study is a valid and rational tool which, when used appropriately, generates illuminative research of genuine educative value. The facility of the case study approach to promote open and honest discourse, and in so doing challenge assumptions, preconceptions, misunderstandings, oversimplifications etc, gives authority to this type of research. Its authority also arises from the fact that case study examines actual experiences of people operating in the real world. As such, case study achieves the objectives of all research, that is, to inform and increase understanding, and facilitate modifications that result in improved outcomes. Kemmis (1980) has stated that the methodology of case study is a further contribution to the continuum of educational research and 'evolutionary epistemology'.

3.4 Summary

The literature in rich in its discussion of the major factors associated with successful implementation of ICT teaching and learning in schools. Conversely, there is a paucity of advice about what schools should actually do to improve their performance in this area, and how they should bring about such changes. In short, the problem has been well described but the solutions have not.

There is agreement that schools will need to focus on teacher education and pedagogical factors before successful implementation and integration of learning with and through ICT in schools can be achieved. Unfortunately, there is no clear evidence to suggest that previous and ongoing teacher professional development in ICT has resulted, or is likely to result, in demonstrable changes in actual teaching and learning with ICT in our

schools. The fact is that teacher professional development in ICT in New Zealand has not considered or emphasised how learning might be enhanced through ICT and it has not examined possible ways that such learning might occur in and beyond the classroom. These issues must be considered before any plan of action can be formulated and undertaken. Furthermore, any plan must incorporate a whole school approach in recognition of the fact that a change in culture must occur if lasting improvements in ICT teaching and learning are to be made. ICT is in schools 'for the long haul' and will continue to require funding on a large scale. However, concerns will mount if schools continue to report less than anticipated returns from this investment.

The literature has identified factors which are present in successful ICT teaching and learning schools. The aim of this research is to identify those elements within a successful ICT teaching and learning school that contribute to and account for the presence of these identified factors. A case study approach has been selected for this research because it is an extremely practical method for identifying and interpreting a range of interrelated occurrences within an actual operating system.

Chapter Four

Research Aims and Significance, Proposed Investigation and Other Considerations

4.0 Introduction

This chapter presents and discusses the aims, significance and investigation methods used in the research. Discussion of the research method includes an outline of the three stages of the investigation, the questions that were addressed, and the data collection methods used. The characteristics of the school studied, and the criteria used to select the school, are presented. The relevant ethical issues are identified and explained, and a profile of the researcher is provided. It is hoped that the latter will establish the researcher's 'credentials' (including specific and detailed knowledge of the case study school) while allowing readers to consider the impact of any possible elements of bias and subjectivity.

4.1 Specific Aims of the Research

4.1.1 Major Aim

- *To identify elements in a selected contributing primary school that have facilitated the successful implementation of school-wide teaching and learning with ICT.*

Is there a set of identifiable success-guaranteeing elements that can be applied in a generic format to a range of schools? Perhaps, according to Sammons *et al* (1995), who have identified a number of 'Key Characteristics of Effective Schools' (see section 2.2). These researchers argue that these 'key characteristics' are consistently found in successful schools. Unfortunately, they provide no clues as to how these characteristics were established in such schools.

The major aim of this research is to identify any key elements of the case study school that are responsible for the successful implementation of teaching and learning with ICT in that school. It is not to establish any causal links between any key elements identified and the attainment of any student learning outcomes. However, the researcher hopes that this research might provide schools with clearly identifiable and successful procedures and practices which they may choose to adopt or adapt in their attempts to improve ICT student learning outcomes. The assumption is that those elements which contribute to successful implementation of teaching and learning with ICT in the study school may be

applicable, with similar outcomes, in other schools.

It is also important to point out that this research does not focus on technologies and the actual operation of the equipment. Rather, the focus is very definitely on the people, the processes, the procedures and the culture of a learning community which has used the available technologies as vehicles for learning.

4.1.2 Secondary Aims

- *To establish evidence of links between the stated national requirements of schools, for example, achievement objectives in gazetted national statements, and consequential teaching and learning with ICT.*

It is important to examine gazetted national statements and establish that the case study school has identified and addressed any legal requirements related to ICT. In fact, there are limited requirements of schools with regard to ICT. This issue must also be considered in the light of the school's own desire or determination to put in place ICT programmes of work or learning opportunities for its students.

- *To examine and describe all of the case study school's documentation relating to teaching and learning with ICT.*

It is important to examine the school's position on the implementation of ICT as outlined in specific and documented policy statements. Such policy statements are likely to identify the practices, procedures and processes that bring about ICT student achievement.

- *To consider how the management and operational processes in place support teaching and learning with ICT.*

The actual operation of the school's ICT-related processes will clearly have an impact on any possible problems and successes the school is experiencing. Thus, the school's management procedures and operational processes need to be presented in order to provide an understanding of the ICT environment in which this learning community works.

- *To examine how teacher competence and confidence contribute to teachers' understanding, use of, and ability to teach and learn with ICT.*

It is contended that teachers are vitally important to successful teaching and learning with ICT in a school setting. Thus, it is important that their competence and confidence in teaching and learning with ICT are not simply assumed. Teachers are also themselves students of learning with ICT, and their 'voices', their experiences and expectations must be heard.

- *To identify and examine evidence of links between teacher planning and teaching objectives, learning activities/experiences, and student learning outcomes with ICT.*

Teachers are required to translate school policy statements into meaningful programmes of work for their students. Such programmes of work should reflect the school's considered and agreed position on teaching and learning with ICT while addressing and catering for the needs of students. It is standard practice for teachers to develop a sequential plan which begins with a statement of aims and the desired student learning outcomes in important learning areas. Learning processes and experiences can then be captured, students' progress assessed and evaluated, and the results reported back to parents.

- *To identify and describe assessment data, evaluation information and reporting on student learning outcomes through ICT.*

If ICT learning is considered to be of genuine importance, it follows that the content and outcomes of teaching and learning in this area should be carefully considered, planned for, implemented, assessed, evaluated and reported - just as is the case in other important learning areas.

- *To identify and describe the behaviour and perceptions of students engaged in teacher-planned learning with ICT.*

Having examined the declared ICT teaching and learning intentions of the school (in relation to both external requirements and internal needs), together with the planning, implementation, assessment, evaluation and reporting of programmes of work by the teacher, there is a need to observe actual ICT learning in students. This is the only way to determine whether what teachers say or think is happening *is* actually happening in the classroom, and whether students are learning what the teacher intended.

- *To discover and describe parents' and care givers' perceptions of their child's learning with ICT.*

Since the expectations of parents and care givers have a very real effect on their children's achievements, the research is also interested in the perceptions of parents or care givers about their child's learning through ICT.

4.2 Significance of the Research

The underlying and most significant intention of the research is to improve ICT learning opportunities for students. Thus, the primary target audiences of this research are schools and the Ministry of Education. By demonstrating not only the actualities but also the possibilities of ICT learning, it is hoped that this research will give schools further direction in ICT learning while facilitating more purposeful funding by the Ministry.

The secondary target audience of this research includes wider but possibly more influential groups, namely parents, business interests and the media. The researcher believes that these groups - which are largely ignorant of the true situation - generally consider that New Zealand schools are 'doing a good job with' ICT. In reality, the researcher contends, schools have mostly been preoccupied with 'keeping up appearances' in ICT instead of addressing whether students have actually been learning with the available ICT. Indeed, this research will have achieved one of the researcher's aims if it removes schools from their ongoing competition to acquire more and more hardware, peripherals and software. The current situation, which supposedly demonstrates a school's capacity to remain abreast of the latest education developments, in reality more closely resembles the fallacy illustrated in the tale of 'the Emperor's new clothes'.

It is also hoped that this research will help move schools towards a complementary basis of identifying and sharing best practices in the area of teaching, and most importantly learning, with ICT. Ideally, the research will also help schools identify *what* they could be doing in this area of learning, and *how* they could be doing it. It is important to re-emphasise that the focus of this research is not on the technologies, but rather on the people, the processes, the procedures and the culture of a learning community. The aim is to identify a set of elements, together with some practical guidelines, which schools can consider and perhaps implement in their efforts to make ICT a vehicle for successful learning. It is time for schools to look towards and learn from other schools, which in return must be prepared to share their successes.

The research will also attempt to address some commonly expressed concerns and criticisms relating to use of ICT in schools. Specifically, evidence gathered from observation of the case study school will show that use of ICT on a school-wide basis can produce identifiable ICT-related student learning outcomes. Furthermore, it will be shown that these identified learning outcomes relate to both the processes of learning and the content of the New Zealand Curriculum Framework.

Other concerns and criticisms relating to ICT in schools focus on access to equipment and teacher professional development. In fact, New Zealand schools do not suffer from lack of access to the tools of ICT. Data collected by the Computers in Education Development Unit of the Department of Education, the Ministry of Education and the Telecom Education Foundation (Sullivan and Patten, 1996) has shown that our schools are well

served in terms of hardware and supporting resources. Teachers have also been well served in terms of access - at no cost - to targeted professional development through the Telecom Education Foundation. Furthermore, professional development has been, and continues to be, available through the Ministry of Education in the form of specific teacher development contracts (at negligible cost to schools) and advisers (at no cost). Why is it, therefore, that the vast majority of schools continue to be in a state of confusion about *what* to do and *how* to do it in the area of teaching and learning with ICT?

Funding is considered to be a barrier to implementation of teaching and learning with ICT. The research will concentrate on what is possible for today's students with today's funding, rather than what might be possible with unknown funding in the future. The current level of resourcing for schools is known, and there is data outlining the possible costs of further ICT capital expenditure and ongoing maintenance for schools in the future (Ministry of Education, 1996). However, rather than become enmeshed in this debate, which is essentially about funding, this research will present some practical options that the Ministry and schools can consider and implement now.

The researcher contends that the community has been led to believe that ICT is the way forward for our children. This understanding is not unsoundly based. However, as alluded to above, there is also an expectation on the part of the community that schools are 'delivering' to students in terms of ICT learning and teaching. This expectation is fuelled by observation of the large amount of local and government funding that has been directed by schools into ICT equipment. However, while schools are often keen to publicise their acquisitions of ICT equipment, they are suspiciously silent on the point of whether application of these technologies has resulted in successful outcomes for their students. This anomaly has been noted by Papert (1992), who has strongly criticised the performance and pedagogical processes of schools as they relate to computers and learning. Despite such concerns, the community remains generally unaware that schools are not necessarily doing very well in teaching and learning with ICT.

Fortunately, there is still time for schools to act and regain some credibility in an area which is in fact already their individual and collective responsibility, that is, achieving successful teaching and learning with ICT. But the action taken must be both informed and proactive. This research should therefore be of particular significance to schools because it presents a successful *whole school* approach to teaching and learning with ICT. In addition, it should be of significance to a range of interrelated players - including teachers, the Ministry of Education, parents and care givers, businesses, the media, the school's community etc - all of whom are able to influence students and their learning. Most importantly, the research will have a significant impact if it enhances successful learning outcomes for all students as they actually use and apply the vehicles of ICT to make better sense of their world.

4.3 Proposed Investigation

4.3.1 Research Questions and Data Collection Methods

From a critical theorist's perspective, it is important to consider whose interests are being served when conducting research. Kemmis (1988) emphasises that research on ICT in education should be directed by decision-makers within the practising setting rather than by those outside it. Research conducted under the aegis of the controlling authority, Kemmis warns, will serve political and economic purposes. It is likely to be quantitative, to be grounded in the positivist paradigm, and to ask questions of a broad and technical nature designed to relate expenditure to the amount of hardware acquired or the number of teachers exposed to ICT professional development. However, as Benzie (1995) has noted, these types of quantitative research questions should not be asked. Firstly, they measure what currently exists rather than what could exist; secondly, they perpetuate the hidden and false premise that ICT is merely a tool for teaching more efficiently that which we have always taught. In a similar vein, Tiffin and Rajasingham (1995) have noted the error of measuring and applying existing practices and understandings to new technologies without considering the new opportunities afforded by the latter. They liken this approach to comparing the performance of an established rail system with that of the earliest aircraft. On this basis, an efficiency and effectiveness comparison of these two transport systems in 1910 would have seen flight consigned to the scrapheap.

With these points in mind, the researcher has determined that the following questions should be asked in the course of this research:

- What has been achieved?
- What is currently being achieved?
- What might be achieved?
- How might the latter be achieved?

The research for this thesis was carried out in three stages. Each stage examined significant issues by posing a set of research questions designed to further the major and supporting aims of the research. Data was collected using a range of methods aimed at informing the reader. Various examples of documentation and practice were presented to support the findings and provide rich description for readers to interpret and, where possible, apply to their own circumstances.

The practical elements of the case study were carried out during three terms of one school year. This time frame was considered sufficient to identify and examine the range of significant factors that encouraged the successful implementation of teaching and learning with ICT in one school. These included the school's development plan; professional development; planning, assessment and evaluation procedures; Board of Trustees governance and school professional leadership; staffing changes; and policies, practices and curriculum, all of which were integrated into the total school operating design

responsible for demonstrable achievements in teaching and learning with ICT. The researcher also considered that targeting a range of teachers, classes of students and parents over a discrete time period would reduce the number of other variables that might impact on the ICT teaching and learning factors listed above.

The research was undertaken in the knowledge that teachers vary in their ICT teaching and learning proficiency. However, a contention of this research was that the performance of the school *as a whole* would determine the degree of success in teaching and learning with ICT experienced by all teachers and students. Thus, all teachers and some of their supporting staff at the case study school were involved, to varying degrees, in this research. At the same time, greater focus was placed on five teachers, the students in their respective classes, and the parents or care givers of these students. The five teachers in this group were selected by the Research Review Group (see section 4.4.2) with the aim of establishing a representative sample, for study purposes, of teachers in the school. Thus, the five sample teachers selected demonstrated varying ranges of teaching experience, personal experience with ICT, class levels and proficiency in teaching with ICT.

4.3.2 Stage One

Stage One of the research was a preliminary stage that included two areas of focus. The first of these involved gathering all information related to teaching and learning with ICT that had been gazetted or made compulsory for schools on a national basis. Information was also gathered about the school's actual policies, processes and practices with respect to ICT teaching and learning. This allowed the researcher to consider the relationship between national requirements of schools and the school's actual policies, processes and practices. Consideration of the latter also drew attention to any school management processes which had an important bearing on the implementation of teaching and learning with ICT at the school. Such processes included leadership, professional development and infrastructure.

The second area of focus attempted to establish the self-perceived competence - that is, the level of understanding of ICT teaching and learning, and the capacity to use, teach or learn with ICT - of all teachers, some support staff and a random selection of students. This area of focus also sought to identify the expectations of all teachers, some support staff, a range of students and a sample of parents.

Stage One Questions

i) *What gazetted national statements exist in relation to ICT?*

ii) *What written statements and operational practices exist in the school that relate in any way to teaching and learning with ICT?*

iii) *What management processes in the school are considered to be contributory to the implementation of teaching and learning with ICT?*

iv) *How competent do teachers and students perceive themselves to be in their understanding of, use of, and capacity to teach or learn with ICT?*

v) *What expectations do teachers, students and parents have regarding implementation of teaching and learning with ICT at Central School?*

Stage One Data Collection

A search was completed on all known, current and available gazetted national requirements of schools in New Zealand that made reference to ICT. A search was then carried out, with the assistance of Central School's ICT coordinators, of all documentation developed by Central School related to teaching and learning with ICT. At the same time, an examination of Central School's ICT operational practices and ICT-related facilities was completed, again with the assistance of the school's ICT coordinators. Many of Central School's ICT operational practices and ICT-related facilities were referred to or described in its documentation.

Four questionnaires (one each for the ICT coordinators, staff, students and parents) were developed to assist in obtaining answers to questions iii, iv and v. The questionnaires were designed to identify the understandings, perceptions and expectations of individuals within these four groups. More detailed information was gathered during selected follow-up discussion and from the responses to a further questionnaire administered to the Research Review Group and the five selected teachers.

ICT Coordinators (Management) Questionnaire

The management questionnaire for the two ICT coordinators gathered information relating to three areas:

1. Leadership.
2. Professional Development.
3. Infrastructure.

This questionnaire presented a range of open-ended questions and ranking statements to which the ICT coordinators responded independently. The ICT coordinators were also asked to rank in order of importance a series of statement about the three ICT teaching

and learning areas listed above, and to add any further observations as they saw fit.

Staff Questionnaire

The staff questionnaire gathered information relating to six areas:

1. Background information on ICT teaching and/or learning experience.
2. Experience with and attitude to ICT as a teaching and or learning vehicle (including teaching and learning uses, teacher professional development, actual student use, beliefs about ICT use in the school).
3. Understanding of the school's direction with regard to the use of ICT.
4. Perceptions of school support and personal ability.
5. Perceptions of personal and professional opportunities for development with ICT.
6. Expectations as to what should occur in the classroom and throughout the school in terms of supporting learning through ICT.

The questionnaire invited staff to respond in terms of a combination of likert-type scales, written answers, and ranking options. All teachers were invited to make any additional comments where they felt this was appropriate, and to identify any factors, within the influence of the school, that assisted or detracted from the successful implementation of ICT. These issues were pursued more directly in discussions with selected staff.

Parent Questionnaire

The parent questionnaire gathered information relating to three areas:

1. General information about home access to ICT.
2. Attitudes to ICT.
3. Understandings and expectations about their child's use of ICT in the school and classroom.

The questionnaire invited parents to respond in terms of a combination of likert-type scales and written answers. Parents were also invited to make additional comments concerning ICT at Central School.

Student Questionnaire

The student questionnaire gathered information relating to three areas:

1. Experiences with ICT at their school and in their classroom.
2. Understanding of ICT processes and practices at their school and in their classroom.
3. Expectations of what they will gain from use of ICT at their school and in their classroom.

The questionnaire included multi-choice options and the opportunity to add written comments. A single researcher conducted the questionnaire to ensure relative consistency of administration. Nevertheless, some difficulties were experienced with the

administration of the questionnaire in some classes. With the junior classes, for example, it was necessary to administer the questionnaire in a group interview format. Questions were put orally to small groups of students, whose responses were recorded by the researcher.

4.3.3 Stage Two

The aim of Stage Two of the research was to identify how teachers translated their interpretations of Central School's policies regarding implementation of teaching and learning with ICT into actual practices. The relationship between teacher intent and student engagement was also considered. Stage Two also reviewed all ICT learning assessment, evaluation and reporting processes carried out by both teachers and students.

Stage Two Questions

(i) *How are teachers incorporating any school ICT intentions/objectives in their planning for student learning outcomes?*

(ii) *What ICT learning opportunities/activities are created for, captured and experienced by students?*

(iii) *How does the school assess ICT student learning outcomes?*

(iv) *What evaluation of teaching and learning with ICT is carried out?*

(v) *How are ICT student learning outcomes reported within the school and to parents/care givers?*

Stage Two Data Collection

Answers to the five questions listed above were obtained through the application of a combination of approaches. These included examination of teacher-documented planning, assessment, evaluation and reporting procedures; individual and group discussion; and observation of practices in the classroom.

Stage Two was further divided into two parts: Part One involved all 21 full classes of the school (eight other withdrawal classes, for example, reading support, second language support, special needs classes etc, were not specifically included in the study). Part Two focused on five selected teachers and their classes.

Part One *(all classes):* Examinations of teacher-documented planning, assessment, evaluation and reporting procedures, together with all in-class observations, were conducted as part of the assessment of agreed school-wide performance and management processes. All examination was conducted in light of the five questions listed above. As with all areas of focus relating to Central School's performance management system (see

section 5.2.3, Performance Management System), key performance areas and indicators were agreed and established within each teacher's performance agreement.

Examination of these documents was carried out by the school's principal and three associate principals. Comments about each teacher were recorded and presented as feedback to the teacher for discussion as required. Observations of in-class practice were made by the researcher and recorded on an In-Class Observation form. These observations were also presented as feedback for discussion as required. Both sets of data were then signed off by the respective parties and included in the teacher's personnel file.

Part Two *(five selected teachers and students in their respective classes):* The sample of five teachers for Part Two was selected by the Research Review Group (see section 4.4.2) for more detailed research. Questionnaires had already been administered to the parents or care givers associated with the students in these five classes.

Individual and group interviews were conducted with the five selected teachers to gather greater research detail than could be obtained from the staff questionnaire. Individual interviewing of teachers in this sample was conducted according to the techniques developed by Selby *et al.* (1993) for research involving computer-using teachers. Explanations were sought for all identified processes wherever possible in order to provide a full description of intended and actual learning with ICT.

Additional in-class observations of the sample teachers and their classes were conducted to help identify the links between school ICT intentions and actual practice (student engagement and on-task behaviours) in the use of the vehicles of ICT. These in-class observation visits were planned but not otherwise discussed in advance with each teacher. Where necessary, follow-up discussions were held with individual teachers. In addition, the five selected teachers were asked to keep a research diary for one week, one purpose of which was to record any learning behaviours that did not take place during the researcher's period of observation but which the teacher felt were significant indicators of successful learning through ICT. The researcher also believed that the research diaries would provide additional range and depth of information about ICT learning activities/experiences.

Individual and group interviews were conducted with students in the five selected classes to explore and clarify their experiences of learning through the media of ICT. Recordings of these interviews were discussed with the relevant teachers, a strategy which permitted 'triangulation' (Figure 4.1) of research interpretations.

Triangulation Model

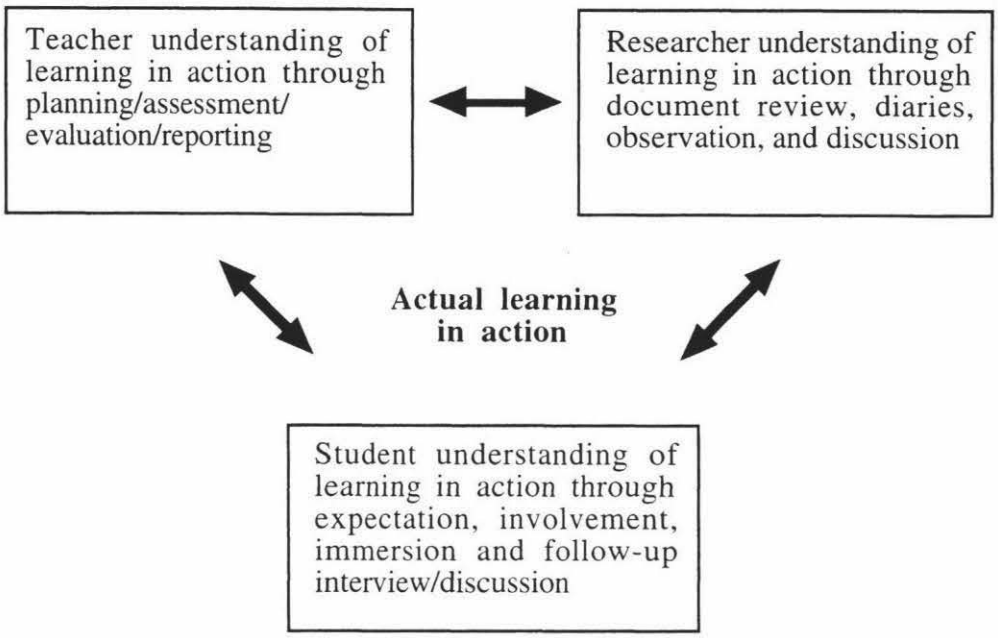


Figure 4.1. **Teacher's, student's and researcher's understanding of actual learning in action: the 'triangulation model'.**

4.3.4 Stage Three

Stage Three of the research was a more contemplative process in which the researcher, the five selected teacher research participants and the Research Review Group reflected on the actual implementation of teaching and learning with ICT identified in Stages One (see Chapter Five) and Two (see Chapter Six) of the results. Participants at this stage were also asked to consider possible future developments in ICT at Central School. Stage Three presented an opportunity to correct any misinterpretations and to ensure that the 'voices' of the Central School learning community were being reported accurately and fairly.

Stage Three Questions

(i) *What factors or characteristics within the influence of the school do the selected teacher research participants and the Research Review Group believe assist or detract from implementation of teaching and learning with ICT at Central School?*

(ii) *What suggestions do the selected teacher research participants and the Research Review Group have regarding any future changes or developments related to teaching and learning with ICT at Central School?*

(iii) *Do the selected teacher research participants and the Research Review Group*

consider the content of Chapters Five and Six to be an accurate interpretation of the implementation and processes of teaching and learning with ICT at Central School?

Stage Three Data Collection

As previously noted, Stage Three was a reflective stage in which teacher research participants were asked to consider - in light of the three questions listed above - data already collected from research diaries, individual and group discussions, questionnaires, school documents and in-class observations carried out during Stages One and Two of the research. The five selected teachers and the members of the Research Review Group were given copies of the edited Chapters Five and Six together with a questionnaire which explored the three questions listed above. It was considered that the questionnaire would provide each person with an opportunity to present his or her views without concern for what others might say. These contributions were kept confidential between each person in the group and the researcher.

The researcher discussed the inclusion of verbatim extracts in the report on Stage Three of the research (see Chapter Seven) with the person concerned. Each person was assured that he/she had the right to insist upon inclusion in this section of any part of his/her contribution. The researcher believed it was an important that participants felt encouraged at this point to 'tell their stories' in a manner that would add to the rich description, for the reader, of 'the way they did things.'

Stage Three also provided an opportunity for the five selected teachers and the Research Review Group to collectively discuss and, if necessary, explain their thoughts about the implementation of teaching and learning with ICT at Central School. The group also had the opportunity at this point to revisit the researcher's recorded data and any ensuing interpretations. The group were able to consider whether any changes needed to be made in order to uphold the validity of any interpretations made by the researcher.

The question concerning future developments was included because of the constant nature of changing developments in teaching and learning with ICT at Central School. The researcher hopes that, by the end of this study, readers will be able to understand the background to, and development of, implementation of teaching and learning with ICT at Central School. It is further anticipated that the responses to the question about future developments will emphasise to readers the dynamic nature of teaching and learning with ICT while providing them with options to consider for the future development of their own organisation.

These discussions were of critical importance to the research because they provided the entire research group with full access to the researcher's 'final' data. This meant that the validity of the case study could be examined by the major players in the process. It also meant that the researcher could state that the interpretations were representative of what actually happened, an accurate reflection of 'the way we do things with ICT'!

4.4 The Case Study, Researcher and Ethical Considerations

This section presents Central School as the 'case study site' and attempts to establish both the credibility of its selection and the credentials of the researcher.

4.4.1 Selection of the Case Study School

The aim of this research is to inform. As stated, there is a clear need for schools throughout New Zealand to be able to identify elements and possible strategies that will improve the implementation of teaching and learning with ICT in their respective learning communities. Thus, it was necessary that the case study school selected for this research was one in which such (successful) elements and strategies had been and continued to be evident at the time of the study. Furthermore, for the research aims to be fulfilled and the stated research questions answered, it was necessary that a 'bounded system' be selected which incorporated an array of illuminative practices.

With these background considerations in mind, selection of an appropriate case study school then depended on identifying a school which was known to be implementing an explicit ICT-related curriculum across the whole school. Unfortunately, there are few contributing primary schools in New Zealand which can lay claim to this characteristic, a fact that meant that the selection field was very limited from the outset. From this small group of eligible schools, however, the researcher selected the school that (in his opinion) best met the following criteria:

- Willingness of the whole learning community to be involved in the study.
- Commitment from the learning community to make ICT an integral part of students' learning.
- Determination by the learning community to take responsibility for the implementation of teaching and learning with ICT.
- Sufficient cross-sectional breadth of students, classes, staff and parents to allow a valid and reliable case to be presented.
- A mid-decile demographic range that would be expected to increase the socioeconomic background distribution of the students.
- School awareness of the directions and opportunities relating to ICT teaching and learning presented in various Ministry of Education documents, including the New Zealand Curriculum Framework and associated Essential Skills, associated and gazetted National Curriculum Statements, and the gazetted National Education Guidelines.
- Identifiable planning by the school to initiate and implement teaching and learning with ICT.
- A school scheme (see section 5.2.2, ICT Education Plan) and supporting policies relating to ICT.
- Identifiable staffing roles and responsibilities that support the implementation and institutionalisation of teaching and learning with ICT.

- Demonstrable staff professional development to complement the programmes of work and learning opportunities for students.
- Identifiable processes of teacher planning, assessment, evaluation and reporting to parents on the progress and achievement by students in ICT learning.
- Access to supporting ICT equipment throughout the school.
- Recognition by a range of education and related organisations that the school is a leading school in ICT.
- A clearly articulated understanding by the school of what it is doing in ICT and how it is doing it.
- Regular and relative ease of researcher access to the school.

While all of the above criteria are important, none is perhaps more important than the case study school's standing in the area of ICT teaching and learning. Thus, it is critical to the credibility of the research that the national and international reputations for successful implementation of teaching and learning with ICT enjoyed by the selected case study school are recognised at the outset. In support of this claim, the following list identifies important individuals or organisations that have recognised the eminence of the selected case study school in ICT teaching and learning (with examples of how such recognition has been demonstrated in parentheses):

- The Honourable Wyatt Creech, as former Minister of Education (personal visits to view and discuss teaching and learning with ICT in action; personal invitations to participate in ICT-related policy advisory groups).
- The Honourable Dr Nick Smith, as former Minister of Education (personal visits to view and discuss teaching and learning with ICT in action).
- Curriculum, property and policy divisions of the Ministry of Education (invitations to participate in policy advice and resource development; numerous visits to observe and discuss teaching and learning with ICT in action; appointment of the school in 1998 as the first of a national group of 23 lead schools in ICT professional development).
- Computer supply companies (requests to trial hardware and software; requests to host their clients in the school; selection of the school as Apple Computer's first New Zealand site reference school; sponsored assistance to visit schools in Canada and the USA; opportunity to represent Apple Computers at an international conference).
- Telecom New Zealand (appointment of the school as an official Telecom Telelearning school responsible for teacher professional development in other schools in the Auckland region; invitations to present at Telecom-sponsored conferences concerned with ICT in education).
- Schools throughout New Zealand (visits every week over the past four years to discuss teaching and learning with ICT in action).
- Auckland, Massey and Waikato Universities (appointment of the school as a teacher training school and part of the Auckland University consortium in recognition of the school's work in ICT; invitations to school staff to present papers

at Massey University conferences for educators; requests from university staff to host visitors to New Zealand interested in observing teaching and learning with ICT).

- Principal, teacher and Board of Trustees groups (invitations to present on ICT and education at a range of conferences; sponsorship assistance to attend international conferences and report back).
- International schools and education organisations, notably in Australia, Denmark, Sweden, Canada and the USA (requests from many schools internationally to host visitors to New Zealand interested in observing teaching and learning with ICT; invitation to present at an international conference in Denmark).

4.4.2 Researcher Profile

Regardless of the case study school selected and despite the best intentions of the researcher, it is possible that elements of bias and subjectivity will enter into this research. However, the researcher, who has considerable experience and expertise in the area of teaching and learning with ICT, is committed to presenting and interpreting actual practice in a leading ICT teaching and learning school with as much objectivity and scientific integrity as possible.

The researcher has:

- An extensive background in teaching in a diverse range of schools.
- Direct involvement in education over a period of 24 years.
- Successful experience as a classroom teacher over a period of 14 years.
- Successful experience as a principal over a period of 17 years.
- Worked in and visited a large number of schools throughout New Zealand in the following roles: Education Adviser (Department of Education), Education Officer (Department of Education), Special Education Adviser (Special Education Service), and Curriculum Facilitator (Ministry of Education).
- Direct experience in the field of ICT as a teacher, principal, participant in the Department of Education 'Exploratory studies'; participant in and observer/negotiator for Ministry of Education teacher development; lecturer and conference. speaker/presenter in ICT teaching and learning; adviser to the Ministry of Education; evaluator of ICT teaching and learning research for the Ministry of Education; member of a school/business ICT partnership; and member of the ICT Strategy for Schools reference group.

In addition, the researcher believes he has the capacity to gather the data honestly and provide rich description for interpretation; to define the leadership issues; to challenge teachers' perspectives; to gather the full range of data possible from the school; and to access all classes with the confidence of the staff, children, Board of Trustees and parents. The researcher also believes that his background makes him a suitable candidate for researching ICT learning via a case study approach that requires involvement and

subjective interpretation of data, and that his credentials and abilities in this regard would make him an appropriate choice for this task irrespective of the school selected. Nevertheless, in an effort to counterbalance any bias or subjectivity on the part of the researcher, a Research Review Group was established to review all aspects of the study (progress, data gathering, ethical issues, interpretation and reporting of study data, etc) and act as a moderator. The Research Review Group consisted of three education professionals at the case study school who were selected according to the following criteria:

- Management experience in the case study school together with knowledge and experience of the potential for, and barriers to, implementation of ICT teaching and learning in schools.
- Experience as a coordinator/director of ICT teaching and learning in the case study school.
- Current involvement in a teaching position in the case study school together with the ability to represent the views and expressions of other school staff.
- Experience in education research.
- Experience in the delivery and evaluation of ICT professional development within the case study school and other schools.
- Willingness to give time to the school and to the research.
- Willingness and capacity to undertake the responsibilities associated with case study research.

4.4.3 Ethical Considerations

The need for preserving the anonymity of study participants was carefully addressed. As a consequence, all data was coded to protect the identities of the participants. In addition, the Research Review Group was charged with the responsibility of ensuring that data collected could not be improperly traced back to individual participants in the study.

At the same time, participants retained the right, on request, to access any data relating to their own involvement, and that of their students in the study. This right of access also extended to those interpretations of the research which were collaboratively written and approved by the key teaching participants. Study participants also had the opportunity to discuss any issues that they believed required further clarification. In addition, they received periodic feedback about all interpretations of the research data. Participants were also informed in writing of the reasons the study was being undertaken, they received written accounts of research progress, and and they were able to volunteer to be involved or to withdraw from the study at any time.

Documented informed consent to participate in the trial was obtained from all study participants, including the Board of Trustees, school staff, students and parents/care givers (see Appendices 3, 4 and 5). The Board of Trustees, school staff and parents/care givers were also provided with a letter of Introduction to the Study as well as a copy of

the aims of the research (see Appendices 1 and 2).

While permission to participate in the study was required and participant confidentiality guaranteed, it was also vital that a clear feeling of trust existed amongst all participants about the purpose of the study and the integrity of the researcher conducting it. The researcher contends that his established and active involvement with the school helped maintain credibility and trust amongst participants.

Where possible, data was gathered unobtrusively. Because of the on-site participant role open to the researcher, limited disruption to normal programmes of operation occurred.

4.5 Summary

The main aim of the research was to identify those elements of a selected contributing primary school (Central School) that have facilitated successful implementation of ICT teaching and learning at that school. Having identified these elements, the researcher hoped that presentation of these findings to other schools may contribute to improved ICT teaching and learning in those schools and - most importantly - to improved student learning outcomes. Achievement of that goal would accord genuine significance to the research.

The investigation, a case study conducted over three terms of a school year, was divided into three stages. Each of these stages examined significant issues through a set of research questions designed to further the major and supporting aims of the research.

Stage One was a preliminary stage with areas of focus that included:

- Identification of the declared operating state of the school with respect to ICT.
- Establishment of the self-perceived ICT teaching and learning competence of teachers, selected support staff and a selection of students.

Stage Two, during which most of the research data was collected, had three main aims:

- Identification of the means by which teachers translated the school's declared operating state regarding implementation of teaching and learning with ICT into actual practice.
- Exploration of the relationship between teacher intent and student outcomes in ICT learning.
- Review of all ICT learning assessment, evaluation and reporting processes carried out by both teachers and students.

This stage was further subdivided into two parts:

- Part One was a school-wide review which involved all 24 classes of the school.

- Part Two was a more detailed study of five teachers (selected primarily on the basis of their proficiency in ICT teaching and learning), their classes, and the students' parents/care givers.

Stage Three was a reflective stage in which the five selected teacher research participants and the Research Review Group reflected on the actual learning programmes and practices in action identified in Stages One and Two. These individuals were asked to identify all factors or characteristics within the school's influence that assisted or detracted from the implementation of teaching and learning with ICT in the school. This group was also asked to speculate on future developments with ICT at Central School. Most importantly, the group was also asked to comment on interpretations of the data obtained in Stages One and Two of the research.

The case study school, Central School, was chosen after consideration of a number of relevant selection criteria. Of these criteria, perhaps the most important was the national and international recognition that has been accorded to the school for its achievements in teaching and learning with ICT.

The researcher has considerable experience and expertise in teaching and education in general, and in teaching and learning with ICT in particular. While acknowledging that bias and subjectivity can never be entirely removed from involved and subjective case study research, the researcher contends that his knowledge of the study school, the open and trusting relationship he enjoys with its staff and students, and the moderating influence exerted by the study's Research Review Group helped ensure that the research was conducted as reliably and rigorously as is possible with this form of study.

Finally, the researcher recognised the need to ensure that study participant anonymity and trust was maintained at all times. To this end, procedures were instigated to ensure that all study participant responses remained confidential. At the same time, participants retained the right to access their data on request and were encouraged to play active roles in the interpretation of research findings that involved them directly. The researcher contends that this open, inclusive and ethical approach to the research resulted in accurate and reliable collection and interpretation of data.

Chapter Five

Stage One

5.0 Introduction

This chapter discusses the manner in which the case study school has considered the national requirements relating to teaching and learning with ICT, developed its own set of operating guidelines or practices in this area, and then put into place a range of operating processes to ensure that the learning community's desired intentions with regard to learning with ICT actually occur. Data is then presented about the ICT-related experiences and perceptions of school staff, parents and the students themselves.

5.1 Gazetted Requirements

i) What gazetted national statements exist in relation to ICT?

While reference is made to ICT in compulsory curriculum areas, such reference is often open to interpretation and generally does not direct schools to use ICT. Rather, the references suggest what students may, could or might do, and they include statements about 'students' needs' as opposed to what 'students will be required to do'. Conversely, in other areas, there is vast array of direct curriculum requirements of schools throughout all National Curriculum Statements. Furthermore, these requirements have been broken down into specified 'achievement objectives' which indicate what students must learn. When these requirements are compared with the limp Ministry of Education references to learning with ICT, schools could not be blamed for inferring that there are no required student learning outcomes related to ICT.

Schools are obliged to carry out a variety of Government-legislated requirements. These apply to a variety of state and integrated school's operations, ranging from curriculum to finances. The New Zealand Curriculum Framework (NZCF) (Ministry of Education, 1993b) outlines, among a range of education elements, a set of seven Essential Learning Areas and a set of eight Essential Skills. For each of the Essential Learning Areas, a National Curriculum Statement has been or will be published which details the learning requirements for state and integrated primary, intermediate and secondary schools. Once draft versions of these statements have been released for the purposes of consultation, these National Curriculum Statements are finalised and then gazetted by order of the Minister of Education as compulsory requirements of schools.

The Ministry of Education (1998) states:

> *"...ICT will be used to enhance teaching and learning in the seven essential learning areas. Each curriculum statement makes reference to the value that ICT can add to the classroom programmes."*

This statement shows that ICT is seen by the Ministry as neither a compulsory element *of* learning nor a requisite tool *for* learning. And yet, most people would agree that ICT, like reading, is a set of tools with which to learn across the curriculum. But if that is the case, why is reading not similarly consigned by the Ministry of Education and schools to the same bland and optional implementation as ICT?

5.1.1 ICT and the Essential Learning Areas

The following passages, with key words italicised by the researcher, are taken from the five gazetted National Curriculum Statements to date. These extracts provide a clear message to schools that learning with ICT is at best a vague preference. It is also worth noting that out of a total of 711 pages of 'curriculum direction', the combined reference to ICT in the National Curriculum Statements would take up no more than two pages.

English in the New Zealand Curriculum (214 page document)

"The use of appropriate technology enhances learning, and facilitates new kinds of teaching. It can encourage independence in learning, as a cooperation and interaction with others. Being able to use a word processor, fax machine, video camera, tape recorder, CD ROM, and other computer technology can assist the development of oral, written and visual communication skills. The use of databases and library materials is essential for the development of information skills. ... Teachers *should* develop approaches and programmes which ensure that all learners have equitable access to various technologies.

Students *need* to develop:

- Knowledge and understanding of tools such as word processors, video equipment, electronic spell-checks and dictionaries, and electronic display and presentation devices (including digital cameras).
- The ability to use technology effectively, for example, interactive video, technology for media studies applications (such as multimedia and hypermedia applications), and tools for reading, writing, viewing and presenting in the classroom.
- Awareness and evaluation of the role of technology in a range of contexts (historical, cultural and everyday), which may include the study of relevant texts." (Ministry of Education, 1994b).

Mathematics in the New Zealand Curriculum (215 page document)

"Calculators, graphics calculators, and computers are learning tools which students *can* use to discover and reinforce new ideas. Graphics calculators, and computer software such as graphing packages and spreadsheets, are tools which enable students to concentrate on mathematical ideas rather than on routine mechanical manipulation, which often intrudes on the real point of learning situations. Computer programs... provide excellent environments for mathematical experimentation and open ended problem-solving." (Ministry of Education, 1992b)

Science in the New Zealand Curriculum (136 page document)

"Students *could* be learning by:

- Using microfiche / CD ROM (and Internet) to access information.
- Using a wide range of media, including computers, videotape recording, audiotape recording, and a range of publishing methods.
- Using a desk top publishing program to compile a report.
- Using a computer spreadsheet program to analyse and plot (including using computer based data logging probes and instruments).

Reporting in science *may* include using a wide range of media, including computers, videotape recording, audiotape recording, a range of publishing methods." (Ministry of Education, 1993c)

Social Studies in the New Zealand Curriculum (58 page document)

"There *should* be a range of materials available so that all students have access to information and ideas that enable them to meet the achievement objectives. Some examples of teaching and learning resources (including both human and material resources) are:

- Photographs, charts, maps, radio interviews, posters, films, and television programmes.
- The Internet, the World Wide Web, and simulation software." (Ministry of Education, 1997c)

Technology in the New Zealand Curriculum (88 page document)

"Schools and teachers *should* develop learning approaches and technological activities within the technological areas which will best help their students achieve the objectives of this curriculum.

- ICT includes systems that enable the collection, structuring, manipulation, retrieval and communication of information in various forms. This includes audio and graphical communications, the use of electronic networks, and interactive media." (Ministry of Education, 1995)

The last of these passages is of greatest relevance to ICT teaching and learning. In the document, 'Interactive Education: An Information and Communications Technologies Strategy for Schools' (Ministry of Education, 1998), the Technology curriculum is said to provide:

> *"...(A) framework for the teaching of specific ICT skills and the application of these skills in a meaningful context. Information and Communication technology is also one of the seven designated technological areas that provide a focus for students developing specific knowledge and skills. In this context, ICT provide the solutions that meet specific needs or opportunities identified by the students. Students will also learn about technology and its impact on people and the environment."*

However, reference to the Technology in the New Zealand Curriculum Statement (Ministry of Education, 1995) above suggests that describing the Technology curriculum as a *"framework for the teaching of specific ICT skills..."* is a rather optimistic interpretation. However, in fairness to the authors of the Technology in the New Zealand Curriculum, the latter does suggest that a learning and assessment example be developed into a unit of work for students. Unfortunately, the suggested student Achievement Levels are Five and Six, that is, beyond the assumed capacities of primary school students, who generally work at Achievement Levels One, Two and Three.

The researcher contends that, on the basis of the information presented in the five gazetted National Curriculum Statements to date, no school could be held accountable for failing to achieve any specific student learning outcome related to teaching and learning with ICT. Even if schools have access to ICT equipment, there is no compulsion for them to use it.

5.1.2 ICT and the Essential Skills

The eight Essential Skills, while an integral part of the NZCF (Ministry of Education, 1993b) and most schools' curriculum, have yet to be gazetted and are therefore not considered compulsory. The ICT-related Essential Skills are set out on the following page in order to establish the broader context of Government-determined teaching and learning. The Ministry of Education (1998) highlights these direct and indirect links between ICT and the Essential Skills. Essential Skills which have a very direct link to learning with ICT are set in bold face.

Communication skills

Develop skills of discrimination and critical analysis.

Become competent in using new information and communication technologies, including augmented communication for people with disabilities.

Numeracy skills

Use ... a range of measuring instruments confidently and competently;

Recognise, understand, analyse and respond to information which is presented in mathematical ways, for example, in graphs, tables, charts.

Organise information to support logic and reasoning.

Information skills

Identify, locate, gather, store, retrieve and process information from a range of sources.

Organise, analyse, synthesise, evaluate and use information.

present information clearly, logically, concisely and accurately.

Use a range of information-retrieval and information processing-technologies confidently and competently.

Problem-solving skills

Analyse problem-solving from a variety of different perspectives.

Make connections and establish relationships.

Inquire and research, and explore, generate and develop ideas.

Test ideas and solutions, and make decisions on the basis of experience and supporting evidence.

Self-management and competitive skills

Adapt to new ideas, technology and situations.

Social and cooperative skills

Work in cooperative ways to achieve common goals.

Take responsibility as a member of a group for jointly decided actions and decisions.

Develop the ability to negotiate and reach consensus.

Physical skills

Develop ... manipulative skills.

Work and study skills

Work effectively, both independently and in groups.

Schools can and do opt out of taking responsibility for teaching and learning with ICT. While the Ministry has finally taken the first responsible step in developing a national ICT

teaching and learning strategy for schools (Ministry of Education, 1998), it is important to note that this represents but the first step of a long journey. It is also important to note that the strategy is not compulsory for schools and while it is admirably predicated on the goals of student learning with ICT, it is a strategy which is concerned more with how achievement of those goals might be resourced than with specifying what is required of schools, staff and students in the area of ICT.

5.2 Central School's Requirements

ii) What written statements and operational practices exist in the school that relate in any way to teaching and learning with ICT?

5.2.1 ICT - It's Compulsory

Prior to 1993, Central School was typical of many schools in New Zealand. Efforts had been made to acquire computer hardware and software to be used in school administration, largely for word processing, and in the classroom, largely for educational games. In 1993, a concerted effort was made to substantially increase the number of computers up to one machine per class. Administration hardware was also revitalised and the whole school moved to one operating platform. A variety of staff development initiatives came into being and, over the course of two years, the school was able to identify a range of significant ICT teaching and learning outcomes. For the most part, however, staff development initiatives and ICT teaching and learning outcomes were directly proportional to the level of individual teacher enthusiasm; if this was low or non-existent, the computer sat underutilised in the classroom. On the administration side, most of the school's systems moved on to or towards a computer-processed operation.

At this stage, there was still no identifiable and agreed school-wide pedagogy associated with ICT. Where classroom practice was of an exemplary nature, there was no substantive transmission of such practice to other classrooms. There was no school-wide planned approach to staff development in teaching and learning with ICT. There was no medium or long term development plan for ICT in the school. There were no curriculum-related requirements for teaching and learning with ICT.

Nevertheless, Central School was building an enviable reputation in terms of the hardware and software it had acquired. Furthermore, some staff were proving themselves leaders in the application of ICT in the classroom and some students were producing work of distinction through the application of ICT as a tool for learning. At the same time, flaws in the approach to teaching and learning with ICT were becoming increasingly apparent. Of the then 16 classes in the school, frequent classroom checks over three months identified an average of 12 classes not using the machines available at the times checks were carried out.

A review of practices and processes early in 1995 identified a lack of an agreed coordinated and consistent school-wide approach to teaching and learning with ICT at Central School. The outcomes from this review included:

- Development of an Information Technology Plan outline for the school which presented a range of intended actions (March 1995 - see Appendices 14 and 15).
- Preparation of a school-wide professional development plan with the assistance of the Education Advisory Service (20 March 1995 - see Appendix 16).
- Staff and Board of Trustee agreement to quickly develop an Information Technology Education Plan to be followed by all staff in the school and applicable to all students (completed 30 April 1995 - see Appendix 17).
- Agreement from the Board of Trustees, in consultation with the school community and school staff, to make information technology a *compulsory* part of teaching and learning at the school (agreed prior to and declared at a staff meeting on 24 April 1995- see Appendix 18).

In retrospect, one teacher summed up the feelings of Central Staff at this time as follows:

> "*Having identified what we were doing and in particular in reaching agreement about the importance of IT for our children, we realised that it was time to plan more carefully for the future in a way that would have all children learning with IT at our school. We knew we could plan it out, we knew we could organise the professional development for staff and we also knew that if we weren't serious about what we were doing, it [ICT] could easily slip away again.*" Teacher A

A key issue for the whole school community was the need to commit itself to ensuring that children made valuable use of ICT at school. Central School acknowledged that community support on this point was critical, and that in this regard it was in a position of advantage compared with most schools. Most importantly, in order to ensure that the gains already established could be cemented in place and productively built on in the future, it was agreed that ICT would be made a compulsory element of the curriculum at the school. The school also clearly stated that while it recognised that ICT related to all curriculum areas, as does reading, for example, the school would not just assume that ICT was an integrated element which was being used effectively in each of these areas. Instead, and as for reading, a separate ICT education plan (a school-based statement explaining why teaching and learning with ICT is part of the school's curriculum, what the ICT goals and student learning outcomes are, and how staff are required to ensure these goals and outcomes are achieved) was developed.

Within a short space of time, Central School had decided, in the absence of nationally required student learning outcomes for ICT, that it would take responsibility for these itself at a school level. Of critical importance was the fact that the Central School community, and in particular the staff, had agreed on *why* ICT should be part of their

teaching and learning environment. The challenge then was to consider *what* was expected to take place and *how* the school was going to ensure that it did.

It is equally important to point out that the decision to make teaching and learning with ICT compulsory meant change was necessary at Central School. Any process of change brings about elements of resistance and stress amongst those required to initiate and implement the changes. Thus, it was important at this point that the school leaders responsible for initiating these changes realised that the hearts and minds of other staff had to be won over before meaningful action was possible. However, a small number of staff resented the proposed changes and decided that Central School was no longer the place for them. While their departures represented a disappointment for the school community and obviously for the staff members themselves, their reasons for leaving were understood and respected.

5.2.2 School-Based ICT Documentation

The following school-based and school-determined ICT documentation is a series of interrelated statements that bind Central School's approach to teaching and learning with ICT. These statements focus on the requirements of the staff, Board and students to ensure that a consistent and coordinated school-wide approach remains in place. The statements also identify the questions of *why* teaching and learning with ICT is taking place, *what* is to be achieved, and *how* Central School attained its current levels of operation in ICT.

The Charter - This is a formal agreement between the Minister of Education and the school's Board of Trustees which outlines the required general operations of the school, including its legal obligations, goals and objectives, codes of conduct, the National Guidelines, awards and agreements. The Charter also incorporates additional local goals and objectives determined by the school community. Central School community developed and included two local goals in its Charter to legitimise the inclusion of two additional elements within the school curriculum. One goal relates to the inclusion of religious instruction and the other goal to ICT. The goal related to ICT is outlined on the following page and reflects the school community's recognition of the importance of ICT learning. Inclusion of this goal in the Charter serves to ensure the compulsory implementation of teaching and learning with ICT by school staff and students while reflecting the expectations of the parents and wider community.

Excerpt from Central School's Charter

Goal: To include sets of skills and applications relating to information technology as part of the curriculum for all students.

Objectives:

a Implement an information technology information education plan that will be used by teachers to develop programmes of work for all students.

b The education plan will include reference to the relevant skills and applications expected of all students.

c The Board of Trustees will annually approve the education plan as part of the curriculum. (Central School, 1996)

The Information and Communication Technology Education Plan - Education plans, often referred to as school schemes of work, are the school's interpretation of National Curriculum requirements and the considered needs of students. Education plans are developed for each subject to be taught and learned at school. These plans provide the parameters within which staff must operate and develop learning experiences for the students in their respective classes.

Central School has recognised the importance of ICT by developing a separate education plan for ICT predicated on the belief that without such a plan, the agreed pedagogy of teaching and learning with ICT would not translate into actual classroom practice. Additional references to ICT in other education plans were also included, for example, within the school's Writing Education Plan: *"... (T)he same steps will be followed with both pen and paper and word processor."*

The ICT Education Plan was developed by Ramsay, Shere and Jefferies (1997), trialed by staff, and, following consultation with the community, formally approved by the Board of Trustees. The plan formally ratifies the agreed school-wide approach to teaching and learning with ICT and sets in place required practices for all teaching staff.

Central School

Information and Communication Technology Education Plan

Introduction

This Education Plan is a statement of intent as to how the teaching and learning of ICT will be carried out at Central School. It is important to note that ICT is acknowledged formally as compulsory at Central School. Our school Charter also notes information technology as a local curriculum goal and objective.

This Education Plan is consistent with our school philosophy and is based on:

- The needs of our children.
- *Technology in the New Zealand Curriculum*
- *English in the New Zealand Curriculum.*
- The New Zealand Curriculum Framework.
- The strengths of our teachers.
- The creatED Education Solutions programme.
- Other resources available.

As a compulsory component of the curriculum at Central School, learning experiences and opportunities will be created using the various tools of ICT available. Learners at Central School are not being allowed to wait for outside intervention to determine the scope of learning opportunity. Our community has signalled, both in voice and financially, their commitment to ICT. There is a clear expectation by the parents/caregivers and learners to learn through the experiences and opportunities possible in ICT. This education plan has been designed to meet these understandings and the goals and objectives noted below.

ICT is therefore to be treated as a curriculum area in its own right. While integration with other curriculum areas has to happen by the very nature of the learning contexts involved, integration must not result in ICT being left to chance. A clear set of interrelated skills and applications in ICT have been developed to ensure that specific student learning outcomes occur.

1. Learning Needs

There is an established and lifelong need for ICT in our society. ICT is considered an essential vehicle for learning, enabling those of us with access and a range of skills to explore and expand our understanding of our world. It is the responsibility of our school to translate this assumption into reality.

All learners at Central School will therefore develop confidence and competence through a graduated range of skills and applications in ICT based on the agreed interrelated goals of:

- Word processing.
- Telecommunication.
- Information processing.

Attainment of the above goals, which incorporate sets of sequential skill development related to their respective ICT content (see section 3), e.g. email, will move the learner from simple to more complex operations. The most important element of this process is directing the learner to apply the skills learned and consequently encouraging further applications independently of the programme.

2. Goals

- To develop independent learners who are at ease with and can apply the tools of ICT.
- To encourage learning through ICT as an enjoyable and successful experience.
- To provide appropriate sequential skill development integrated within our curriculum through selected applications.
- To emphasise that ICT is a range of vehicles to enable learning.
- To teach the skills and strategies that will encourage all learners to take responsibility for further application of their knowledge and understanding.
- To provide an integrated curriculum in ICT that will be easily interpreted and applied by children and teachers.
- To directly relate the curriculum in ICT to the national statements and Essential Skills.
- To monitor progress, including self-monitoring, based on individual needs.
- To easily assess, evaluate and report to parents in a meaningful manner.

3. Content

Basic Curriculum

Children learn about ICT by being immersed in an environment that encourages and expects active learning to take place. This section outlines and refers to the content which teachers are required to use as a basis for their planning. The creatED Education Solutions programme provides the base curriculum for ICT at Central School. Please refer to the reverse side of the three certificates on Word Processing, Telecommunications and Information Processing. The sets of skills and applications described in four stages on each certificate stand as the curriculum content.

The four stages described on each of the certificates are organised to be developmental in that no one learner will necessarily progress according to any set time frame. Learners progress according to their accumulated experiences and assessed needs. It is intended that each learner will be aware of the next step and prepare for it accordingly. The curriculum is designed to take learners from basic understandings of the purposes and uses of technologies to an advanced level of operation and application. The certificates are inter-related and build on the skills and applications accordingly.

It is suggested that teachers use the Word Processing certificate first because learners develop familiarisation with computers in a valuable and meaningful context. The Telecommunications certificate may be started soon after and can be run at the same time.

The various skills developed and applications applied will lead learners on to the Information Processing certificate. Both the word processing and Telecommunications certificates can be started with new entrants and the Information Processing certificate perhaps introduced at the year three level. It is important to note that all certificates, as an integrated curriculum, can be applied at any stage from year 1 to year 12. The curriculum is ideal for teachers to work through.

Additional Development

Teachers are encouraged to select and plan for additional options to the basic curriculum. It is expected that additional options will be developed in consultation with the IT team related to the interests indicated by learners and the level of resourcing available. It is anticipated that these options will be extended applications of the creatED Education Solutions programme. However teachers are encouraged to consider possible options from the following examples:

- Students work through a simulation that requires them to integrate a range of curriculum learning areas and problem-solving strategies, for example, setting up an interactive fiction focus or a thematic focus to support the classroom programmes of learning.
- The development of user guides by students for specific ICT tools that are then able to be used by staff and students.

4. Learning Experience - Teaching Approach

In developing children's skills and understanding in ICT, we believe that children learn best by:

- Being actively involved in the learning process.
- Directing their own learning and being able to communicate their findings.
- Accessing information that is timely and relevant.
- Interacting with and receiving support from others.

The main thrust of this section focuses on the involvement of all learners through the creatED programme. It is anticipated, however, that there will be scope for additional development of related applications, which in itself should be a particular indicator of both the programme success and more importantly of each child's success.

Section 3 outlines the content of the curriculum. Teachers are required to make planning provision during the whole year to incorporate the curriculum content as well as allow for the additional applications. It is possible that work on any of the three certificates could occur concurrently.

Application of the Three Certificate Programme

- Each learner will have one each of the three certificates (Word Processing, Telecommunications, and Information Processing). These should be kept in a clear file beside the computer so that children have ready access to their own certificates.
- When planning a unit of work to meet the needs of the group of learners in their class, teachers should include one of the goals, for example, telecommunications, noting the associated skill development and application that they expect their groups of learners to be working towards.
- The expectation is that pupils in middle and senior levels will accept more responsibility for setting their own goals through the skills they wish to develop and their respective application within each unit of work.
- Classroom management strategies will need to be put in place so that all learners have access to the necessary tools to achieve the skills and applications. These strategies may encompass such things as setting in place a timetable that makes the most of access to the technology throughout the day or the assigning of 'buddies' to check off the accomplished skills. Tutors with knowledge will also need to be made available either within the classroom or from other levels.
- Teacher modelling of the skills to individuals, groups or the whole class may be required.
- While the buddy will be responsible for checking the accomplished skills of his or her partner the teacher is directly involved in the application of these skills and in awarding the application sticker.
- The teacher will need to plan for the assessment of the application through individual and group conferencing, based on actual evidence of the application being successfully completed.
- The reverse side of the certificates should be photocopied and sent home to parents at least twice per year. On completion of each certificate, the student will take the certificate home. A record of completion will be kept in the student's school profile.

Examples of Applying the Certificate Content in Context

- As part of a social studies focus on communication looking at the methods of communicating in the past and present, children could plan, draft, edit and publish email or faxes to communicate with others. This would allow them to meet the criteria within the Word Processing certificate while seeking and trialing successful means of communication.
- As part of a group or class newspaper project, learners could develop their text layout including clip art and their own graphics in accordance with the word processing certificate, insert video camera still shots and digital camera shots, thereby meeting some of the telecommunications requirements. This would allow them to work through a meaningful learning experience as well as meeting some of the skill and application requirements of two certificates at one time.

5. Planning

Refer to the School Planning and Preparation Policy.

Planning should centre on what the learner will do, not what the teacher will do.
Planning will include:

- An optional overview that indicates the topic to be taken and the expected timeframe.
- A written unit of work. This can be jointly planned but must follow the ICT planning template (refer to Staff Disk on fileserver 'Long Term Plans' or in the planning template file in the Information Centre).
- Daily planning that refers to the activities being undertaken on a day to day basis.

6. Assessment/Evaluation

Refer to the school Assessment and Evaluation Policy.

Assessment

Teachers are required to follow the directions and format noted in the introduction to the Assessment folder.

Basic Curriculum

Assessment for the creatED Education Solutions programme has been set within the programme design. As outlined in section 4 of this education plan, the skills sections for each stage will need to be self- and peer-assessed. Teachers will be required to carry out small sample moderation of this process to ensure consistency and to confirm that the assessment is accurate. The applications sections for each stage will require teacher assessment for each learner, remembering that this important section is the amalgamation of the skills learned and applied in context.

Additional Development

In planning for additional options noted in section 3 of this education plan, teachers will be required to identify learning outcomes for the learners involved. Consistent with assessment and evaluation in other curriculum areas, a three point scale will be applied:

1 = **Introduced.**
2 = **Developing** related skills and/or knowledge.
3 = **Confidence and Competence** in application of skills and/or knowledge.

Anecdotal notes can accompany the three point scale. These can be carried out at the completion of, or during, the programme.

Evaluation

On completion of the unit, teachers should enter significant progress/achievement anecdotally into the Kid Base reporting format. Please note that with the creatED Education Solutions programme no additional anecdotal information is required for reporting to parents. A photocopy of the reverse side of each certificate currently being used will be sent home to parents, accompanying the biannual reports.

Review of the creatED Education Solutions programme in action should occur once per term as teachers aim to maintain momentum. Three indicators are suggested for consideration:

- The objectives noted in section 2 of this education plan.
- The ongoing progress through the respective skills and application stages of the certificates.
- Further applications demonstrated by students through additional options taken.

7. Resources

The following resources are available and are to be used in conjunction with this education plan:

What:

The Information Centre:

- A resource base for storage and retrieval.
- A communications centre that encourages sending and receiving throughout the school as well as national and international communication.
- Supervised Internet access.
- A staffing component supporting management of facilities, school-wide programme development and implementation support, maintenance of resources, communication with learners, staff and community.
- An active learning centre to support learning how to learn by the learners.
- Work group servers for school Intranet and Internet access.
- Storage of the following tools; eMates; digital camera; monochrome and colour Quickcams; zip and jaz drives.

School-wide:

- Computer with CD ROM access in every classroom and specialist teaching area.
- Network access to shared information.
- Network access to a range of printers, laser, inkjets - colour and monochrome.
- Telephones in all rooms.

- Email access internal and external.
- CreatED certificates printed for every learner to support the creatED programme.
- In-class professional development support from in-house experts focusing on planning, implementation and assessment.

Where:

The required resources will be managed from the Information Centre. Bookings for the use of specific resources and/or space to use the resources within the centre will be coordinated by the staff within the centre. The resources available include:

- CD ROMs.
- Interactive CDs.
- Video library.
- Television/video/presentation system.
- Fax.
- Phone with speaker function.
- Specific software.
- Hardware peripherals.
- Living books.
- Video camera.
- User guides and professional reading material.
- Laptop computers.
- Shared across the school-wide network- CD ROM resources, documentation etc (updated to meet current topic focus).

who:

- ICT coordinator.
- ICT team.
- Principal and associate principals.
- Administrative staff.
- Tutors - teachers and students with expertise to share.

(Ramsay, Shere and Jefferies, 1997)

Staff at Central School sign an annually negotiated Job Profile and associated Performance Agreement. Part of this Job Profile makes reference to each teacher's responsibility to carry out the requirements of all approved education plans. In addition, the 1998 Performance Agreements included a generic reference to ICT as a specific school-wide staff development and student learning outcome focus to be appraised by management staff accordingly (see Appendices 19 and 20).

School Policy - Boards of Trustees are required to develop policies that cover the day to day operations of the school. These policies make specific reference to the practices and procedures that must be carried out, invariably by staff, to ensure the professional, safe and productive operation of the school. Such policies include, for example, appointments; emergencies; playground supervision; and finance management. While school policy does not include the level of detail required to implement separate areas of the curriculum, it does make reference to teaching and learning-related practices that are considered to require emphasis, for example, planning and preparation; assessment and evaluation; reading recovery; and reporting to parents.

Because teaching and learning with ICT was included in the school Charter, Central School determined that all agreed elements relating to ICT needed to be clearly stated for all staff, thereby providing in turn the basis for a coordinated and consistent approach across the school for all students. As with all school policies, the ICT policy below was developed by the Board of Trustees and staff in consultation with the community. The policy further emphasises the role and importance of ICT in teaching and learning at the school. Once again, as part of their Job Profile, all teachers at Central School agree to carry out all school policies as stated. Accordingly, staff are appraised on their ability to carry out these policies.

Central School

Information and Communication Technology - Policy

Definition:

ICT refers to the use of computers and the associated communication tools such as telephone, fax, email, World Wide Web.

Rationale:

ICT is considered, like reading, to be a tool for learning. Accordingly students will develop a range of associated skills and relevant applications based on educational outcomes that will ensure access, engagement and success for all.

Purposes:

1. ICT **must** play an integral part in classroom programmes and not 'stand alone'.
2. All children will access a sequential programme of skills and applications to ensure core competencies in ICT literacy.
3. As part of and where necessary in addition to the core competencies programme, children will develop enquiry learning and problem-solving skills through information processing as part of their ICT environment.
4. ICT provides worthwhile learning opportunities for all children at Central School.
5. ICT provides opportunities for children to work on and solve problems individually and cooperatively.
6. The use of ICT should be limited to those activities which make the best use of the resource for learning. The use of drill and practice activities is to be avoided.

Guidelines:

1. The application of ICT through the use of computers and associated tools is a compulsory part of the curriculum at Central School.
2. Previewing and planning for the use of specific software is essential to ensure that the use of computers fits comfortably within the class programme and that the best value is gained from its use.
3. Computers are a tool for children's learning. For maximum benefits, children need the opportunity to interact with both computers and their peers.
4. All children should have equal access to computers regardless of age, gender and ability. These aspects need to be considered before using a particular software package and in relation to management strategies.
5. Opportunities for staff training in ICT use will be made available through our Staff Development programme that is consistent with staff needs and school policy.
6. Laptop computers are available for staff to take home to use for a variety of planning preparation and reporting purposes.
7. Teachers should seek classroom organisations and management strategies that allow children to have access to the computer throughout the day.
8. The three primary areas of focus for ICT are: Word Processing, Telecommunications and Information Processing.
9. All children must complete one full cycle of writing, from draft to publication each term (see Education Plan - Writing).
10. The Information Centre is an important resource, to support all children working and achieving with the skills and applications of the three primary areas.
11. Simulations with a focus on group problem-solving using interactive fiction programs is an additional focus area and may be integrated into classroom programmes of work twice a term.
12. All software used at Central School must be licensed to Central School.
13. Finances permitting, a current aim is to continue with the reasonable turnover of hardware and to build up our laptop numbers.

Conclusion:

ICT and its associated software is only teaching and learning tools and as such its benefits will be best achieved when it is integrated into the classroom programme to build on the concept of "classrooms without walls".

Formulated: 1.10.94
Reviewed: 23.1.98
Reviewed: 10.7.98
Approved:

Signed_____ Chairperson - Board of Trustees

ICT Curriculum Content - What Is to Be Achieved with ICT - Central School, through Ramsay, Shere and Jefferies (1997), has set up a comprehensive series of ICT skills and related applications, presented as student learning outcomes and referred to in the ICT Education Plan and the ICT Policy. There are three sets of student learning outcomes consistent with the three learning content goals of the school: Word Processing; Telecommunications; and Information Processing. The ICT Education Plan provides further detail about the organisation/application and teaching/learning processes related to these three goals. As noted, each of these three goals and their associated student learning outcomes are presented in a certificate format so that all students know what is expected of them, what they are currently achieving, and where they can move to next.

While the emphasis of the ICT curriculum content is on student learning outcomes, it is vitally important to recognise the relationship between this content and staff professional development. Central School has decided that, rather than have its staff attend *ad hoc* courses on ICT development, it would take care of most staff professional development within its own environment. Where necessary, the school has brought in outside expertise. However, the staff has found that as soon as they have identified what it is they want their students to achieve, it becomes obvious what they, as staff, need to do to facilitate this.

In simple terms, each teacher at Central School has been required to work through the same ICT curriculum content as the students, and to achieve the same outcomes to a level of confidence and competence that would then enable them to implement the processes in class for their students. Clearly, issues of classroom management such as student access, on-task engagement, assessment of work completed, student assistance and reporting to parents also needed to be addressed as part of staff development. However, what constantly proved to be of immense significance, in terms of motivation of staff, was having an actual and defined curriculum from which to work. As one teacher recalls:

> "*One of the biggest fears I had with ICT was my ignorance, not only of the equipment and how to use it, but most importantly concerning the curriculum learning experiences I had to put in place for my class. I felt inadequate and looked for every diversion tactic I could find. Once things were spelled out, once I could see what we were expected to do with the children, it became obvious and reasonably simple. It was like being scared in a dark room and then having the light turned on ... even if there really was something to be frightened of, I could now deal with it.*
>
> *As we all work through the ICT material we realise that we are still teachers and that our skills and knowledge apply equally as well in ICT as they do in reading - and I don't have to be a 'wire head'! If I don't know something, there is always someone on staff able to show me. It's so much easier when we are all doing this as a school together.*" Teacher C

For commercial reasons, the actual content of the school's curriculum, which is subject to copyright, is unable to be included or appended in this research.

The 'Hit List' - Development and Application - Planning is recognised by the school as a critical element of success in implementing any changes. ICT is no exception. The school knows that it is important to make plans that are simple, realistic and which work. Successful planning for this school usually involves careful communication, good data gathering, generation of possible options, prioritising, then conversion into action that can be monitored and measured. The 'Hit List' approach for this school has proven to be a successful method for helping the staff and Board realise goals.

Using this approach, the staff and Board of Trustees list all of the wishes they would like to see developed for ICT into various categories, for example, staffing, software, policies/school schemes, hardware, buildings, operating processes etc. The result is a comprehensive list. This process differs from the strategic plan concept in that no preordained time line is put in place for a 'Hit List'. The staff and the Board then select the priority elements from the 'Hit List', taking into account key aspects of the school's current state, agreed philosophies, the capacity of the staff to deliver and, of course, the finances available.

'Hit List' - Actual Example as at March 1995

- Review implementation to date concerning: staff development; hardware; software.
- Review classroom programmes in action and student involvement/achievement.
- Advertise the position of Assistant Principal to include the areas of responsibility of the proposed Information Centre, information technology, text resources.
- Establish the ICT team and various roles under the direction of the Assistant Principal.
- Guide the ICT team to consult, consider and establish a plan for school staff development relating to actual programme content.
- Review and update or replace the complete pupil database with Kid Base.
- Review and amend current 'ICT in-class' policy to reflect a mandatory requirement of ICT in the classrooms for all learners
- Reconsider and plan for the applications of the proposed Information Centre to include: staffing; proposed learning opportunities; resource management; resourcing; hardware; software; building design.
- Review and coordinate the storage, recording, loan and applications of all available software.
- Review and purchase as required additional printers and portable computers.
- Review and update the evaluation/reporting process and report format.
- Following the ICT teams's development plan, consider medium and long term application and implications e.g. telecommunications - (telephones, email, Internet audiographics), networking - (fileserver, netstackers, wiring, CD access), additional classrooms, increase of powerbooks/printers.

- Establish and advertise for the senior teacher position of technology support/trainer and trouble-shooter.
- Implement staff development plan for ICT.
- Implement the Information Centre plan.
- Implement the classroom programmes consistent with school goals and policy requirements.
- Implement the revised reporting process.
- Develop and implement the school networking plan concurrent with the Information Centre Plan.

(Central School, 1995)

When agreement has been reached, the selected priority elements are transferred to Central School's annual development plan. The staff and Board look specifically at the immediate year to achieve their current goals and objectives. There are a number of compelling reasons for operating in this way. For example, the school knows which staff members are capable of doing the hard work, they know their children, they know the Board and they have all agreed on their current direction. They also know the school's financial capacity and they are aware of the speed of change in the ICT area. There is such a range of variables that to plan in detail for a three to five year period would be waste of staff time. Central School has established its commitment, accepted responsibility and taken ownership, all critical factors for achieving any success. It can then get on with the task of implementing its plan.

As the staff work through the year, a number of factors will change. For example, the school, through the staff and the Board, has often found that it is succeeding at a far faster pace than anticipated or that finances allow for more investment. In that case, the staff and the Board can then go back to the 'Hit List' and select additional priority elements. Whatever happens, Central School has the capacity to respond to events without some three to five year strategic plan being automatically thrown out of kilter. Aware of the speed of change in ICT, Central School expects - and capitalises - on change. The 'Hit List' approach provides the school with the flexibility it needs within the framework of a simple, achievable and success-oriented plan.

A number of these 'Hit List' elements have been built in to the School Development Plans discussed below.

Annual School Development Plans - Each year, Central School compiles a School Development Plan. Formulation of this plan is a coordinated process involving staff and the Board of Trustees. Consideration is given to the various needs of the school in broad areas such as: teaching and learning (processes); curriculum (content); staff development; policies; resources and equipment. Those staff with responsibility for areas of the school operation coordinate items or initiatives for inclusion on respective area 'Hit Lists' (see

above). As discussed, these 'Hit Lists' are considered accordingly by the management staff of the school, after which an annual development plan is drafted in concert with the school's draft budget. The finalised School Development Plan is approved by the Board of Trustees along with the budget for the same year. All staff agree, through their respective Job Profiles, to carry out the goals and objectives of the annual School Development Plan.

Once again, a clear and specific series of actions has been taken by Central School staff to identify the required practices to support teaching and learning with ICT throughout the school. These initiatives relate to the development of pedagogy, associated education plan and policy development, consequential teacher professional development, and the resourcing of infrastructural elements. It is a comprehensive process, as demonstrated by the following excerpts from annual Central School Development Plans (1995b, 1996b, 1997 and 1998).

1995 Plan

Staff Development

Goal - Information Technology

All teachers to undertake professional development in information technology as related to computers in the classroom. This development to be based on our school emphasis on access by all learners, agreed learning outcomes for all learners while addressing the range of individual teacher needs (Allow $2000).

Objectives:

1. Establish an information technology team within the delegated staff responsibilities.
2. IT team to meet with the District Adviser - Technology to develop a plan to incorporate all elements of the above goal. (By week eight - term one.)
3. IT team to present the plan to ##### for consideration, resourcing and approval. (By week 10 - term one.)
4. The plan to then be carried out. (By week ten - term three.)

Resources and Equipment

Goal - Printers

Establish a printer alongside each of our classroom computers. Examine funding possibilities as well as the option to lease. (Initial funding available = $2000.)

Goal - Networking Computers

Consider the advantages and logistics of networking all classroom computers. Allow for networking as budget determines - consider for 1996.

Goal - Telecommunications

Consider the advantages and logistics of establishing electronic mailing capacity for each of the teaching blocks - to include hands-free telephone and modem facilities. Allow for as budget determines - consider for 1996.

Buildings

Goal - Information Centre

Establish and coordinate an Information Centre at Central School that will include appropriate and challenging programmes of work as well as learning facility and base for information and communication accessible to the wider school community. Development to include: teaching staff support; ancillary staff support; the school library; additional text-based teaching and learning resources; a multimedia centre; a telecommunications centre. (See library resources above.)

Objectives:

1. Through the Board of Trustees-established subcommittee, develop by mid-February and begin work to a timeline relating to the establishment on site of the preferred building, internal resourcing and community usage to include:

    i) Commissioning of floor plans from the preferred architect.
    ii) Agreement on the detail of the floor plan.
    iii) Consultation with staff and community.
    iv) Clarification of all anticipated costs including project management costs, furniture costs, playground repairs, architect fees etc.
    v) Meeting with the Ministry to confirm agreement of offer made on 9 November 1994.
    vi) Building consent/permit and proposed on site commencement;
    vii) On going review of procedure.
    viii) Purchase substantial text based resources to be accessed through the Information Centre (to find $35000).
    ix) Develop further liaison with wider community to encourage access to the Information Centre by the wider school community.

1996 Plan

Teaching and Learning

Goal - Information Centre

To communicate the range of learning opportunities available to all children and teachers through the applications in the Information Centre.

Objectives:

1. To organise the library component for full class and individual learner access through normal visits to the library and through on-line information in-class.
2. Provide all classes with access to the CDI facility, initially on a tutored basis and then through class study focus.
3. Organise all non-library resources for access by children and teachers.
4. Introduce multimedia production to groups of all children and teachers throughout the school.

5. Facilitate and develop email communication for all children and staff throughout the school.
6. Develop confidence and competence with the on-line information available to all classes through the fileserver. To be considered as a classroom requirement in terms two, three and four.
7. Provide tuition in the application of telephone conferencing and fax communication for tutors in each classroom to share with others in their classrooms.
8. Develop procedures for class, group and individual access to the Information Centre.
9. Introduce Internet services to teachers once available in the Information Centre. Consider how this service can be developed further for all learners.

Curriculum

Goal - Information Technology (IT)

Consider the expectation of our learning community, the resources established in our school, the applications of our Information Centre and National Curriculum Statements to develop an education plan on information technology. (Allow $200.)

Objectives:

1. Re-establish an IT team within the delegated staff responsibilities.
2. ##### to develop the outline of the IT Education Plan draft for the IT team to develop further - to include word processing, simulations, telecommunications, information gathering, appropriate multimedia production.
3. The Information Technology draft Education Plan to be presented to the management team and teaching staff for consideration and trial implementation by teachers.
3. Feedback from the teachers to be incorporated as determined by the writing group. (By end of term two.)

Staff Development

Goal - Information Technology:

All teachers to undertake professional development on a needs basis in IT as related to computers in the classroom. This development to be based on our school emphasis of access by all learners and agreed learning outcomes for all learners while addressing the range of individual teacher needs.

Objectives:

1. Re-establish an IT team within the delegated staff responsibilities.
2. IT team to develop a plan to incorporate all elements of the above goal and consistent with the section in Teaching and Learning goal on IT.
3. The report writing process to be covered by all staff.
4. Staff induction to be a focus as required.

1997 Plan

Teaching and Learning

Goal - Information Centre

To communicate a range of learning opportunities available to all children and teachers, as well as identified community groups, through the applications in the Information Centre.

Objectives:

1. To introduce multimedia production to all groups of children and teachers throughout the school.
2. Develop further confidence and competence with the on-line information available to all classes.
3. Provide tuition in the application of telephone conferencing and fax communications for tutors in each classroom to share with others in their classrooms.
4. Introduce Internet services to teachers and develop a plan for how this can be effectively utilised for all learners.
5. Introduce Internet services to interested community groups.

Goal - Information Technology Certificates

To introduce to all staff the concept of self-pacing certificates in Word Processing.

Objectives:

1. By the end of term one all staff to be introduced to the first certificate 'Word Processing'.
2. The IT team to provide staff development opportunities for the introduction of these certificates.
3. The IT team to gather information on the implementation of the use of these certificates.
4. Establish the Telecommunications certificate to be introduced to staff and children by the end of term two.
5. Establish the Information Processing certificate to be introduced to staff and children by the end of term two.

Curriculum

Goal - Information Technology

To consider developing an education plan based on our children's needs, the IT certificates and the school philosophy.

Objectives:

1. With leadership from #### and the IT team, establish a writing group to draft and revise an appropriate IT Education Plan. (By the end of week five, term two.)
2. An IT draft Education Plan consistent with our developed plans to be presented to staff for consideration and trial implementation by teachers.

3. Feedback from teachers to be incorporated as determined by the writing group.
4. Present to the Board of Trustees and community for consideration. (End of term two.)

Staff Development

Goal - Information Technology

All teachers to undertake professional development on a needs basis in IT as related to computers in the classroom. This continued development to be based on our school emphasis of access by all learners to agreed learning outcomes while addressing the range of individual teacher needs.

Objectives:

1. IT team to develop a plan to incorporate all elements of the above goal.
2. The report writing process is to be covered by all staff.
3. Staff induction to be a focus as required.

Resources and Equipment

Goal - Upgrading IT equipment

Continue the replacement of IT hardware through our agreement with ##### .

Objectives:

1. Establish a replacement programme for all IT hardware and associated peripherals.
2. To make provision for financial requirements to meet this goal through financial planning in consultation with the IT team, based on an independent funding operation.

1998 Plan

Teaching and Learning

Goal - Information Centre

To communicate a range of learning opportunities available to all children and teachers, as well as identified community groups, through the applications in the Information Centre.

Objectives:

1. To maintain ongoing support with multimedia production to all groups of children and teachers throughout the school.
2. Develop further confidence and competence with the on-line information available to all classes.
3. To put in place the second of our IT goals of Telecommunications to teachers and to students.
4. To introduce to a sample group of teachers and students our third IT goal of Information Processing.
5. Introduce Internet services to interested community groups.

Goal - Information Technology Certificates

To introduce to all staff the concept of self-pacing certificates in Telecommunications and Information Processing.

Objectives:

1. By the end of term one all staff to be introduced to and proficient to Level Four of the second certificate of Telecommunications.
2. The IT team to provide staff development opportunities for the introduction of this certificate.
3. The IT team to gather information on the implementation of the use of the Word Processing and Telecommunication certificates.

Goal - Intranet

To further refine access to all aspects of the Internet through the development of a home page as the basis for an Intranet.

Objectives:

1. Plan the development of the Intranet in consultation with outside agencies.
2. To develop our Web site in consultation with outside agencies.
3. Provide opportunities for student and staff input into the content of our Web site.
4. To introduce the Intranet to staff, Board and community .

Goal - Long Term Planning Folder

To make adjustments based on the 1997 review of the long term planning.

Curriculum

Goal - Information Technology

To consider developing an education plan based on our children's needs, the IT certificates and the school philosophy.

Objectives:

1. With leadership from #####, ##### and the IT team, establish a group to review the draft of an IT Education Plan. (By the end of week five, term one.)
2. An IT draft Education Plan consistent with our developed plans to be presented to management team and teaching staff for consideration and trial implementation by teachers.
3. Feedback from teachers to be incorporated as determined by the writing group.
4. Present to the Board of Trustees and community for consideration. (End of term one.)

Staff Development

Goal - Information Technology

To maintain and further develop staff expertise in all aspects of IT to further enhance the learning opportunities of our students.

Objectives:

1. The IT team is to plan and implement a professional development programme that will further develop individual expertise in all aspects of IT at our school.
2. For all staff to participate in the professional development opportunities provided according to their needs and to meet the expectations of our school.
3. The IT team to provide new staff with an induction programme to the core technologies used by the staff and students as a whole (e.g. email).
4. The IT team to plan and deliver a series workshops that will upskill all staff to level four of the Telecommunication Certificate. (By the end of term one.)

Resources and Equipment

Goal - Upgrading IT equipment

Continue the replacement of IT hardware through our agreement with #######.

Objectives:

1. The IT team to complete an audit of current hardware.
2. As a result of the audit, establish a purchasing programme to maintain hardware to levels that enable current and future IT programmes to be implemented.
3. To purchase a server and software that will allow school-wide access to the library electronic catalogue.
4. Through negotiations with #####, employ an on-site technician for eight hours per month.

This evidence of comprehensive documentation at Central School shows that the school has carefully considered its ICT needs in a range of areas with the aim of bringing about successful ICT learning outcomes for students and staff. As one teacher has noted:

> "*It is important to remember that this planning content reflects the reviews and needs of ICT in our school. Other schools will have different parts in their plans. It is not the content of the plans that is important, it is the process of planning and carrying out what you set yourselves to do. It is hugely rewarding to have reached a goal, see the learning actually taking place, observe the enthusiasm and enjoyment of the children, and be able to recognise where you have been and just how we got to where we are. That all gives us the confidence and competence to plan further and keep the process developing for our children.*" Teacher D

It is apparent that care in planning has been a significant contributor to the ICT teaching and learning successes now apparent at Central School.

5.2.3 Further ICT Documentation

The following examples of school documentation are concerned largely with the processes of ICT teaching and learning in action. They are not requirements of the school, staff or students, but rather contribute to, or report on, the implementation of teaching and learning with ICT.

Teacher Planning - Units plans are developed in accordance with the school's related education plan and the current assessed needs of the students. Each teacher is required to develop a long term 'unit plan' for each curriculum subject area. These plans vary in duration, usually from three to six weeks. Among other requirements, staff must indicate the proposed student learning outcomes and the associated learning experiences intended to enable the students to achieve these outcomes. Staff then assess, evaluate and report on the performances of each student in relation to these plans.

ICT outcomes are infused throughout unit plans. Furthermore, during the course of the year, the management staff check that these outcomes are actually written into the plan and included in learning experiences and reported outcomes in class (see Appendix 21).

ICT Team Meeting Notes - Central School has an established and effective ICT team with specific roles and responsibilities (see Appendix 22). This team meets at least every two weeks to ensure that the issues of teaching and learning, professional development and infrastructure are being considered and coordinated effectively throughout the school (see Appendices 23 and 24).

ICT Board of Trustees - Staff Report - Every month, the school's ICT coordinator prepares an ICT report for the Board of Trustees and the school staff. It is considered important to keep the Board informed as to what developments and successes in ICT are taking place. In addition, the Board is kept informed about any infrastructure needs. The same report is provided to staff so that they are made aware of what is happening in other classes and around their school. ICT is also the subject of professional staff meetings during the year, at which time staff share initiatives taking place with their respective students (see Appendices 25 and 26).

Performance Management System - All schools are required by the Ministry of Education to have a Performance Management System in place. The function of this system is to appraise the work of all teaching and management staff and ensure that both staff and school development are occurring. Central School included ICT as a school-wide focus for all teaching staff in 1998 as part of its Performance Management System. In addition to the school's organised teacher professional development, individual staff members can also choose to select ICT as a personal goal for additional development (see Appendices 19 and 20).

Parent Booklet - At the start of every year, a Parent Booklet is provided to all families with children attending the school. This is considered to be an important element of communication in the school-parent partnership and is valued by both partners. The booklet contains general information on the operation and organisation of the school, including topics such as the Charter, the curriculum, reporting to parents and school trips. The booklet emphasises ICT, along with reading, writing and mathematics, as key areas of education provided at the school. There is also a section in the booklet concerned with teaching and learning with ICT, which is reproduced below.

> **Excerpt from Parent Booklet - Central School**
>
> **Information and Communication Technology (ICT)**
>
> As already stated, the application of ICT to provide learning tools for our children to use in a variety of learning contexts is a particular feature of your school. Central School, as a direct result of parent support has over 80 computers throughout the school. We operate a single platform for hardware using the proven quality of ######## to present a marvellous variety of software programs.
>
> The present emphasis with our computers includes applications in writing, telecommunications, and information processing, integrating different methods of presentation (e.g. video, text, graphics, art and sound) on the computer. The school-wide network allows us to communicate between classes, between schools, within New Zealand and internationally. All classes have telephones as well as full electronic mailing capability.
>
> ICT is a compulsory part of your school's curriculum to ensure that your child learns with the available technologies.
>
> (Central School, 1998b)

Reporting to Parents - Central School reports to parents four times a year, twice in writing during terms two and four and twice by conference during terms one and three. Information on the progress and achievement of each student in ICT can be presented to or discussed with parents on these occasions.

5.3 Management Processes

iii) What management processes in the school are considered to be contributory to the implementation of teaching and learning with ICT?

Management processes are defined as organisational and operational elements that facilitate teaching and learning with ICT in the school. This section covers elements which fall under the headings of leadership, professional development and infrastructure. The views of the school's two coordinators (referred to here as C.1 and C.2) of ICT

teaching and learning at Central School over the last four years were obtained following administration of the Management Questionnaire (see Appendix 6). The responses from C.1 and C.2 below have been taken directly from their responses to the Management Questionnaire and then coded, for example *(MQ 2.1)* = Management Questionnaire question number 2.1. This section also presents data from staff that identifies a range of factors contributing to active management of engaged learning with ICT for staff and students.

5.3.1 Leadership

People identified in a leadership capacity, relating to ICT. *(MQ 1.1)*

(C.1) - "The principal, the ICT coordinator, the management team and the staff."

(C.2) - "People in management positions. They have 'status' within the school structure and the respect of teaching colleagues. They are:

- *Able to demonstrate use of ICT in their position.*
- *Knowledgeable about the appropriate integration of ICT for student learning.*
- *Knowledgeable about the management strategies in classroom application of ICT."*

Roles and/or issues associated with these leaders. *(MQ 1.2)*

The principal

(C.1) "Development of a school-wide understanding. Being part of the making of and the supervision of decisions as to what will be done for our learners. Setting the tone, leading by example, believing in the value of teaching and learning through ICT. Working with the Board of Trustees to develop a common understanding/belief/direction. Ensuring the necessary structures, mechanisms are in place to be successful - staffing, financial planning, teaching and learning approaches etc. Ensuring the focus placed on ICT is not to the detriment of other things - that it supports the work being done in other curriculum areas. Ensuring that if the expectation is there for our learners to utilise ICT as a part of what they do every day, our teachers should also demonstrate this. This has to be the way if we believe, as a whole staff, learning with ICT makes a difference. Providing support and recognition for developments - both students and staff."

(C.2) "Ability to relate to other personnel, provide direction and support to individuals, teams, whole school, ability to guide people towards where they see ICT in the school. Having considered foresight. Having a clear understanding of the role of ICT and the benefits of ICT in teaching and

learning - why we are doing ICT. Having a clear understanding and knowledge of the Essential Learning Areas, to be able to provide and share models of ' best practice' - how to do ICT."

ICT coordinator

(C.1) ""Ensuring valuable learning opportunities supported by the use of ICT taking place for all learners in a planned and well-managed manner. Maintaining the momentum of programmes in action. Provision/coordination of a staff development programme that is specific and supporting of the student learning outcomes we have identified.

Coordination of ICT team managing the following: hardware and software, network maintenance, technical support, in-class programme development and role modelling (planning, implementation, assessment and reporting), purchasing decisions and general organisation.

An understanding of the value of teaching and learning through ICT and of the class management, organisation and implementation elements crucial for success. Demonstration of this within classrooms on an ongoing basis. Planning for best use of the resources and facilities available on a school-wide basis e.g. Information Centre. Developing community awareness through communication and training. Providing support and recognition for developments - both students and staff."

Management team

(C.1) "Supporting team groups in the meeting of requirements. Demonstrating good practice. Maintaining good communication with the ICT team, coordinator and principal to ensure suggestions, queries etc are addressed so that things are continually improving."

The learners

(C.1) "They play an important leadership role within the school - working with others, demonstrating good practice, assessing development of buddies etc."

Rated importance of leadership in ICT - maximum = 10. *(MQ 1.3)*

(C.1) - "10"
(C.2) - "10"

Reasons for this rating. *(MQ 1.4)*

(C.1) *"To ensure school-wide goals are established. To develop and set expectations and requirements that need to be adhered to if we want to meet*

the agreed goals. To utilise the expertise/knowledge of those in positions of leadership regarding school-wide developments. To make sure things happen and keep happening for our children - that's what leaders are there for - successful implementation of teaching and learning be it through ICT or otherwise."

(C.2) "The ability of the leader to manage change - somebody needs to steer the boat - certainly not all the time but keeping weather eye out for possible problems - an emphasis on taking journeys with the capacity to adjust the planning as we go, all the while mindful of the destinations for our learners."

Other relevant information. *(MQ 1.5)*

(C.2) "Issues of access based on needs - both student and teacher-driven. The demands of the teachers for access should not be at the expense of student learning, e.g. demand for personal laptops. Financial considerations - once again the leader's ability to make sound financial judgments so that money is available to maintain levels of access and to increase engagement where needed. Issues of teacher involvement - the reluctant learners assigning a buddy teacher/mentor to assist them in gaining confidence and competence. The capacity of all staff being enabled and encouraged to take a leadership role."

Feedback from staff, the Board of Trustees and parents leaves no doubt that the levels of expectation and engagement with ICT at the school owe much to the commitment and emphasis on ICT demonstrated by the management staff, and in particular the principal and associate principals. However, leadership at Central School is not solely the domain of the management staff. It is a responsibility of all staff; the emphasis is on initiative, shared practice, and implied staff ownership of the changes achieved in teaching and learning with ICT. While signposts and directions are provided for the staff, the actual journey is determined by the staff as they travel.

The school-wide commitment to and emphasis on ICT evident at Central School is not the result of piecemeal actions in a range of discrete, albeit interrelated areas, such as consideration of a pedagogy for ICT; an agreement on student learning outcomes; facilitation of related staff professional development; detailed planning and documentation; school-wide declaration of ICT as compulsory within the curriculum; and the provision of infrastructure and support. While each of these elements has been the focus of careful consideration and planning, the key to success has been the coordinated development of each element in concert with the other elements. The aim has been to develop teaching and learning with ICT by building on actual successes, so that successful elements, once implemented, can be institutionalised as "the way we do things". However, while the school's plans have provided the guiding structure in this process, they have not stifled an evolution of learning with ICT as the staff sifted out the workable ideas from the absolute disasters.

Achievement of ICT aims has become the responsibility of the people at Central School. The role of the leaders has been to set an example through their actions, coordinate planning, and stimulate the process. The staff know that they have a distinctive role to play in the processes of change because the best-intentioned planning will not succeed without the ongoing inclusion and cooperation of the staff.

5.3.2 Professional development

Rated importance of professional development in ICT - maximum = 10. *(MQ 2.1)*

(C.1) - "10."
(C.2) - "8"

Reasons for this rating. *(MQ 2.2)*

(C.1) *"Having established why ICT will be an important part of our approach to teaching and learning, what we need to teach, and while we are addressing how we are going to go about doing it, we need to consider what our staff needs are to be able to successfully bring about achievement of the learning outcomes we have identified for our students. This means the focus on professional development needs to be carefully planned to ensure we utilise our own strengths and upskill where necessary to remove any hurdles preventing us from doing this. It means providing ongoing support to ensure better teaching and learning is taking place through ICT. If it is directly linked to meeting the learning outcomes for our learners then professional development is crucial."*

(C.2) "The professional development of teachers in using ICT within teaching and learning programmes needs to have clearly identifiable student learning outcomes as the focus of the professional development. The link between teacher professional development and student learning must be readily identified. Professional development should not be seen to turn teachers into ICT gurus. I believe that professional development is important but not as important as the leadership that considers and determines the 'why, what and how' of learning and ICT. Professional development is most important but it is a consequence of leadership decisions as opposed to a haphazard set of actions that, from experience, I know some schools apply."

Reasons for, examples and processes of professional development. *(MQ 2.3)*

(C.1) "Type - *software* - Reason - *staff awareness of software and how it can be used within their programmes to support/improve teaching and learning through ICT* - Process - *small groups of teachers working with the ICT team - in-class support as requested/required* - Content - *introduction to the software, instructions, identification of place and value to students in*

class, opportunities to upskill and further support.
Type - *assessment, evaluation, reporting* - Reason - *understanding of and the ability to implement the appropriate systems for all students school-wide* - Process - *whole staff introduction with ongoing management and ICT team support* - Content - *Why do it? What is it we will be doing? How will we do it? What support will there be?*
Type - *programmes of learning* - Reason - *addressing the issues of the use of ICT, identification of learning outcomes, planning, teaching, and learning approaches, assessment, evaluation, reporting* - Process - *whole staff introduction with ongoing management and ICT team support* - Content - *As noted in the previous 'content' - based on the use of the Word Processing and Telecommunication certificates thus far, management and organisation issues, expectations, integration, use of resources, time management, support etc."*

(C.2) "The professional development within this school has been aimed at school-wide goals and personal goals. Teachers needed to come 'on board' with the learning outcomes identified for students so professional development was provided for them e.g. in the area of telecommunications. The application of ICT tools as a school requirement, e.g. digital photos of students, meant that professional development was provided on a needs basis. New staff were given professional development in the processes and management and expectations of ICT in our school. Classroom applications of ICT tools, e.g. creating draw stationery templates to assist in the writing process.

The main focus for the professional development has been providing teachers with 'hands on' examples of how ICT can be used to enhance the teaching and learning process. The facilitation of the professional development has largely been of an in-house nature. This provides opportunity for staff to share the leadership and become upskilled in the delivery of 'courses'."

Professional development decision-makers and deliverers in ICT. *(MQ 2.4)*

(C.1) "Once agreed goals have been set for the whole school the ICT team looks at what professional development needs to be delivered to assist staff in meeting these goals. They may decide to utilise outside support agencies if required but in most cases they handle it internally, upskilling themselves to be able to deliver."

(C.2) "The IT team provides a range of times and dates so that the optimum number of teachers are able to attend. By offering choice in times and dates I believe there is less pressure and more of a commitment from staff to attend. It also means that staff who forget are able to catch up at another time. In-class support has been provided with the leader of the IT team working

alongside the class teacher on applications within the class environment, e.g. using Dabbler as part of the art programme. Support staff are also encouraged to participate in any professional development.

The IT team is able to identify professional development needs through discussion at a team level. The school development plan also identifies key goals for professional development through the main areas, e.g. curriculum, teaching and learning resources."

Evaluating successful professional development in ICT. *(MQ 2,5)*

(C.1) "By looking at what is happening in the classrooms with our learners, by providing the mechanisms to ensure a structure is in place to support planning, implementation, assessment/evaluation and reporting, keeping up communication with teachers, providing an in-class support system, setting expectations that must be adhered to and monitoring them."

(C.2) "The success of the professional development is clearly apparent in the kinds of activities the students are using to apply their skills. The progressive nature of the identified skills/levels provides a very transparent indicator of student learning and application of ICT skills. The continued increase in the demand for access is another indicator that things are happening at a student learning level."

Other relevant information. *(MQ 2.6)*

(C.1) "While we have what appears to be a structured approach to the implementation of ICT and professional development, I would not want to convey the impression that we have set our course in concrete. It is important to realise that we have continued to make changes to our plans, and the 'we' in this case is the staff. Quite clearly, professional development is a perfect example of this 'changing plan'. The professional development is often a needs-based operation. It is not possible to plan for anticipated needs in all cases."

(C.2) "The compulsory nature goes a long way in ensuring teachers are meeting what is required of them through teaching and learning through ICT."

Professional development is clearly *a* key to Central School's successes in learning with ICT. It is seen and practised as an integral part of the process of teaching and learning with ICT. It is not, however, *the* key to success. Professional development is a considered and coordinated part of a 'working whole' that has been established by the people in the school. Most significantly, it is linked to outcomes for students.

While the school does utilise external support, this is the exception rather than the norm. Central School has created its own internal ICT expectations and expertise. This is reflected in the comments of the two ICT coordinators, who note that the school has to be self-supporting as a direct consequence of its aspirations to self-determination.

It is interesting to note that the ICT coordinators at Central School emphasise that the success of any professional development must be judged according to how it impacts on the practices of students. While this may seem absurdly obvious, all too often professional development in any curriculum-related area becomes an end in itself. It is also interesting to note that the teacher's at Central School perceive professional development as having largely a school-based focus. If change is effected by changing the school's culture, then the key players in the process must be the people in that culture. Central School is a learning community which emphasises its capacity to develop teaching and learning initiatives through community members' collective determination.

> *"The path to change in the classroom core lies within and through teachers' professional communities: learning communities which generate knowledge, craft new norms of practice, and sustain participants in their efforts to reflect, examine, experiment, and change."* (McLaughlin and Talbert cited in Sergiovanni 1996)

5.3.3 Infrastructure

Infrastructural elements of ICT. *(MQ 3.1)*

> *(C.1) "The physical buildings - how they are used to support ICT, the network, the hardware and software, money, the programme itself ... and the human element to ensure it all works."*

> *(C.2) "Elements of infrastructure: personnel - leadership/management; access to hardware and applicable software; financial; technical support; accountability for money spent; administration; assessment; identified skills and applications."*

Infrastructure development/initiatives over the past three years. *(MQ 3.2)*

> *(C.1) "School-wide networking, increasing quality and quantity of resources, allocation of spaces to support the ICT initiatives, dedicated staff, commitment of funds."*

> *(C.2) "Identified personnel with specific responsibilities, networked hardware to ensure ease of access by and for all. A recognition of the importance of ICT by making it compulsory for all learners. This has the support of the school community and is identified in our Charter as a local curriculum goal.*

The accountability aspect has seen three learning goals identified and skills at four levels developed to help all learners in the learning community have a clear pathway of ICT application within learning.

The establishment of a technical contract from a supplier provides a 'one-stop shop'. The expenses are able to be established at the beginning of budget rounds which assists financial planning. The identification and use of external agencies for fund generation, e.g. Telecom, and the active soliciting of these funds."

Explanation of these development/initiatives. *(MQ 3.3)*

(C.1) "We are committed to providing quality learning programmes for our learners, we have decided/believe ICT plays an integral part in doing so, we made ICT compulsory ... so we got on with it."

Importance of infrastructure to the implementation of ICT. *(MQ 3.4)*

(C.1) "It is part of the big picture - however, the people element is by far the most important component. We have to determine why we should use ICT, what we hope to achieve and how we need to go about the processes - equipment and services are the vehicles and tools, people do the driving and operating - after all this is our place and it is the people who make it what it is."

(C.2) "The interrelationship between infrastructure and implementation is one that develops hand in hand. It is no good having all the fancy bells and whistles if the deliverers of ICT don't have the faith, confidence, belief in ICT. It is easier to have the believers in the benefits of ICT for teaching and learning work with less capable hardware if the infrastructure is in place to improve the access, delivery etc. As we strive to make things manageable, simple and accessible for teachers in other areas of the curriculum, so too do we need to be able to apply these same criteria to ICT in the teaching and learning process."

Other relevant information. *(MQ 3.5)*

(C.1) "I would not like people to read this and think we have all the answers to all problems. To have achieved what we have is thanks to our collective successes. It is also thanks to our numerous failures in a range of areas from professional development initiatives to 'strategic planning'. The important point to remember is that the people at our school have made the big decisions through their actual practice."

Central School has acquired and installed the ICT infrastructure which best fits with its objectives, required levels of access and engagement, and funding capacity. The school has not waited until it has obtained the best equipment. Rather, it has made the most of what is actually available and what can be further justified by pointing to any demonstrable successes in student learning.

Again, it is interesting and important to note that the above comments emphasise the need for a coordinated 'human infrastructure' over and above the 'thirst' for more technically able equipment. Is it the technology that will make the greatest difference to effecting change, or is it the shared commitment and will of the people involved? Central School appears to put its faith in its people.

5.3.4 Active Management of Engaged Learning

The research reveals a wealth of documented evidence to confirm that implementation of school-wide learning with ICT has been carefully planned at Central School. However, in order to further confirm that what has been written down has been converted into actual practice, students and parents were asked for their perspectives. The following data was collated from the Staff Perception Questionnaire, the Student Questionnaire and the Parent Questionnaire (see Appendices 8, 9 and 10). All three questionnaires are appended with the actual question coded for each table, for example, *(TQ 2.6)* = Staff Questionnaire, question number 2.6, *(SQ 3)* = Student Questionnaire, question number 3, and *(PQ 3.5)* = Parent Questionnaire, question number 3.5.

A total of 33 staff members responded to the Staff Perception Questionnaire, although not all staff members responded to some questions. A total of 124 students were administered the Student Questionnaire, although two of the surveyed classes were not asked the second two elements of question 3 because they were junior classes with limited knowledge of the area in question. Ninety-two parents responded to the Parent Questionnaire.

All staff were asked to list examples of ICT professional development received at Central School. All staff were able to list responses and in a number of cases, similar examples were listed. These responses were collated and summarised (Table 5.1).

Staff perceptions

Table 5.1 *(TQ 2.4)*

In-school professional development received in ICT.

- ICT certificate word processing
- Use of the Internet/Internet seminar
- Use of Kidbase/Moneyworks
- Sharing of ideas across classes at staff/team/group meetings
- Quickcam
- Report writing
- School telephone system
- Powerbooks trouble-shooting
- Support from senior teachers
- 'Where Earth Meets Sky'
- Management of ICT in the classroom
- Use of the school network
- Ideas for using ICT in the classroom
- Planning and implementing ICT
- ICT certificate Information Processing
- Paint and draw
- Digital camera
- Email
- Access it
- Living books
- Fax use
- Using ClarisWorks
- Flash it
- Spreadsheets
- Databases
- E-mate trialing
- Avid Cinema
- Use of tool box
- HyperCard
- ICT update booklets
- Printer trouble-shooting

Importantly, all of the examples listed in Table 5.1, with the exception of the use of Kidbase/Moneyworks, were directly related to students' learning with ICT.

All staff were asked to list examples of out-of-school professional development received while at Central School. Fifteen staff members were unable to cite any examples. The remaining staff were able to cite examples, and in a number of cases similar examples were given. These responses were collated and summarised (Table 5.2).

Table 5.2 *(TQ 2.5)*

Out-of-school professional development received in ICT.

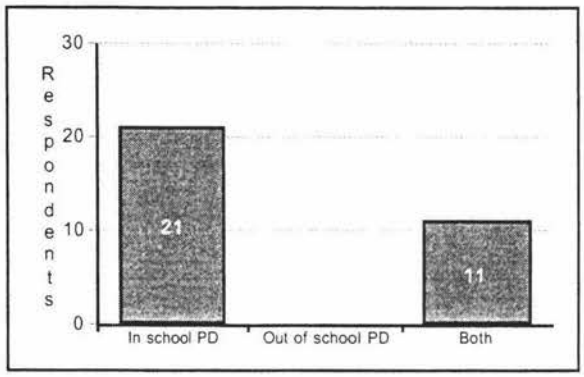
- Computers in written language
- Microsoft Office
- Use of spreadsheets
- Datashow
- ICT conferences (numerous)
- Visiting other schools (local, national, international)
- E-mate training;
- night school classes
- Bus tours
- Web page design
- University papers

Again, all the examples listed in Table 5.2, with the exception of the use of Microsoft Office, the Datashow and Web page design, were generally related to students' learning with ICT.

Table 5.3 shows the form of professional development considered to be *most* beneficial to staff. Clearly, staff consider out-of-school professional development on its own to be of lesser value than in-school professional development.

Table 5.3 *(TQ 2.6)*

Most beneficial professional development (PD) in ICT.



All staff were asked to list examples of training with and/or sharing of ideas about ICT with other staff at Central School. All staff were able to give examples, and in a number of cases, similar examples were provided. These responses were collated and summarised (Table 5.4)

Table 5.4 *(TQ 2.7)*

Training and/or sharing of ideas with other staff in ICT.

- Sharing of work samples with group, team and staff (noted by 24 respondents);
- In-school development (focus not stated)
- Use of ICT tools
- Printer problems
- Use of applications - Creative Writer, Kidpix
- Trouble-shooting help for buddy teacher
- Development of help sheets
- ICT reports to Board of Trustees
- Assisting teacher aides and other support staff
- Word processing for support staff
- Training staff on the Internet
- Training parents on the Internet
- Working with the ICT team to provide training assistance or being asked by the ICT team to lead in training (focus not stated).

The staff responses listed in Tables 5.1, 5.2 and 5.4 indicate a strong emphasis on staff professional development initiatives at Central School in ICT. However, it is important to note, given that changes in teaching and learning with ICT occur gradually, that these initiatives have taken place over a period of three years. Some of the areas of development have been 'one-off' initiatives whereas others have been ongoing. In any case, the evidence is clear that Central School has has not only placed real emphasis on staff development with ICT but has also intentionally linked this to student learning outcomes. Examples of this linkage include: sharing of ideas across classes; ICT Certificates in Word Processing, Telecommunications and Information Processing (see section 5.2.2, ICT Curriculum Content - What Is to Be Achieved with ICT); and management of ICT in the classroom.

It is also important to note the range of examples of professional development identified by staff members, and the extent to which staff members share what they do. However, one area of concern was that a significant number of respondents reported no instances of external professional development. It could argued that Central School might benefit from greater contact with the 'outside world', if for no other reason than to confirm that the school is employing the most effective strategies.

Table 5.5 shows that, during the sample week, 26 of the 29 classes surveyed were using ICT for teaching and learning for more than 10 of the possible 25 class hours. Furthermore, 19 of the 21 full classes surveyed were found to be using ICT for more than 15 hours per week (between 60% and 100% of the available class time). Of the remaining eight classes, which were open for much shorter periods during the week, all but two were found to be teaching and learning with ICT for more than 70% of the available class time. These measurements, which were taken without the knowledge of the staff at the time, confirm the substantive use of ICT tools throughout most of the school.

Table 5.5 *(TQ 2.8)*

Hours of use of ICT in all classes during the sample week.

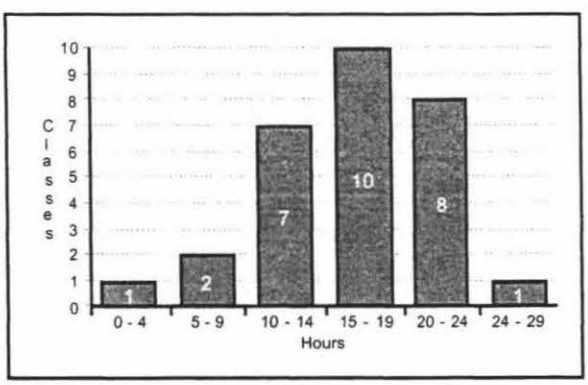


Table 5.6 shows that students, according to staff, are mostly engaged in the use of ICT tools every day. While the data does not show which of the various tools were being used, it is reasonable to assume, on the basis of the findings listed in Table 5.11, that most activity was computer-oriented.

Table 5.6 *(TQ 2.9)*

Regularity of student use of ICT tools for learning.

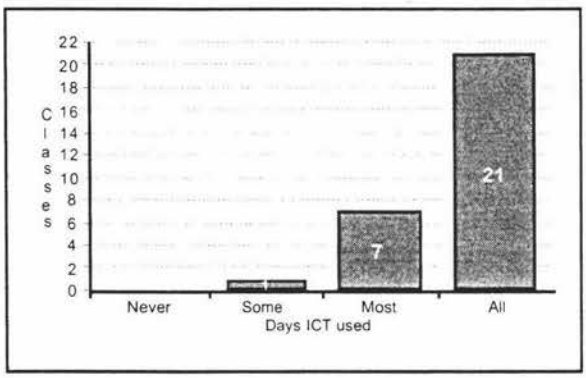


Table 5.7 shows that staff strongly believe that their school provides good support in the applications of ICT tools for learning across the curriculum. However, two comments made by respondents suggested that ICT professional development may occur at the expense of staff development in other areas. Such comments serve as important reminders that all professional development in ICT should clearly relate to and enhance teaching and learning across the existing curriculum.

Table 5.7 *(TQ 4.1)*

Provision of staff support in applying ICT tools for learning.

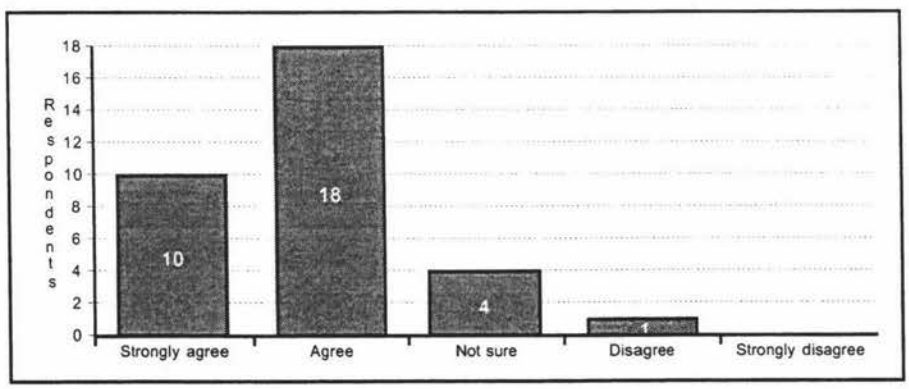
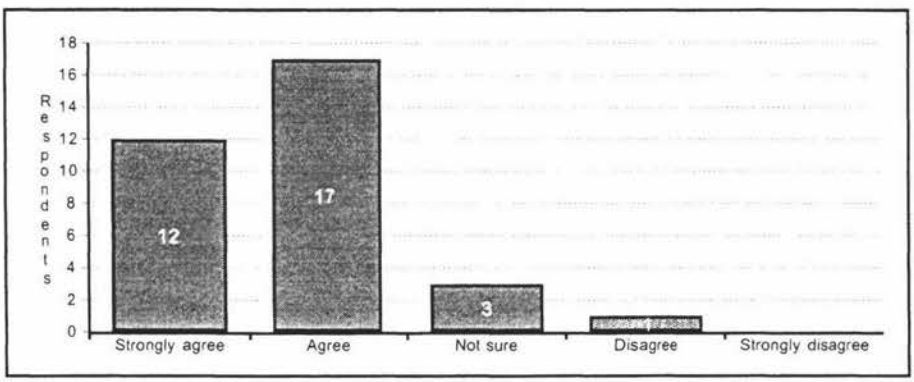


Table 5.8 shows that staff believe their school provides very good opportunities for personal learning through ICT. The school claims to support the balanced development of staff and student confidence and competence. Accordingly, efforts have been made to develop staff members' personal use of ICT to the point where its use is entrenched in their everyday lives. While staff access to ICT at home was not examined, it is believed that only a low percentage of staff have access to ICT in their homes. This may well be an issue for Central School to consider if it wishes use of the tools of ICT to become an everyday element of each staff member's life.

Table 5.8 *(TQ 5.1)*

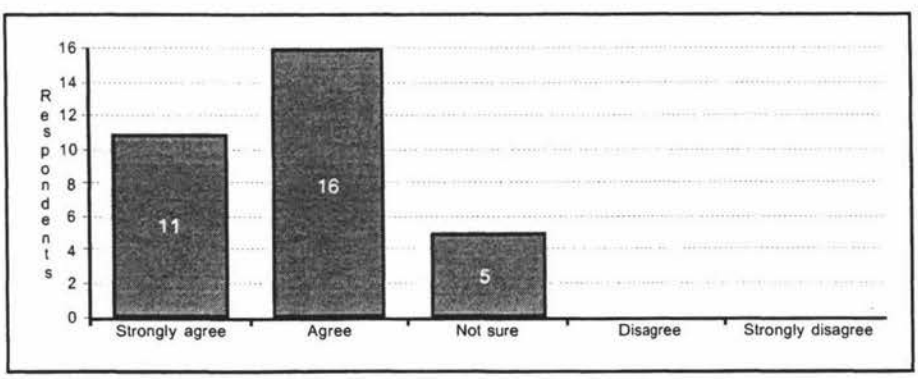
Provision of opportunities for personal learning through ICT.



The results shown in Table 5.9 reflect the management view that the school provides very good opportunities for professional development related to teaching and learning with ICT. Together with the results shown in Tables 5.1, 5.2, 5.3 and 5.4, this data reinforces the accent within the school on comprehensive school-wide and school-based professional development in ICT.

Table 5.9 *(TQ 5.2)*

Provision of opportunities for professional development related to teaching and learning through ICT.



5.4 Staff and Student Competence

iv) *How competent do teachers and students perceive themselves to be in their understanding of, use of, and capacity to teach or learn with ICT?*

One of Central School's recurring claims in its ICT-related documentation and statements from management staff is that staff and students at the school are highly competent and confident in teaching and learning with ICT. In support of these claims, this research has identified, by reviewing the relevant documentation and observing in-class practice, an agreed and robust pedagogy in ICT at the school. Review of the relevant documentation, in-class observation, and analysis of responses to staff questionnaires and teacher interviews has also identified a wealth of staff professional development in ICT. Furthermore, the research has identified engaged student learning with ICT through its examination of the relevant documentation, in-class practice and the responses to student questionnaires and interviews.

Further confirmation that the appropriate pedagogy, professional development and engaged learning in ICT are in place at Central School - and having their intended effects - was sought by asking staff and students to rate their competence with ICT. Central School asserts that staff and student perceptions of their own competence with ICT is a major indicator of the school's success or otherwise in delivering effective teaching and learning with ICT. The perceptions of parents on this point are also pertinent.

Staff and parent perceptions

Tables 5.10 and 5.11 are collations of responses to the Staff and Parent Questionnaires.

Table 5.10 *(TQ 2.2)*

Personal ICT application by staff.

- Web page authoring
- Journal searching
- Administrative purposes - accounts
- Planning
- Report writing
- Assessment entry
- Data input/student database
- Business applications
- CV preparation
- Writing, letters/word processing
- Music CDs
- Internet/seeking information
- Games
- Display/labels
- Assignments
- Communication memos, email
- Spreadsheets
- Library database
- Presentations using multimedia
- Modelling for children
- Clip art
- Touch typing lessons

The top six personal ICT applications by percentage of respondents were as follows: writing, letters/word processing 98%; communication memos, email 84%; Internet/seeking information 52%; data input/student database 16%; Clip art 16%; and spreadsheets 12%.

Table 5.11 *(TQ 2.3)*

Classroom ICT applications.

- Faxing
- Communication - email
- Living books
- Timetables
- Art - paint/draw
- Alphabet
- Maths concept reinforcement
- Newspapers
- Music
- Telephone
- Digital camera/Quickcam
- Internet - seeking/processing information.
- Problem-solving activities
- Writing - word processing
- Reference CDs
- Database entries
- Administration
- Graphing/spreadsheets
- Slideshows
- Access it
- TV, video, video camera
- Scanner
- Financial records

The top seven classroom ICT applications by percentage of respondents were as follows: writing - word processing 88%; communication - email 68%; reference CD's 60%; telephone 52%; curriculum related applications (maths, problem-solving, music) 40%; Internet - seeking / processing information 36%; and faxing 32%.

In Tables 5.10 and 5.11, staff have indicated a substantive number of areas in which personal use and learning with ICT is taking place in the classroom There are some interesting similarities as well as distinct differences between the top six personal and top seven classroom ICT applications. It is also worth noting that a number of the applications listed in Tables 5.10 and 5.11 involve cross-curricular gathering and processing of information, for example, use of the Internet, fax, telephone, reference CD and email.

Because perceived staff inability in any subject area is usually reflected in poorer student attainment in that area, the issue of staff confidence and competence in applying ICT as a tool for student learning is significant. Thus, the generally positive levels of staff confidence and competence reported in the key area of teaching and learning with ICT in Table 5.12 are encouraging, particularly when it is appreciated that staff members generally understate their perceived levels of expertise.

Table 5.12 *(TQ 2.10)*

Staff confidence and competence in applying ICT as a tool for student learning.

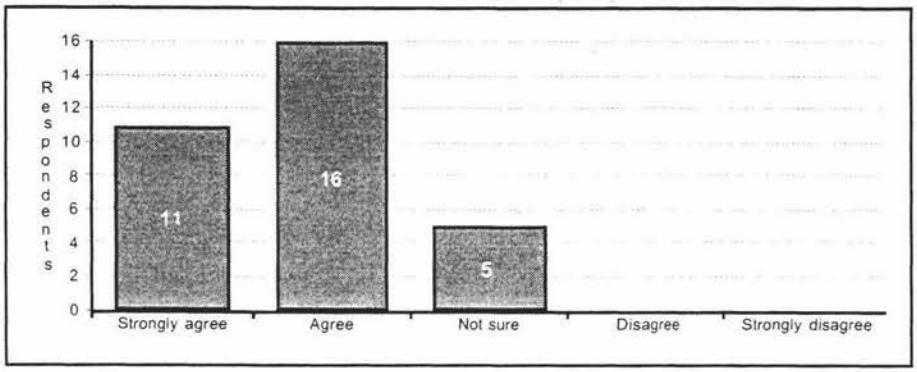


Table 5.13 shows that staff generally believe that ICT is being successfully implemented as a tool for learning by students and staff throughout the school. This information is consistent with the high levels of expectation related to teaching and learning with ICT evidenced in responses to staff and parent questionnaires. Table 5.14 presents responses to the same question asked of parents and demonstrates a clear correlation with staff responses.

Table 5.13 *(TQ 2.11)*

Successful implementation of ICT tools for learning across the school (staff).

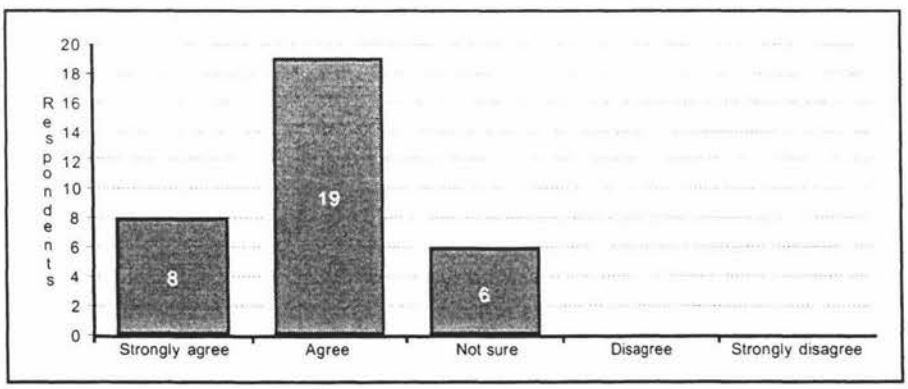


Table 5.14 *(PQ 3.2)*

Successful implementation of ICT tools for learning across the school (parents).

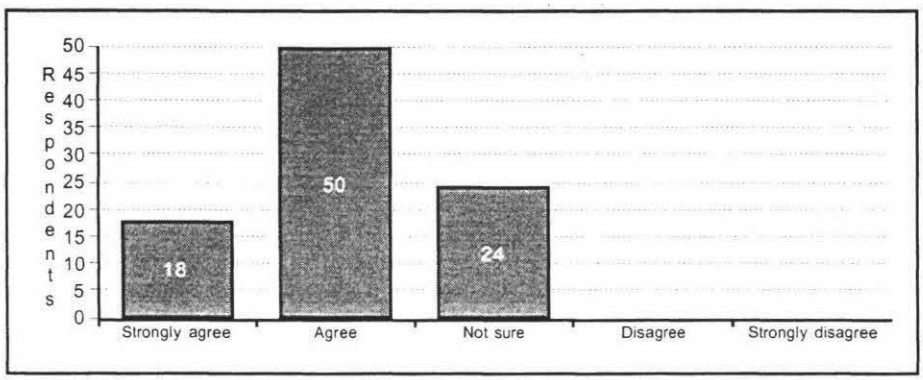


Table 5.15 supports the assertion by Central School that staff believe they are successfully implementing ICT as a tool for learning by students in their classrooms. Having defined student learning outcomes and established an agreed method for assessing and evaluating these outcomes, staff can measure the actual levels of success in learning with ICT being achieved. Table 5.16 presents responses to the same question asked of parents. Interestingly, while there is clear agreement amongst most parents that their children are learning with ICT tools, a substantial group of parents are not clear on this point. This finding identifies a need for Central School to further report on and clarify to parents what students are achieving in learning with ICT.

Table 5.15 *(TQ 2.12)*

Success of ICT as a tool for learning by students in classrooms (staff).

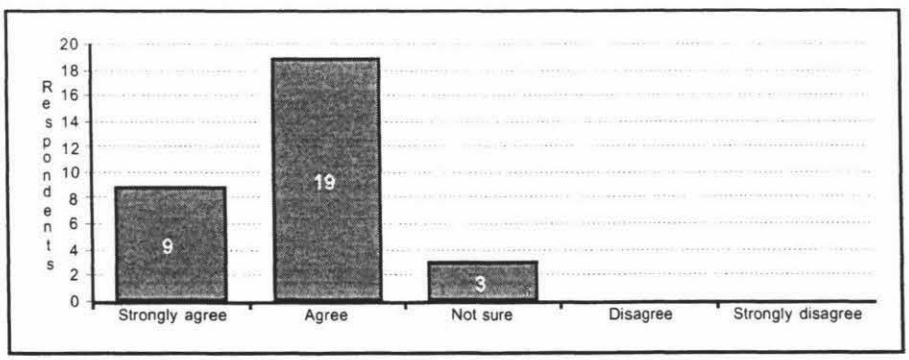


Table 5.16 *(PQ 3.1)*

Success of ICT as a tool for learning by students in classrooms (parents).

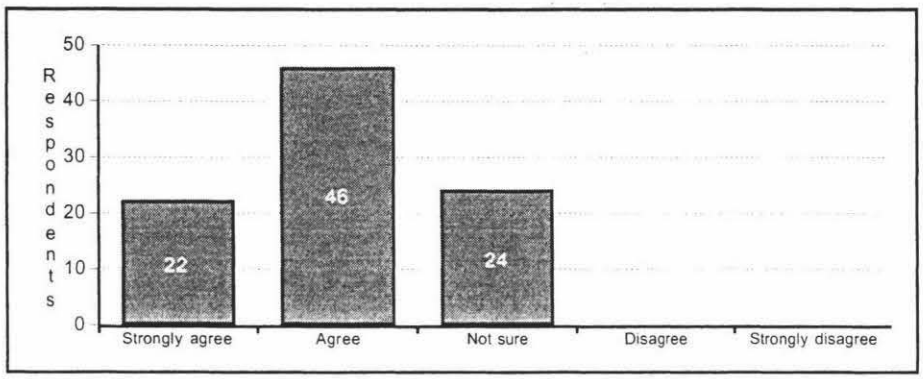


Table 5.17 presents results which are consistent with those of Table 5.8 and with the school's emphasis on encouraging staff through specific professional development to become competent and confident users of ICT. The results shown in Table 5.17 are also consistent with those of Table 5.12, which showed that staff generally considered themselves confident and competent in applying ICT as a tool for student learning.

Table 5.17 *(TQ 4.2)*

Staff as confident and competent users of ICT.

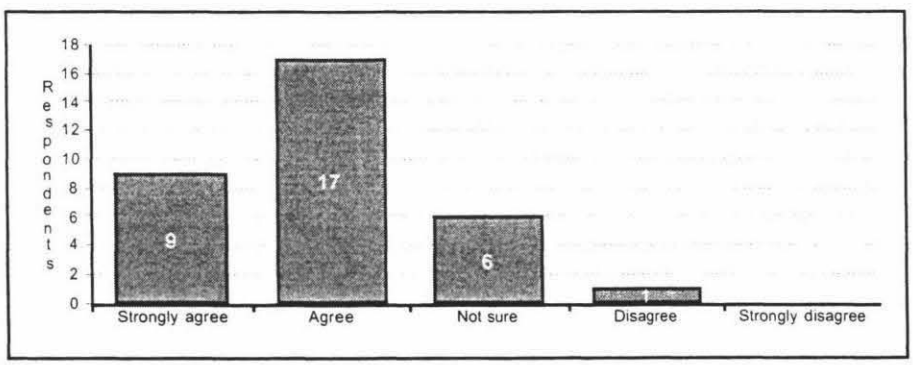
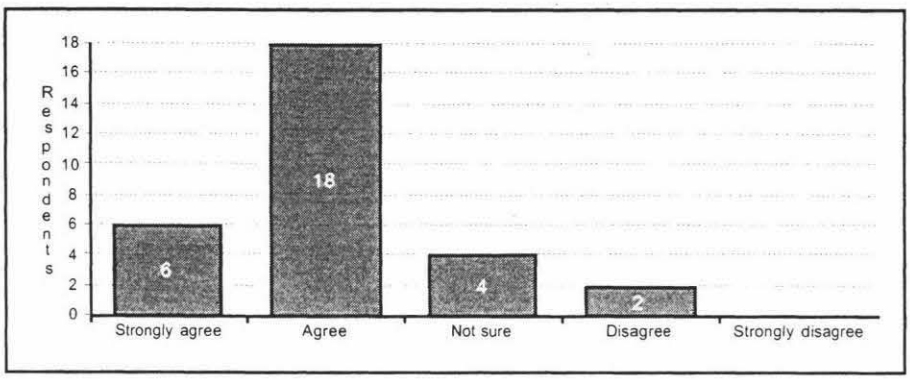


Table 5.18 provides further information about the critical area of subjective confidence and competence as a teacher of ICT. This issue has been examined from a number of standpoints in order to ensure consistency of findings. Thus, the significant consistency of agreement apparent when the results of Tables 5.5, 5.12, 5.17, and 5.18 are compared strongly indicates that teachers at Central School are confident and competent in regard to the successful implementation of teaching and learning with ICT throughout the school.

Table 5.18 *(TQ 4.3)*

Confident and competent teacher of ICT.



Student perceptions

As noted, 124 students were administered the Student Questionnaire, although two of the surveyed classes were not asked the second two elements of question 3 because they were junior classes with limited knowledge of the area in question. The five classes administered the questionnaire were selected by the Research Review Group on the basis that they provided a cross-sectional sample that would include a range of year group levels, staff experience, and staff attitude to ICT.

Table 5.19 shows areas identified by students as involving learning with ICT. These results reveal a clear awareness amongst the vast majority of students surveyed of the ICT equipment and/or applications used for learning at Central School.

Table 5.19 *(SQ 1)*

Student use of ICT at their school.

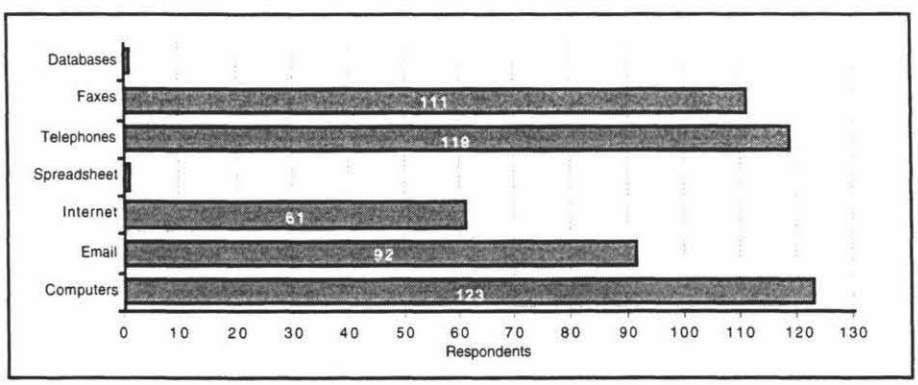


Table 5.20 shows students' perceptions of their learning with ICT at school. These results show that students clearly believe they are using ICT for learning and that they are able to specify how they are using the ICT tools. The total number of students surveyed for the "find information from..." item was 104 because one class was unable to respond. Additional learning with ICT specified by year four to six students included: find information from the Internet (10); find information from CDs (2); 'talk to other countries' (4); make slide shows (14); audio conference (29); use the digital cameras (11). In addition, many students identified other specific skills in various programmes/applications.

Table 5.20 *(SQ 2)*

Student perception of their learning with ICT at their school.

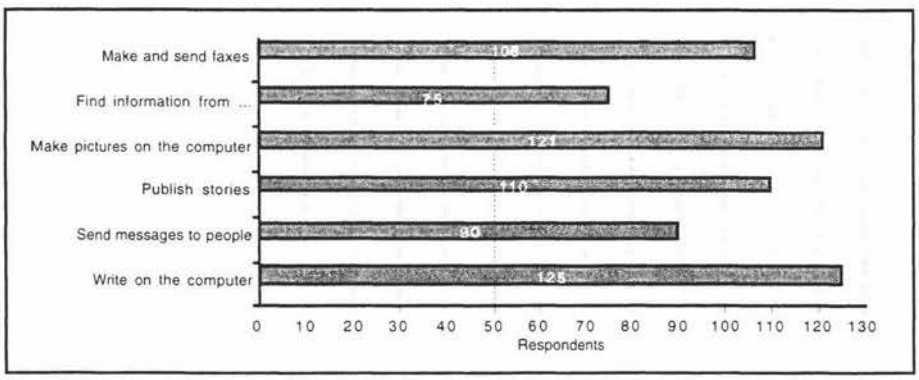


Table 5.21, which depicts responses from 90 students only, indicates strong student awareness of their own progress through the sets of skills and applications required in word processing and telecommunications areas. The very low score in the area of information processing reflected the fact that the school had yet to introduce this set of skills and applications at the time the questionnaire was administered. The low response for this item increases the reliability of the other responses.

Table 5.21 *(SQ 3)*

Student perception of personal ICT progress at their school.

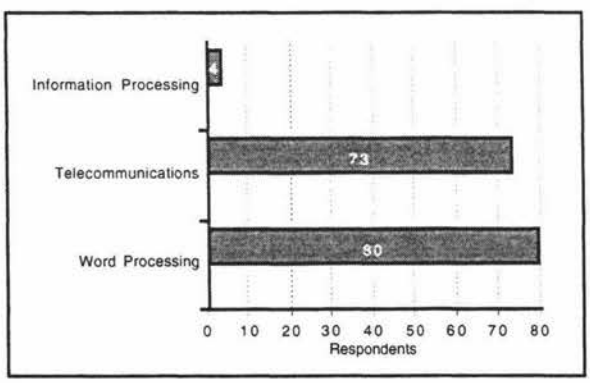


Table 5.22 shows that 92% of the students surveyed believed they were 'okay' or 'very good' at using a computer. Some of the responses made by students who considered themselves 'okay' or 'very good' in this respect were:

"I write good stories .... We do good pictures .... I print my work .... I learn stuff like numbers and letters." (Year one students.)

"I'm a computer helper ... I get to work on the computer by myself .... I learn lots to show my mum and dad .... It's just fun .... I can easily read what I do." (Year two students.)

"I can do most of the tricky things .... I am a computer monitor and I teach my dad a little bit about the computer .... I am a computer helper .... Because I can go into the programme by myself .... I still need a little help .... because I can do things that I like .... just because I'm good, that's all .... because I have learned lots .... I know about the Internet." (Year four students.)

"Because I can word process, do Internet, CD ROM and database .... because I can do email .... because it is hard to email, and I can .... because I am getting faster at it .... because I find it easy .... it is easy with the Internet and clip art and stuff .... I just learn with it and it's okay .... I don't need so much help on the computer .... because I don't get tests all the time, I just do it .... because I know lots, well some short cuts and I can use Internet, email and lots of other things ... because I can use it a lot and I like audio conferencing .... because I am a slow writer, but not on the computer .... because I don't have a computer at home but the school has helped me a lot." (Year five and six students.)

Table 5.22 *(SQ 4)*

Student perception of personal computer ability at their school.

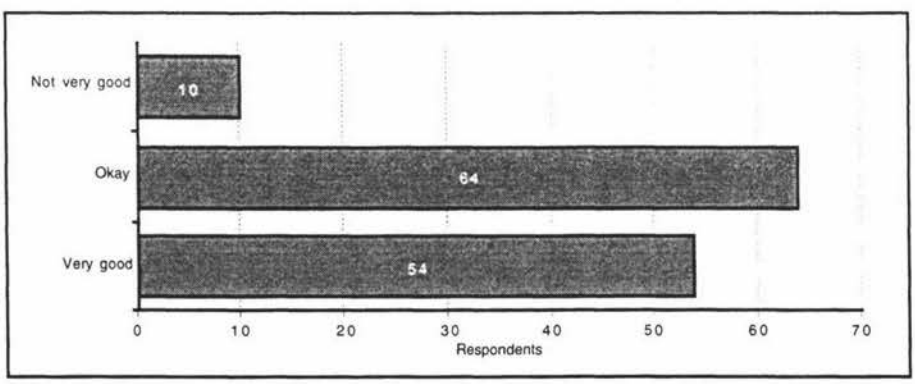
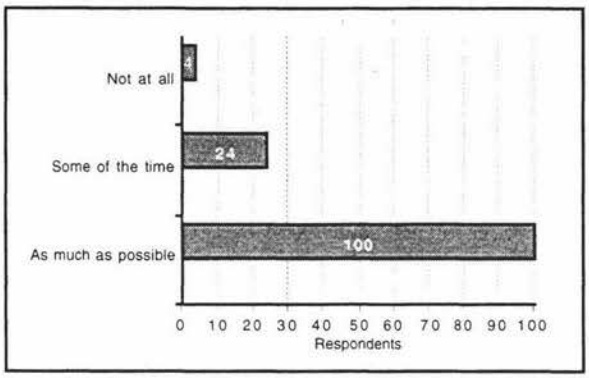


Table 5.23 shows that students strongly preferred to be using a computer at school. This data is clearly consistent with students' widespread belief in their personal ability to use a computer (see Table 5.22). The message is: if children feel good about using something, they are then more inclined to want to use it.

Table 5.23 *(SQ 5)*

Student preference for personal computer use at their school.



5.5 Student, Staff and Parent Expectations

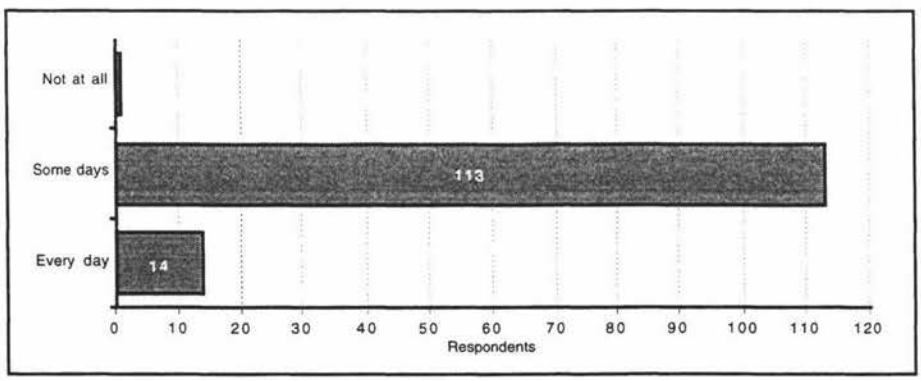
v) *What expectations do teachers, students and parents have regarding implementation of teaching and learning with ICT at Central School?*

Student perceptions

Interestingly, Table 5.24 shows that most students at Central School do not expect to be able to use computers every day. This finding is not inconsistent with staff reports of substantive student use of the ICT tools in the classrooms (see Tables 5.5 and 5.6), since the latter data fails to specify the amount of individual student engagement time. However, it is a matter of concern that students who believe in their ability to use computers (see Table 5.22), and clearly want to be using computers (see Table 5.23), still find that their personal computer time at Central School is limited. One explanation may be that students who are experiencing demonstrable gains in learning with ICT are looking for greater engagement with computers.

Table 5.24 *(SQ 6)*

Student expectation of time on the computer at their school.



Staff and parent perceptions

Table 5.25 leaves no doubt that Central School has high expectations of its staff to successfully implement ICT as a tool for student learning across the curriculum. Staff know what is required of them and are clearly aware of the high expectations placed on them in relation to teaching and learning with ICT. Table 5.26 shows that the great majority of parents are also aware of this expectation.

Table 5.25 *(TQ 6.1)*

School expectation on staff to implement ICT tools for learning (staff).

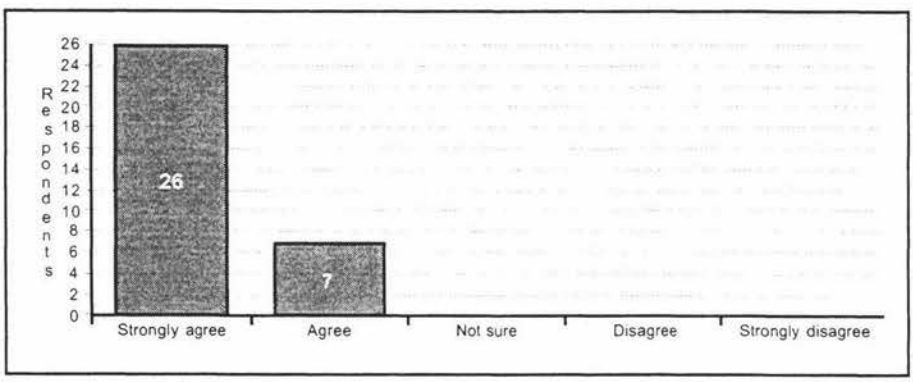


Table 5.26 *(PQ 3.5)*

School expectation on staff to implement ICT tools for learning (parents).

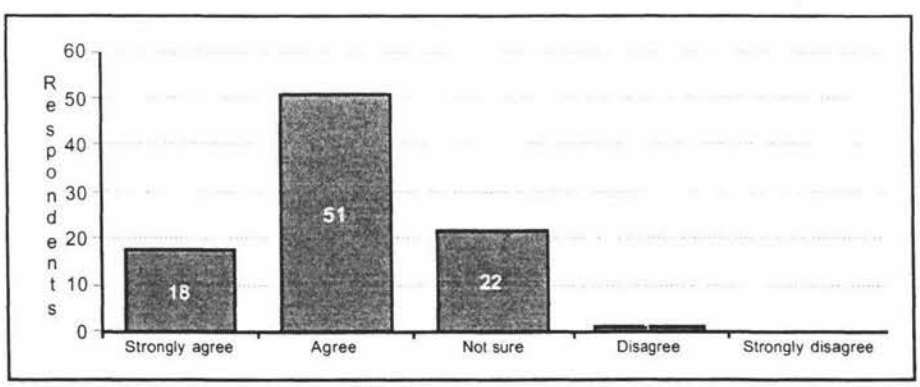


Table 5.27 shows the importance staff members place on mastering successful implementation of ICT as a tool for student learning across the curriculum. Clearly, Central School staff members are strongly committed to this aim.

Table 5.27 *(TQ 6.2)*

Staff expectation on own ability to successfully implement ICT for learning.

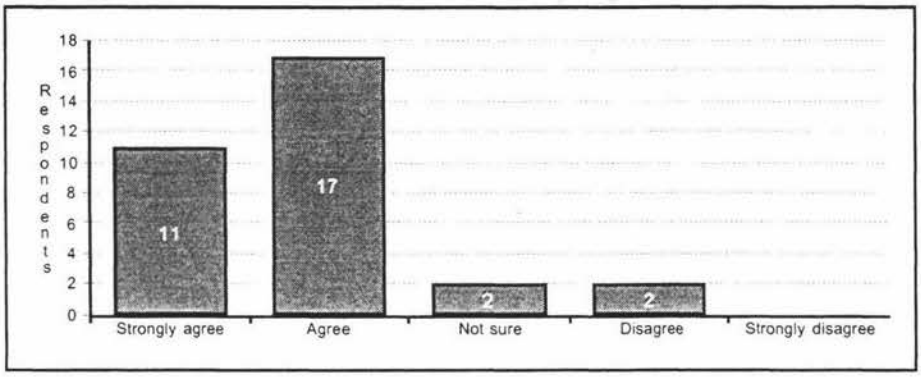


Table 5.28 shows that staff believe students at Central School expect to learn using ICT. This is consistent with staff members' personal expectations about ICT, as shown in Table 5.27. Staff members' beliefs that students at Central School expect to learn with ICT are also consistent with student data presented in Tables 5.19, 5.20, 5.21 and 5.24, and with parents' expectations that their children will learn with ICT at Central School (Table 5.29).

Table 5.28 *(TQ 6.3)*

Staff views on student expectation to learn with ICT.

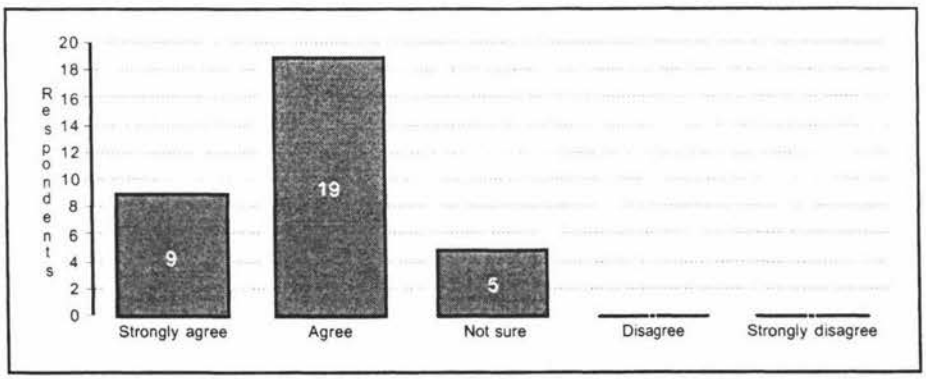


Table 5.29 *(PQ 3.6)*

Students at our school expect to learn with ICT.

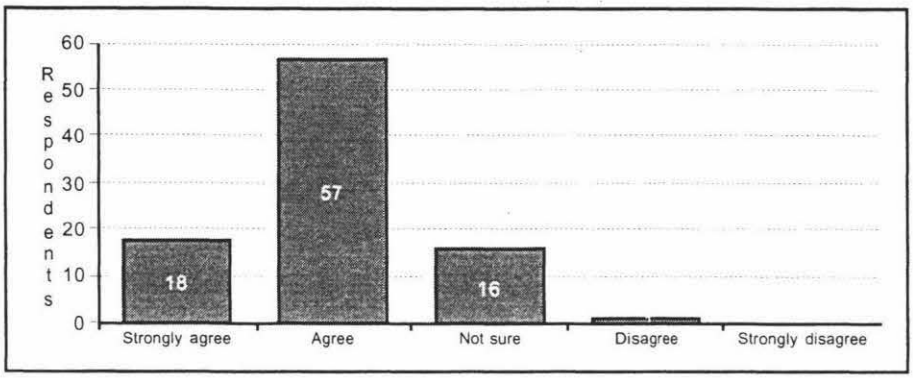


Table 5.30 shows that staff are clear about parents' and care givers' expectations for their children regarding learning with ICT at Central School. These findings reaffirm those shown in Table 5.28 confirming again that there is substantive school-wide expectation regarding teaching and learning with ICT.

Table 5.30 *(TQ 6.4)*

Staff views on parents' expectation for their children's learning with ICT.

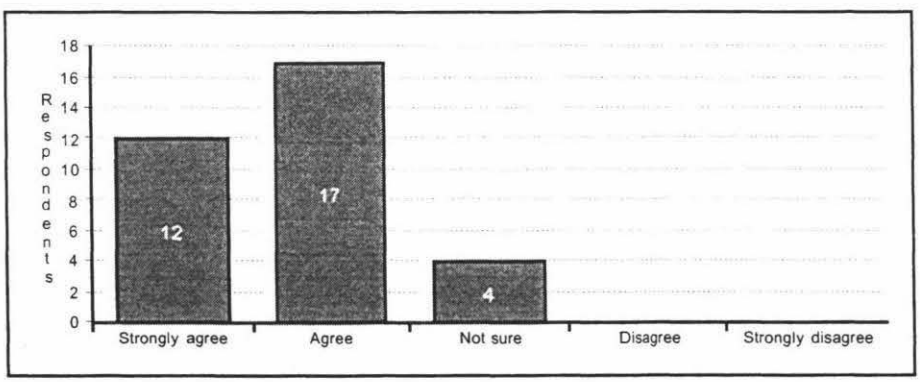
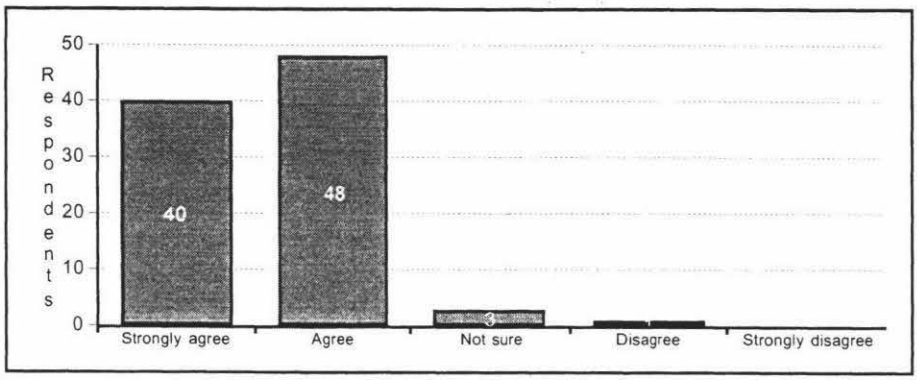


Table 5.31 shows that parents very clearly expect their children to be learning with ICT at Central School, confirming the view of staff presented in Table 5.30.

Table 5.31 *(PQ 3.7)*

Parents' expectations of their children's learning with ICT.



Tables 5.32 and 5.33 show that staff and parents firmly believe in the value of students' learning with ICT. These responses suggest that staff and parents are sure that ICT is making a difference to student learning. This is an important point, because without the commitment and support of staff and parents, implementation of teaching and learning with ICT would be much more difficult. While it cannot be proven that staff and parent belief in the value of ICT learning is a necessary prerequisite of school-wide implementation of teaching and learning with ICT at Central School, it is reasonable to infer that it is at least a corollary of the implementation process.

Table 5.32 *(TQ 6.5)*

Students' learning is positively enhanced using ICT in the classroom.

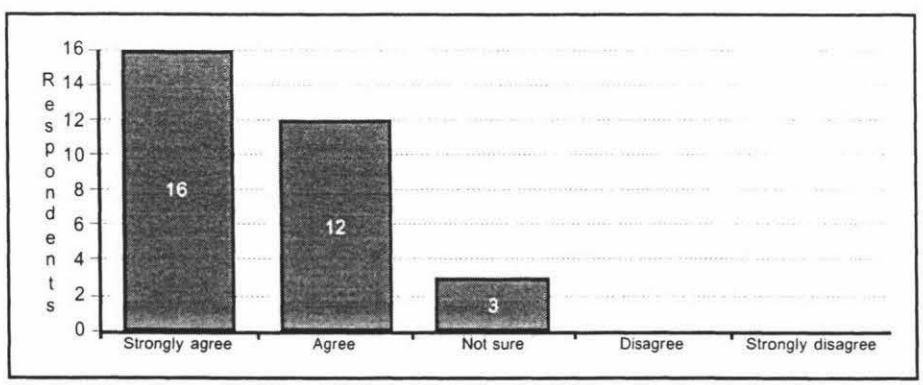
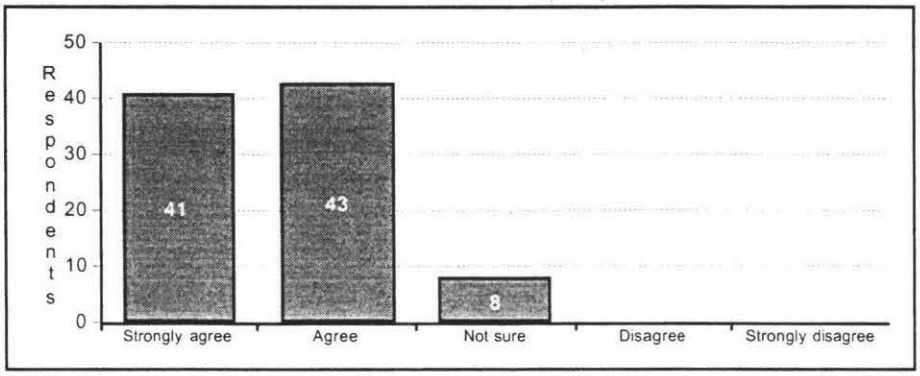


Table 5.33 *(PQ 2.3)*

My child's learning is positively enhanced by using ICT in his/her classroom.



Tables 5.34 and 5.35 show that Central School parents strongly desire that their children will be able to face their future world equipped to learn with ICT. The strength of parents' conviction in this regard probably makes successful implementation of ICT at Central School much easier. That is not to say that parents alone hold the key. Indeed, it would be interesting to survey the parents of children attending a school that is experiencing less success implementing learning with ICT. It is probable that those parents would have aspirations for their children which are similar to those held by Central School parents; the difference would be the lack of implementation of teaching and learning with ICT by the school. Thus, the onus is on each school to take responsibility for delivery of ICT learning according to its capabilities and the aspirations of students' parents.

Table 5.34 *(PQ 2.1)*

Need for my child to learn the skills of and knowledge about using ICT at our school.

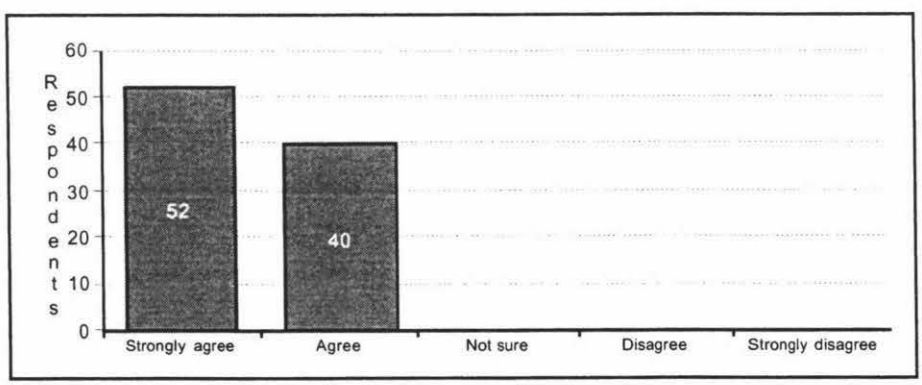
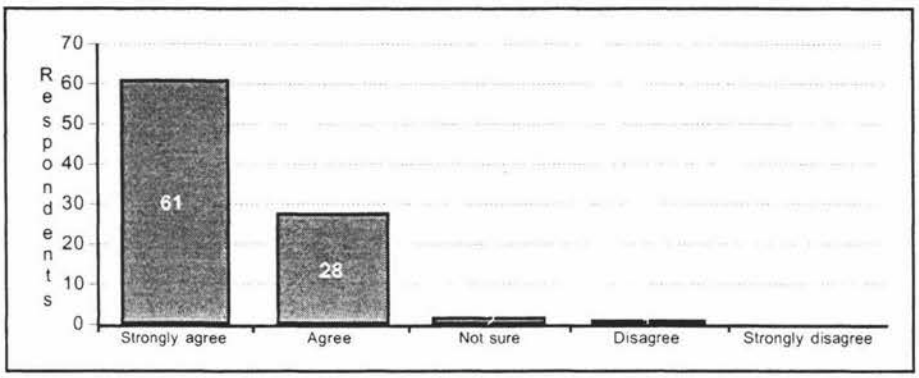


Table 5.35 *(PQ 2.2)*

Need for my child to learn the skills of and knowledge about using ICT today and in the future.



Tables 5.36 and 5.37 reveal strong agreement, for different reasons, amongst Central School staff and parents on the importance of ICT being compulsory. Making teaching and learning with ICT compulsory meant that staff could no longer opt out of teaching with ICT; they were required to implement ICT and therefore to 'just get on with it'. That staff considered this approach successful is evidenced by their assessment that making teaching and learning with ICT compulsory contributed to the successful implementation of ICT school-wide. Parents, on the other hand, welcomed compulsory teaching and learning with ICT because it meant that their children would be guaranteed access to learning with ICT, and that funds were more likely to be used to facilitate such learning.

Table 5.36 *(TQ 3.3)*

The importance of compulsory ICT at our school (staff).

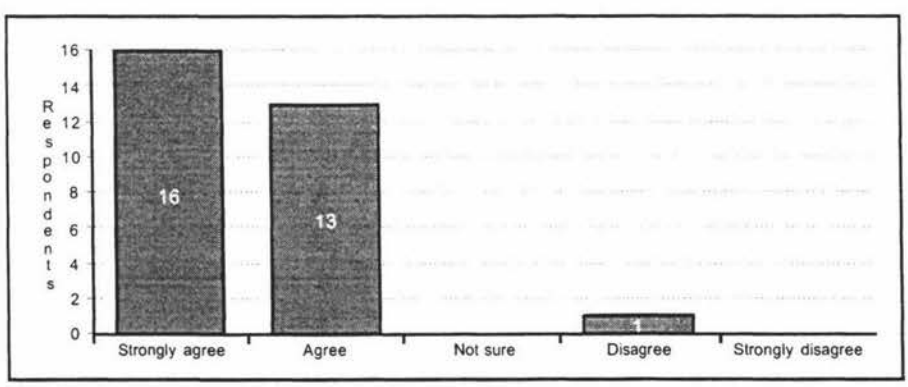
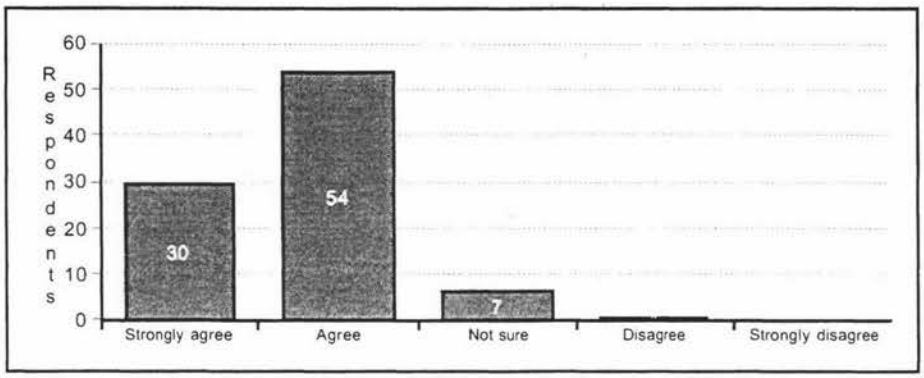


Table 5.37 *(PQ 3.3)*

The importance of compulsory ICT at our school (parents).



5.6 Summary

The gazetted requirements related to teaching and learning with ICT are limited and arguably limiting. For these reasons, Central School has clearly not relied on the Government, through its Ministry of Education, to provide direction, requirements or support in relation to the implementation of teaching and learning with ICT. Instead, the school has taken it upon itself to move ahead as a learning community in this area. This is reflected in the consistency of staff, parental and student expectations about ICT and the shared understanding of what ICT can do to enhance teaching and learning if conditions are conducive.

Furthermore, Central School has welcomed its opportunity to take responsibility for teaching and learning with ICT. To this end, it has set in place a series of agreed policy guidelines to coordinate actual practice. There is clear evidence that the school, following a process of careful deliberation, planning and testing, has established an appropriate pedagogy and a clear set of identifiable student ICT learning outcomes Furthermore, these have all been documented, as have the school's school-wide intentions with ICT and the success or otherwise of its efforts.. While staff concede that it has not all been 'plain sailing', they do have a defined journey and can therefore identify successes (and failures) as they continue their travels. Knowing the 'way we do things' in ICT, it is possible for all concerned to identify an evolution of action as opposed to inaction through ignorance, uncertainty or procrastination.

The aims and processes of staff professional development related to ICT are carefully linked and, on the evidence presented, have ensured that all staff have an agreed understanding of what is required of them, namely, confidence and competence in developing ICT learning opportunities and experiences for students. As a consequence, the teaching staff have acquired leadership responsibilities as important as those of the

management staff in terms of delivery of ICT learning. However, none of this would have been possible without school-based professional development, a factor which both the ICT coordinators and staff identify as a key contributor to implementation of school-wide teaching and learning with ICT at Central School.

Another key finding of the research to date is that *people* matter. While an infrastructure has been assembled to complement other developments in ICT at Central School 'human infrastructure' has come to be considered more important than equipment infrastructure.

The array of data gathered from staff, parent and student questionnaires revealed clear matches between perceived and actual learning. Furthermore, staff, parents and students revealed the expectations they have placed on themselves and, where applicable, their understanding of the expectations that others have placed upon them. The concurrences in both understandings adds weight to the assertion that the school community is moving together in its approach and practice toward successful teaching and learning with ICT.

Perhaps most importantly, there is clear evidence to suggest that any favourable developments in teaching and learning with ICT at Central School have not been achieved by accident. It would also appear that no single element, for example, professional development or leadership, is the key to successful implementation of teaching and learning with ICT throughout the school. All elements in the process can be regarded as complementary. Indeed, the important messages that became evident to the researcher during the process of gathering data for this chapter were:

- The critical importance of having all the people involved in the learning community working together in an attempt to achieve a common goal.
- The need for a school to take responsibility for teaching and learning with ICT, and for all members of the learning community involved to believe that doing so is vitally important..

The consequences of taking responsibility can be identified as:

- An inclusive approach to leadership which involves all participants, including students.
- Achievement of goals through careful planning, realistic management and deliberate actions.
- The establishment of a pedagogy formulated on the basis of student learning outcomes.
- Judicious, extensive and relevant professional development.
- Careful establishment of a complementary and responsive infrastructure.

The evidence presented in this chapter indicates that these elements contribute importantly to the successful teaching and learning with ICT which staff, students and parents attest is taking place at Central School.

Chapter Six

Stage Two

6.0 Introduction

Previous chapters have reviewed national and Central School documentation related to teaching and learning with ICT, outlined existing management practices at the school, and shown how the perceptions and expectations of staff, students and parents relate to the successful implementation of teaching and learning with ICT at Central School. The key practising elements at Central School can now be considered. To this end, data relating to the actual practice of teachers and students involved in planning, experiencing, assessing, evaluating and reporting ICT teaching and learning has been collected and examined. In essence, therefore, this chapter identifies the procedures which establish, maintain and review both the process and progress of teaching and learning with ICT at Central School.

As stated, the research for this chapter was carried out in two parts. Part One considered elements of the research questions put to the 21 full classes. Part Two considered elements of the research questions put to five classes in greater detail (refer to Stage Two Data Collection in Chapter Four, section 4.3.3).

6.1 Planning for Student Learning

(i) How are teachers incorporating any school ICT intentions/objectives in their planning for student learning outcomes?

Part One - All Classes

Teacher Planning Check - This was carried out annually as part of the school's PMS cycle. The long term and daily planning of all 21 full classroom teachers were examined by the three associate principals (see Appendices 19 and 20). Specifically, the associate principals were looking for an identified ICT focus in the curriculum areas of reading and science. In all cases, there was evidence of ICT-related planning across varied areas of the curriculum and clear links between long term and daily plans. Furthermore, all 21 teachers provided evidence of an identified ICT focus as part of their long term reading and science plans. Examples were most frequently identified in the learning experiences section of the long term plans, where teachers indicated which particular ICT vehicle could be used, for example, email or facsimile contact for information gathering and/or expert confirmation; telephone contact for advice and information; report writing on a word processor; seeking information from CD encyclopaedia; reading from a 'living book', etc.

Only eight of the teachers made specific reference to the school's ICT certificates (see Chapter Five, section 5.2.2, The Information and Communication Technology Education Plan and ICT Curriculum Content - What Is to Be Achieved with ICT) with the intent of showing that they were actually planning work to achieve outcomes on these certificates. While this lack of reference to the ICT certificates was initially of concern, all 21 classes were found to be up to date when the ICT certificates in Word Processing were examined as part of the PMS cycle. One teacher responded as follows when questioned about the general lack of reference to the ICT certificates in teacher planning:

> *"We know that the certificates are there, my children know that they are there. The certificates are clear in what is expected and I treat them as plans on their own. Why rewrite the material onto another plan or even make some reference to them? I am trying to plan for my children with their needs and the curriculum in mind - the ICT stuff and the certificates are just there to be used as part of that learning."* Teacher O

The ICT certificate programme is presented by Central School as a teacher's 'one-stop shop' for specific ICT planning, learning outcomes, suggested applications and contexts, assessment, evaluation and reporting to parents. The ICT certificate programme is also presented as a means of encouraging school-wide consistency amongst all teachers and students, and as such, the programme allows the school to monitor student progress based on assessment data used in evaluation, review and for reporting to the Board of Trustees (see sections 6.3 and 6.4). The simplest way to establish whether the 'one-stop shop' was working for teachers was to confirm that the ICT certificates were operating in class for students. As noted above, this check revealed that all 21 classes were up to date in terms of their student ICT certificates in Word Processing.

Having completed the planning (documentation) check on all teachers, it was then important to examine what was actually happening in practice, that is, to determine whether planning was linked to learning activities/experiences.

In-Class Observations - These were organised by all classroom teachers in conjunction with the researcher. They consisted of a set of questions to be asked in-class or elements to be observed (see Appendix 11). It is important to note that while teachers were aware that an observation related to ICT would take place, they were not aware of what would be asked or specifically observed. In addition, the teachers were not made aware of when the observation would take place. There were only two situations where the observation could not proceed as intended by the researcher. In both cases, the classes were out of their classrooms and involved in other school activities. The observations for these classes were conducted at a later time.

It is also important to note that questions 1.1 and 1.2 of the In-Class Observation (see Appendix 11) were asked of the teacher subsequent to the event record observation, element 2.0. After being asked questions 1.1 and 1.2, teachers were then asked if the

activities/experiences taking place were noted in their planning. As noted in Table 6.1, all but one teacher was able to clearly indicate how the student activity related to both the general curriculum and to the school's ICT certificate goals. Thus, the 'surprise' cross-check back to planning provided a good indication that teachers had considered and knew what they were trying to do in their teaching and learning with ICT.

Table 6.1 *(ICO 1.1 and 1.2)*
Teacher responses to actual activities in all classes.

Teachers able to relate the indicated ICT activity to a curriculum are	20/21 (95%)
Teachers able to relate the indicated activity to an ICT certificate goal	20/21 (95%)

This cross-check back to teachers' planning was a deliberate action by the researcher which surprised most teachers. Its inclusion in the In-Class Observation was explained to each teacher as one means of confirming the existence of connections between planning and actual activities/experiences. The ensuing 'surprise' cross-check data was not recorded in any teacher file; rather, the findings were accepted by the researcher and teachers as simply 'the way things happen in a real classroom'. Classroom activities/experiences are not always planned, just as planning does not always translate into activities/experiences. Thus, cross-checking in this case served as a very useful tool for illuminating general practice while confirming that ICT is no different in this respect from other areas of teaching and learning in the classroom.

During the event recording, students were questioned about the activity/experience in which they were involved. The intention of the researcher was to attempt to determine how well the activity was understood and whether students knew why they were doing it. Students were also asked to indicate which ICT certificate they were currently working on. When considering these responses (Table 6.2) it is important to note that *(ICO 3.1)* refers to the question/element 3.1 of the In-Class Observation (see Appendix 11).

Table 6.2 *(ICO 3.1 and 3.2)*
Student responses to actual activities in all classes.

Classes where students could explain what they were doing in ICT	18/21 (86%)
Classes where students could explain why they were doing the activity	17/21 (81%)
Classes where students were aware of what they were doing in relation to the school's ICT certificate goals	19/21 (90%)

As shown in Table 6.2, most students could identify what they were doing in ICT, why they were doing it, and how what they were doing related to the school's ICT certificate goals. Since it was possible that the teacher had selected students for the observation and prepared them accordingly, cross-checks were made in 15 of the classes. This involved selecting one student at random during the observations and asking him/her to explain what he/she had been doing and how it related to the ICT certificate goals. Fourteen of these 15 randomly selected students were able to correctly indicate their most recent ICT-related activities/experiences; 12 were able to identify the relationship between this activity and the ICT certificate goals.

A range of students' comments are presented below to provide an indication of their levels of understanding. Year levels are given for general reference. These comments were provided by students during the formal In-Class Observation, as opposed to the 15 randomly selected students questioned during the subsequent crosscheck.

Student comments

New Entrant - Year 1

"I am writing my story. I know where the certificates are and I've got a sticker too." Class L

"I am painting a picture to go with my story. I know we have them [the certificates]." Class R

"[I'm] doing a duck pond to go with my story. I write my story all by myself." Class X

Year 2

"I am publishing my story. I've done it all by myself. I have seen them [the certificates] and I'm on to Level 2 - this is me working on L2 now. I have one more thing at Level 2." Class N

"I am just writing my story. I'm through Level 1 and on to Level 2 - this is some L2 stuff today." Class T

"I am making a fax to send to #### School. I want to know if they found the secret parcel in their classroom. I am working on two certificates at the moment - but mostly Telecommunications." Class U

Year 3

"I am sending an email to somebody in Christchurch. I am telling him about my school and I want him to tell me about his school. The certificates show what I have done. I am doing Word Processing and Telecommunications now." Class F

"I am putting text direct on to fax to Heather at another school. I'm on Level 2 on Telecommunications and this is Word Processing as well." Class E

"I am putting in my own questions and answers for the hall - it's a newspaper thing. I am up to Level 3 in Word Processing and on to Level 1 in Telecommunications. I am doing Word Processing and finding out things for our newspaper." Class I

"I'm writing a story. When I go to a new class next year I have to be able to do stuff on the certificates. I am doing Word Processing today." Class M

Year 4

"We're doing a fax today - we want to find out more information. We're through to Level 4 on Word Processing and Level 3 on Telecommunications." Class V

"I am helping S to learn the skills from using the Tool Box. We work through the things on the back as we get better at using the computer and fax and things. It tells me what I have to work on next and I like that. I am doing Word Processing certificate at the moment." Class Y

Year 5

"I am writing a fax directly on to the fax header on our computer. It is going to ##### school. This is part of our social studies work and it also works with my Telecommunications certificate." Class P

"I am constructing a fax to send to the Mayor, Mr Curtis. We want to find out about the problems with rubbish collection. I will see if he can give us an email address - it's easier for me to get more information that way. It's too hard on the phone because I forget what they say. This is part of my Telecommunications enquiry." Class Q

Year 6

"Teachers want us to be able to know when to use different tools and how to use them. I am on to Level 2 and 3 applications of Word Processing - my skills are all done. This is a Word Processing certificate application." Class J

"We are working on the editing of Nga Tui Newspaper. This is part of our last application for level 4. We also help others as tutors." Class K

Table 6.3 shows the degree of correlation between teachers' and students' ability to relate identical classroom activities/experiences to ICT certificate goals.

Table 6.3 *(ICO 1.2 and 3.2)*

Teacher and student responses to ICT certificate goals in all classes.

Teachers able to relate the indicated activity to an ICT certificate goal	- 20/21 (95%)
Classes where students were aware of what they were doing in relation to the school's ICT certificate goals	- 19/21 (90%)
Correlation of positive responses for identical activities between teachers and students in the two items above	- 16/21 (76%)

The fact that students in five classes were either unable to identify the ICT certificate goal, or identified a different goal to that identified by the teacher, is not of major importance. Four of the classes concerned were very junior classes and not likely to have a clear understanding of the ICT certificate goals (see the New Entrant - Year 1 student comments above). What is of significance is that in 16 classes (76%), there was clear agreement amongst teachers and students about the relationship between classroom activities and ICT certificate goals. Central School states in writing that teaching and learning with ICT should be a coordinated school-wide process; these findings confirm that this is a reality at this school.

The senior management team at Central School has attempted to keep ICT requirements simple, the aim being to clarify that which has confused too many for too long. The team has also stated that it wishes to provide a range of options which teachers can select from as they go about organising and managing teaching and learning with ICT with their students. That said, the need to ensure and coordinate school-wide consistency of learning with ICT for all students remained paramount. Within this overall framework, however, teachers have selected that which makes sense to them and discarded that which is seen to be surplus to requirements or simply repetitious.

A possible undercurrent of concern about additional planning in teaching and learning with ICT was alluded to by one teacher:

> *"I don't want the planning to dominate what I actually do - I like the way we are keeping it [long term planning] simple and concise at our school. Having another plan just for ICT is like having another reading or writing plan just to go with science or social studies. These things are part of what we do and we do not need another plan ... hopefully!"* Teacher L

The Central School management team has developed a set of long term ICT plans for teachers to use if required. However, these have never been actively promoted to staff. One possible reason for this is that these plans could not used easily be incorporated into other curriculum plans (a suggestion supported by examination of actual teacher planning practice). However, it is also possible that the management team did not promote the use of these long term planning templates for ICT because doing so might have detracted from the implementation of teaching and learning with ICT across the curriculum. Given that students' progress towards attaining ICT certificates was found to be up to date in all classes, it would seem safe to conclude that teachers at Central School can decide for themselves what makes sense and what actually works in practice.

Part Two - Selected Classes

A teacher diary (see Appendix 12) was completed by five teachers/classes selected by the Research Review Group which also randomly selected a week for the five teachers to carry out this task. One of the questions asked was designed to establish how the teaching and learning with ICT related to Essential Learning Areas. Following collation of the five teachers' responses, the teachers were asked if the learning activities referred to were noted in their respective plans. All five teachers were able to identify references to these activities in their long term plans, their daily planning, or both.

Table 6.4 sets out the Essential Learning Areas that were considered to be related to the ICT learning activities/experiences, the number of days each of these activities/experiences occurred during the week, and the associated ICT certificate goals. In Table 6.4, *(TD 1.2)* indicates Teacher Diary question 1.2.

Table 6.4 *(TD 1.2)*

Essential Learning Areas and ICT certificate goals related to ICT learning activities/experiences during the sample week in five selected classes.

Essential Learning Area	Number of days	ICT certificate goals
Class L		
English - writing - expressive	4	WP, TCom
English - reading	5	TCom
Mathematics - problem-solving	5	
General problem-solving - creating	4	
Class T		
English - writing - expressive/transactional	5	WP, TCom
English - reading - personal/close	5	TCom, IP
Mathematics - number/geometry	1	
Art - composition	1	
Science - physical world	1	IP

Essential Learning Area	Number of days	ICT certificate goals
Class Y		
English - writing - poetic/transactional	5	WP, TCom
English - reading - information processing	5	IP
English - viewing/presenting	5	
English - speaking/listening	5	TCom, IP
Class Q		
English - writing - poetic/transactional	5	WP, TCom
Art - composition	1	
Class J		
English - writing - transactional/poetic	5	WP, TCom, IP
Social studies	5	WP, TCom, IP
English - speaking/listening	2	TCom

Abbreviations:
WP = Word Processing
TCom = Telecommunications
IP = Information Processing

Table 6.4 shows that teachers understand the purpose of the ICT activity being undertaken and in particular its relationship to Essential Learning Areas. Again, it is important to note that teachers did not operate according to any specific ICT long term plan. Rather, they all incorporated their ICT planning, in the form of related learning activities/experiences, into existing long term curriculum plans. It is also interesting to note in Table 6.4 that teachers were generally clear about how any particular learning activity/experience related to the school's three ICT certificate goals.

6.2 Student Learning Experiences

(ii) What ICT learning opportunities/activities are created for, captured and experienced by students?

Part One - All Classes

Student activities were observed as part of the In-Class Observation and have been documented in section 6.2. In 18 of the 21 classes, students could explain what they were doing in ICT (Table 6.2). In 17 of the 21 classes, students could explain why they were doing what they were doing (Table 6.2). In all 21 classes, students were engaged

in ICT-related activities/experiences at the time of the observation. The following reports have been selected from the actual event records of a range of the classes observed in order to provide additional background information about what was actually taking place in the classroom.

New Entrant - Year 1

V spent twelve minutes uninterrupted on text entry for her story on 'The Birthday'. I eventually asked her what she was doing. V gave me a detailed explanation of what she was doing and then began to guide me around some functions. She did not resume work on her story and I felt a little guilty having interrupted her flow although V was not too upset. "I was drafting a story - just started today. I am writing my story and I save it to disk. I can show you." V showed me how to save to to the staff disk and how there would be another copy on their own class disk (hard drive). Class H

E was writing a first draft story. It was interesting to note the hold up on keyboard letter finding while she used the direction keys well. Four "sentences" completed. It is ready for Mrs L to check with me now. I asked if she was going to read it over. "I always read each letter when I write it." I asked if she reads the whole story over together. "Only if Mrs L tells me to - do you want me to?" E read her story to me and I assisted with some changes. "Wish I could change it like that in my book." Class L

A was drawing a picture - competently using the Tool Box for lines, colours with 'crayons', 'brush' and 'spray cans'. There was very impressive control and knowledge demonstrated. A entered text for her story with confidence. She confidently read her work back to me and then got K to help with the printing. Class R

J was working on an alphabet recognition sheet, part of a letter I.D. task. J printed off the sheet. Keyboard recognition was developing in the eight minutes 'on task'. Class W

A was painting a picture of a duck pond using a number of tools from the Tool Box. "I like painting with this. I don't get the colours all mucked together." I mentioned that she wouldn't get the paint on her clothes either. "That's silly," replied A. Impressive fine motor control. A had already completed her own story at a previous session but had some trouble finding her story on the student disk. (She had named the file after a friend who was going to go to the pond but did not appear in the actual story!) Class X

Year 2

Circus Game - Pairs assisting in a cooperative activity, taking turns at operating. Any decisions were being made independently by the operator - some agitation from the partner not in control. A mathematics activity involving estimation of angles and problem-solving. Class D

A involved in edit work about to publish it. "I have it saved on to our disk. I'm going to print using the colour cartridge for my picture, but I have to go and ask for the

cartridge from Mrs N." The change of the cartridge was carried out and the final piece was published. A showed me a print out of an earlier draft and was pleased with the changes made. "I even put another sentence on today." Class N

S is a new student in the class. He was entering text with help from another student. P showed him how to 'write with the computer'. P also showed S how the computer can do other things with the words or parts of a story by inserting and deleting text. P explained that S would be his buddy and he would be able to show him "heaps of things, especially when we get to design our own machines." (Part of a technology unit just completed.) P also showed S his first certificate and marked off one of the skills. Class T

K entered text on to her fax sheet to #### School. Corrected text with four 'on screen edits' and saved to class faxes on own hard drive. Actioned the print of her fax ready to send. K completed five sentences in the nine minutes 'on task'. She read over her work and made two further changes. K asked me to proof her fax prior to printing. "We are sharing faxes with #### School. I wish they had email, it is so much easier! We are going over to their school in two weeks for a visit and I will get to see my fax there. They are coming to visit us too and play on our adventure playground." Class U

Year 3

Writing transactional text, letter to a friend, direct on to fax header. Student located fax header that had been previously designed. Text was being entered in an effort to complete the first draft. Six 'on screen edits' observed during event record. A very busy 17 minutes writing. Class E

S was entering text on to email direct, a pen pal letter to school in Christchurch. The email had been loaded by the teacher, but S indicated that she knew how to do this. I asked her to save the email and show me how to reload the email. S needed some help in quitting the email function but was quickly able to load. She figured out where to find her saved email - "I've never done that before!" She indicated that she had not received an email from her friend before. "Sometimes I send a fax. L writes back on a fax but she doesn't put much words on it. I hope she will email more stuff to me." I suggested that she tells L this in the email. Two paragraphs of text composed - to be sent without any further editing. Class F

S was text entering her views on what the hall should be like. She was working on an article that was going into the class newspaper. Everyone was "doing a story or something" for the newspaper "but mine will get in because N (one of the class editors) is my friend and she told me." S was listing her ideas separately. She indicated that she had to do some more editing so that her spelling was right. Four points entered with three 'on screen edits' completed. Class I

Two students observed as I arrived during one of their changeovers. They just used the minute hand on the class clock. F just printed off his work independently. Discussed what he had done to reach that point. Had used Tool Box well. Art tools also well used. (Straight line drawing of helicopter and colouring in.) E opened file. Put in drawing/painting first. Went to text box - entered name and began writing. A very well written story. Class M

Year 4

M was working on text entry for a draft of a descriptive piece of writing. M was well aware of the certificates and was keen to show me two new skills he had learned and was about to check off. He showed me how to move blocks of text and then inserted text also. M managed to write three good paragraphs in eight minutes of 'on task' writing. He also made over 10 'on screen edits'. Class O

C and K working on text entry to prepare a fax. Fully aware of copy function - loading fax header - entering text and faxing another school. "This is part of our Telecommunication work and I will be able to show Dad how to work his fax at work." C and K completed six sentences in nine minutes. They cross-checked the work as they went and reminded each other of their teacher instructions to stop and read each sentence after it was completed. They made two 'on screen edits' and corrected four other errors. Class V

K was working with S on editing and layout work of a restaurant menu. They started with a blank screen and created their own template. This was saved so that they could "make up other menus for different days." K and S were working from Tool Box to create and make changes. After 23 minutes they had the template completed with four starters, five main meals and ice cream as a dessert. I asked if they were going to add to the desserts. "Why?" came the reply. Prices were entered and the next stage was to work on the colours and fonts. Class Y

Year 5

N was drafting fax to the Mayor on recycling of rubbish and the lack of any easy access system for people in our area. "We are only sending him one fax from our class as we don't won't him to get annoyed at getting too many faxes. It would also be too much paper to waste." I suggested that he would then have to answer the question as to how he recycles paper. "We are also asking him if he has email, that way he wouldn't have the waste of paper and we could probably get the reply much quicker." I asked why a letter was not being sent. "A fax is quicker for everybody." Class R

A was preparing to load a fax to send to another school. They had been doing a shared social study together on recreation time at school and at home. Class P

P and D were completing text entry of a full fax to be copied on to a fax header they had constructed. They were concerned about the lack of Wheelie bins in our area and wanted

to know why our area was not like other places where Wheelie bins and recycle bins operated. The girls had very good working knowledge of the technology and managed to complete the task and print the final fax in just under 20 minutes. They both cross-checked the editing and felt that this made the whole process a lot faster. "We only check our final draft with Miss Q." Fully aware of and demonstrated processes well. Class Q

Year 6

D was completing text entry for the weekly newspaper before it goes to our class editors - then on to the block editors. D had already drafted most of the work and was doing some "careful editing so it made sense - and so that it won't have spelling mistakes" He used the spell checker competently. I asked if he felt that using the spell checker was being too reliant on something that may not be helping him to learn to spell the words correctly. "No, I use it all the time, I still have to decide which word is correct ..... do you use a spell checker?" I indicated that I did and received a smile to confirm that the conversation need go no further! "This article will be going into the second issue." D competently opened - worked - saved - closed all on student disk (located on the school fileserver). "We do a back up nearly every day on to our own hard drive." Class J

Two students, R and E, joint editing of block newspaper. Worked on two articles during the observation. Constant discussion about what they were doing as R and E identified errors and corrected them. They moved some text around. I asked if the writer should be consulted. E had not considered this and thought that their job was the final one. "We will also put the stories into the spell checker and I am not telling P (the writer) about that either." I quietly carried on observing. I was impressed at the detailed proofing. R and E had also been responsible for the design layout. "It has to be good because it is going home to parents!" The newspaper was looking very impressive. Class K

L was entering text for her newspaper. She demonstrated a range of skills as she developed her work. I was impressed at the ease and quiet confidence of her work. L entered graphics for her article on 'Beer' from the library. She moved text and graphics competently. She started with two sentences and completed a very good draft with her article basically completed and an appropriate graphic loaded. L was thinking about designing a flow chart to go with her article. There was good evidence of research, with information gathered from two sources, one book and one CD on the network. Class S

Most of the classes observed were working on their Word Processing or Telecommunications certificates. The reference to 'on screen edits' in some of the observations above describes an editing process in which the writer confirms that screen and text type matches up during the actual composition of the text, as opposed to during subsequent proofreading work.

A consistent finding in all but one class was that the level of engagement and 'on task' behaviour was very high. Even when there were considerable distractions in class,

students invariably remained focused on their work. It is entirely possible that this attention to work was prompted by the researcher's presence. When questioned, however, the students indicated good understanding and involvement with what they were doing. The other significant finding was the 'comfort levels' of students' engagement. They were at ease with the technology and not all concerned about 'giving things a try'. While this is not atypical of younger students, it is also possible that this level of engagement arises in part from the 'one-on-one' nature of the student/technology relationship, a situation in which no one else is able to criticise errors or failures.

Part Two - Selected Classes

In Teacher Diaries kept during the selected week, teachers were asked to record the ICT-related activities that occurred in their classes on each of the five days *(TD 1.1)*. The teachers were also asked to note any significant student behaviours that indicated successful learning with ICT *(TD 1.3)*. *TD 1.1* activities clearly focused on actual student learning experiences, whereas *TD 1.3* also included an attempt to assess the success or otherwise of these learning experiences. Thus, the information obtained from *TD 1.3* could arguably have been included and discussed in section 6.3 below. However, following discussions with the teachers concerned, the information gathered from question *TD 1.3* was included in the current section on student learning experiences. This was because the teachers believed strongly that the student behaviours demonstrated were part of the learning experience captured through learning with ICT and therefore needed to be recorded alongside the actual ICT activity.

The following information is taken from the respective Teacher Diaries kept for the five selected classes.

Class L

Day one *1.1*: *Thirteen children entered draft text into word processor independently - drew picture at the top using mouse. Viewing interactive books in pairs - focus viewing on selected pages. Maths problem-solving activities in pairs "Thinking Things" activity. Activity from Maths Circus.*

Day one *1.3*: *Peer tutoring occurring for writers - children calling on their buddy for assistance. Teacher assistance with hand over their hand to guide save and print.*

Day two *1.1*: *Discussed fax and its uses. Children independently drafting text on to our class fax header. Faxes designed to go to parents. Those children with parents who had access to a fax (over half of the class) sent faxes but with teacher help. Pairs reading interactive books. One child writing own story. "Thinking Things" and activity from Maths Circus.*

Day two *1.3*: *"Wooo - this is cool." Importance of writing for a reason and that their writing must make sense so that the person who gets their fax will know what they are saying or what they want. Learned that the fax is just a telephone call with paper.*

Day three *1.1*: *Another fax written by all children on to our header and sent off to another address with teacher guidance. One child independently drafting own story. "Thinking Things" and "Maths Circus" in pairs for 10 minutes.*

Day three *1.3*: *General excitement as the children begin to receive faxed responses to their faxes. Increased number now able to independently send faxes.*

Day four *1.1*: *Two children independently drafting own story. "Thinking Things" and "Maths Circus" in pairs for 10 minute sessions.*

Day four *1.3*: *Nil entered.*

Day five *1.1*: *"Thinking Things", "Maths Circus" and an interactive book "Green Eggs and Ham".*

Day five *1.3*: *Nil entered.*

Class T

Day one *1.1*: *Students worked individually (with assistance from computer buddies where required) entering word processed draft stories in ClarisWorks on the computer and going through the save to disk/print/close word processing steps. Students played "Maths Circus" games related to number and geometry.*

Day one *1.3*: *I have recently noted an increased independence in the learners specifically with regards to the word processing goals of saving work to a disk, printing work and quitting applications. The times learners require a 'computer buddy' is decreasing. Now more than half of the class are able to work fairly independently on the computer versus only four to six students last term.*

Day two *1.1*: *Students worked individually (with assistance from computer buddies where required) creating ClarisDraw pictures with accompanying text. Students accessed stories from "Living Books" on the computer. Students worked individually (with assistance from computer buddies where required) entering word processed draft stories in Claris Works on the computer and going through the save to disk/print/close word processing steps.*

Day two *1.3*: *I have noticed students are recently more able to 'trouble-shoot' on their own when messages arise on the computer that do not follow the "normal" operating functions. This means they are trying to solve difficulties that come up on their own before they seek help from others or myself. The incidence of me actually going over to the computer is rare now. Today, as before, students reminded me about computer turns... they are now very on top of the system we have in place and if I forget to start someone on the computer at the beginning of the day or after tea/lunch they harass me until someone gets their turn!! (regardless of my agenda for the day!!)*

Day three *1.1*: *Students worked individually (with assistance from computer buddies where required) entering word processed draft stories in ClarisWorks on the computer and going through the save to disk/print/close word processing steps. Students revisited emails and faxes sent and saved in our books of emails and faxes.*

Day three *1.3*: *I am finding that students are retaining information about the layout of faxes and emails since they are constantly revisiting emails and faxes we have sent and others have sent us in our book. With daily "postings" from others that I put on the board (emails and faxes we have sent or received which I print out) they are now able to identify which has been sent (fax, email or regular letter), where to locate the email address or fax address on the communication and they are recognising important components of these forms of technology (that is, all email addresses include the "@" symbol, all faxes contain an address section and the main body...).*

Day four *1.1*: *Students worked individually (with assistance from computer buddies where required) entering word processed draft stories in ClarisWorks on the computer and going through the save to disk/print/close word processing steps. Students accessed stories from "Living Books" on the computer. Students drafted Christmas messages to their family on the computer using the ClarisWorks template. Students browsed "The Way it Works" program for information about water in relation to a Magic School Bus book we are reading.*

Day four *1.3*: *Since the last time students explored "The Way Things Work" program (last term) they have become more independent using the program. They are able to explore more areas of the screen and get back to previous areas with less assistance. Again, they demonstrate much more confidence 'trouble-shooting' difficulties and they don't require any assistance with opening/quitting the program which they did require the last time we used the program on CD.*

Day five *1.1*: *Students worked individually (with assistance from computer buddies where required) creating ClarisDraw pictures with accompanying text. Students accessed stories from "Living Books" on the computer. Students drafted and sent an email to Miss K in response to the email we read today that she sent to the staff via school email.*

Day five *1.3*: *Some students are now able to use text boxes in their Claris drawings without seeking assistance. Many have also discovered how to use a range of tools simply through experimentation... different ways to make shapes, manipulate lines etc. Today some students were able to create their own cartoons with speech bubbles simply by looking at examples of other students' work and asking them for assistance when they had queries.*

Class Y

Day one *1.1*:

a) Editing/revising of menus using the paint/draw tools. Pupils worked in pairs.

b) *An individual pupil accessed the email to read the day sheet to the class.*
c) *Whole class viewing of recorded television advertisements. Focus-logo and slogan.*
d) *Designated monitor to answer incoming telephone calls/make calls for the day.*

Day one *1.3*:
a) *Students learnt to revise/edit text, use the paint and draw tools and save work in a class folder.*
b) *Receive email messages independently.*
c) *Pupils were able to list/describe some characteristics of effective slogans and logos.*
d) *Pupils were able to relay/convey messages accurately and appropriately.*

Day two *1.1*:
a) *Editing/revising of menus using the paint/draw tools. Pupils worked in pairs.*
b) *An individual pupil accessed the email to read the day sheet to the class.*
c) *Designated monitor to answer incoming telephone calls/make calls for the day.*
d) *Space research using the Internet . Groups of three.*
e) *Viewing/reading/listening to "Living Book" C.D. Individual (D)*

Day two *1.3*:
a) *Students learnt to revise/edit text, use the paint and draw tools and save work in a class folder.*
b) *Receive email messages independently.*
c) *Pupils were able to relay/convey messages accurately and appropriately.*
d) *Pupils were able to identify, retrieve and record information from a non-fiction text.*
e) *D was able to discuss the visual aspects of a given text. He displayed reasonable literal comprehension.*

Day three *1.1*:
a) *Editing/revising of menus using the paint/draw tools. Pupils worked in pairs.*
b) *An individual pupil accessed the email to read the day sheet to the class.*
c) *Designated monitor to answer incoming telephone calls/make calls for the day.*
d) *Viewing/reading/listening to 'Living Book'/C.D. Individual (D)*
e) *Whole class listening to recorded radio advertisements.*

Day three *1.3*:
a) *Students learnt to revise/edit text, use the paint and draw tools and save work in a class folder.*
b) *Receive email messages independently.*
c) *D was able to discuss the visual aspects of a given text. He displayed reasonable literal comprehension.*
d) *Pupils were able to list some characteristics of a radio advertisement and then compare with a television advertisement.*

Day four *1.1*:

a) *Editing/revising of menus using the paint/draw tools. Pupils worked in pairs.*
b) *An individual pupil accessed the email to read the day sheet to the class.*
c) *Designated monitor to answer incoming telephone calls/make calls for the day.*
d) *Space research using the Internet . Groups of three.*
e) *Tape-assisted reading.*

Day four *1.3*:

a) *Students learnt to revise/edit text, use the paint and draw tools and save work in a class folder.*
b) *Receive email messages independently.*
c) *Pupils were able to relay/convey messages accurately and appropriately.*
d) *Pupils were able to identify, retrieve and record information from a non-fiction text.*
e) *Once two pupils had listened to the same tape, they drew up three content questions and tested each other. If an individual experienced difficulties, allowed to listen to the tape once more.*

Day five *1.1*:

a) *Publishing of menus. All publication was undertaken on one day as this obviated the need to change between black/white and colour cartridges. Pupils worked in pairs.*
b) *An individual pupil accessed the email to read the day sheet to the class.*
c) *Designated monitor to answer incoming telephone calls/make calls for the day.*
d) *Videoing an advertisement made up by pupils. Groups of five. Not very successful. Just one group had a go.*
e) *Dispatching a teacher-compiled fax. Two children.*

Day five *1.3*:

a) *Students learnt to print using the colour cartridge. They realised that the background had to be lighter otherwise the quality of the presentation would be compromised.*
b) *Receive email messages independently.*
c) *Pupils were able to relay/convey messages accurately and appropriately.*
d) *Not enough done to measure learning but at least the mysticism of making advertisements was dispelled. A handful of pupils became familiar with some of the operations of a video camera.*
e) *Fax print out indicated okay. I received a response to my fax.*

Class Q

Day one *1.1*: *Children independently draft, edit email to pen pals in America (five children today). A group of three children drafted their fax to Council about recycling.*

Day one *1.3*: *Consolidation on writing and editing process. Children indicating a clear preference for email over fax.*

Day two *1.1*: *Children independently corrected errors and sent email, new group of five*

started their drafts. Children headed up their fax forms and copied letter to form.

Day two *1.3*: *The group doing faxing learnt how to locate fax sheet and enter details.*

Day three *1.1*: *Emailing - learning the processes involved.*

Day three *1.3*: *New children to class learnt how to email.*

Day four *1.1*: *Emailing.*

Day four *1.3*: *Consolidation on writing and editing process.*

Day five *1.1*: *Creating Christmas cards.*

Day five *1.3*: *Where to locate a template for a card and using the draw program.*

Class J

Day one *1.1*: *The push is on to complete level three of our ICT certificates. Today we spent time writing and sending faxes and searching the Web independently for information on schools nationally and internationally. Students are also following a roster and emailing Canada daily with questions about the school system there.*

Day one *1.3*: *Today was significant for many students as they consolidated their faxing skills. They went through all the steps of faxing by themselves. Many were pleased to receive faxes in return. Also, they were excited to share the information they had found independently on the Internet.*

Day two *1.1*: *Each student drafted his/her alliteration poems on to the computer. The poems were edited, errors were fixed and they printed off their good copies for their individual files. They continued emailing to Canada.*

Day two *1.3*: *Many students had difficulty correcting their errors and saving after their work had been edited. The "expert" of the day worked with them, teaching them how to make corrections and I think that students who previously had difficulty correcting their work have now cracked the code and will be able to do it independently.*

Day three *1.1*: *Students continued emailing Canada with their questions about schools internationally and the roster continued for word processing of poems.*
Day three *1.3*: *Same as day two.*

Day four *1.1*: *Students have continued with their work from the previous days. Many students have begun receiving email responses from Canada. Some students received the messages independently and others with assistance, depending on their personal level. The messages were printed off and shared with the class. Students designed a booklet to*

save the messages for later use.

Day four *1.3*: *Discussion that occurred as a result of the email from Canada was excellent. Students are contrasting and comparing New Zealand schools with Canadian schools, and talking directly to Canadian students via email has really broadened their perspectives.*

Day five *1.1*: *Activities continue according to class roster. Emailing internationally and typing and publishing of alliteration poems. We also had a class lesson on cutting and pasting of graphics into our alliteration work and students worked in groups to practise this skill.*

Day five *1.3*: *Successful email retrievals and sharing. Students were pleased with their independent cutting and pasting of graphics and worked cooperatively to train one another on this new skill.*

These diary entries illustrate a variety of activities and significant ICT learning behaviours. There are also clear contrasts between diary styles and content.

6.3 Assessment of Student Learning

(iii) How does the school assess ICT student learning outcomes?

This section seeks to determine how Central School assesses specific ICT learning outcomes, as opposed to broader-based learning with ICT. It might seem strange that a school that places the emphasis it does on teaching and learning with ICT does not assess this broader-based learning with ICT. The reason for this is that assessment and evaluation of learning is concerned with the content and processes of student achievement, rather than with examination of the tools or modalities being used. But in any case, the fact is that Central School cannot point to any data that conclusively shows that learning with ICT has made a discernible difference to learning across the curriculum, for example, in reading or mathematics.

Central School staff can, however, describe situations in which ICT has helped motivate students to become engaged in learning, including some instances where the student would not otherwise have participated in learning at all. Staff can also identify differences in writing content quality and quantity when a word processor has been used. Furthermore, staff can identify situations where students have demonstrated greater cooperation in an ICT problem-solving setting than in other situations. It is difficult, however, to completely isolate the contribution of successful learning using ICT in various learning areas from other contributing factors in the everyday learning environment. Three teachers offer their thoughts on this point:

"I feel sure that for some children in my class, the computer is really important in helping them to achieve. I see the same children in different situations and then I see the difference with them when they are on the computer. It isn't the same with all children, but I know there is a difference." Teacher P

"Does ICT make a difference to my children's reading? I am not sure, well no I am ... I think. I know they all enjoy reading the interactive books, I know they find rereading their stories on the computer easier, I know they do quite a bit of incidental reading on the computer. I know they are motivated when reading on the computer. It all helps their reading development. The thing is we could do all sorts of tests and take away the computer learning from some children and try to measure differences ... even then how could you be sure that what was changed made a difference? I am sure that the computer helps their total reading achievement and for some of my children, it really turns the lights on!" Teacher E

"You ask me if ICT makes a difference to a child's reading or progress with maths? I believe it does because I see things happen in the daily situations of our classrooms. Can we assess that? No, and I don't believe we should. The whole assessment thing is becoming a real worry ... I mean do I have count the number of beats of a Monarch's wings and the duration of its flight to know how beautiful it is and how well it flies - does bright sunlight make it more beautiful or help it fly better? I simply don't care." Teacher A

What Central School claims is that it can assess ICT student learning outcomes, and that students who achieve those outcomes will be better placed to apply their abilities with ICT over more areas of endeavour. Furthermore, the emphasis Central School places on documentation of ICT teaching and learning practices - the Information and Communication Technology Education Plan; the Charter and the compulsory nature of teaching and learning with ICT at the school; the relationship between student learning outcomes and the three ICT certificate goals - shows that the school's approach to teaching and learning with ICT is carefully considered. Central School's strategy charges teachers with planning responsibilities and managing learning activities/experiences with ICT, and there is clear evidence that teachers are accepting these responsibilities.

There is also clear evidence that both teachers and students understand *what* they are doing and *how* they are doing in relation to achieving students' ICT certificate goals. The ICT certificates provide teachers and students with clearly defined goals and a means of measuring student progress in terms of acquisition of ICT skills and learning applications. Furthermore, as the following discussion shows, the process which allows Central School to operate in this way is simple to put into practice.

Achievement of ICT Certificate Goals - Teachers and students are aware of the skills they need to acquire in a range of areas, for example, word processing, general computer (Word Processing certificate); telephones, facsimiles, email, the World Wide Web (Telecommunication certificate); databases, spreadsheets, CD references and, most importantly, information processing (Information Processing certificate). Having acquired the necessary skills for any one of the areas above, students are required to demonstrate those skills in a meaningful application.

All of the skills are outlined in columns of four graduated levels of difficulty on the reverse side of the three certificates. Each level has approximately 10 skills to be checked off and only one application to be assessed. Students complete one level and move on to the next. They can complete any skill in any level in any order, but they must complete one level of skills and the related application in full before moving to the next level. Students are awarded one sticker for demonstrating that they have acquired a set of skills at one of four graduated levels, and another sticker for successfully demonstrating an application related to the corresponding set of skills. The stickers are attached to the front of the certificates.

As shown in Table 6.4, all five of the selected teachers were able to demonstrate actual links between the ICT certificates and the learning activities/experiences occurring in their respective classes. As one teacher noted:

> *"I use the certificates, once I had figured them out, because they are so simple. I first thought, "Oh no, here we go," because I figured there would be a whole lot of extra work for me with other paper work stuff. It hasn't happened, the certificates are simple for me and my kids, and the parents know what is going on also. The whole lot is there in one place - I just have to work it into the general programmes."* Teacher H

Who Checks and Assesses - In general, students are responsible for checking off their skills in any area once they believe they have mastered them. However, they are encouraged to undergo peer assessment prior to claiming that they have mastered all the skills in any one area. As a general rule, more able students tutor and peer assess other students. This is particularly evident in the junior school, where older students from senior classes provide the necessary tutoring and checking off of skills.

Students present their ICT certificates to teachers when they believe they have mastered the prescribed set of skills in an area. The teacher may select one or two skills to be demonstrated or ask a senior student who has passed that set of skills to check the other student. The classroom teacher is responsible for carrying out or facilitating the teaching or assessing of skills. His/her job is to oversee and manage the process, to keep all students active in working towards the completion of sets of skills.

As noted previously, on successful completion of a set of skills, students are awarded the corresponding sticker to be placed on the front of their certificate. At this point, the teacher needs to clarify the application requirements with the student or groups of students so that they can demonstrate their ability in a meaningful learning context. For example, students may have learned the skills of designing a template, setting out and arranging text, entering and editing text, or shifting blocks of text. Having mastered these skills, they may then be asked to demonstrate the skills in the application of producing a group or class newspaper.

The teacher must assess each student in terms of his/her successful completion of all applications. The associate principal with responsibility in ICT monitors progress and achievement through the examination of class sets of student certificates. The same individual also views all filed student work and communicates with all children in relation to ICT. In this research, these roles of the associate principal with responsibility in ICT were often identified by staff members as major factors in the successful implementation of teaching and learning with ICT at Central School.

Additional formative assessment occurs in an incidental manner. While this type of assessment is not necessarily planned, it is an important means for teachers to note particular issues, barriers or significant achievements in the teaching and learning with ICT area. This type of formative assessment helps to inform teachers' future actions and is generally not recorded. Examples of this type of assessment are noted in the preceding section (see section 6.1, Part Two).

Central School acknowledges the difficulties associated with assessment of learning across the curriculum with ICT. However, staff at the school have demonstrated that they are able to assess specific ICT student learning outcomes. This means that staff can monitor individual achievement against a set of agreed school-wide outcomes for ICT learning.

6.4 Evaluation of Teaching and Learning

(iv) What evaluation of teaching and learning with ICT is carried out?

Is the work Central School is doing in ICT making a difference? Is Central School achieving what it set out to do with ICT? It is important, in the process of evaluation, that schools regularly ask themselves such questions and remind themselves of their aims. In a general sense, schools aim to educate students, to bring about changes in their behaviour through the acquisition of skills, attitudes and knowledge which students can in turn apply in their lives. But in a more specific sense, schools need to consider exactly *why* they are seeking to implement teaching and learning in a given area. Furthermore, given the continued paucity of specific national direction in teaching and learning with ICT, schools have been forced to answer this question on their own.

Central School has done just that, and has also formulated its own set of ICT learning goals. This information was presented in Chapter Five, section 5.2.2, The Information and Communication Technology Education Plan. For readers' convenience elements from this section that relate, in general terms, to the section on evaluation of teaching and learning with ICT are presented again below.

Learning Needs

There is an established and lifelong need for ICT in our society. ICT is considered essential vehicles for learning, enabling those of us with access and a range of skills to explore and expand our understanding of our world. It is the responsibility of our school to translate this assumption into reality.

Goals

- To develop independent learners who are at ease with and can apply the tools of ICT.
- To encourage learning through ICT as an enjoyable and successful experience.
- To provide appropriate sequential skill development integrated within our curriculum through selected applications.
- To emphasise that ICT is a range of vehicles to enable learning.
- To teach the skills and strategies that will encourage all learners to take responsibility for further application of their knowledge and understanding.
- To provide an integrated curriculum in ICT that will be easily interpreted and applied by children and teachers.
- To directly relate the curriculum in ICT to the National Statements and Essential Skills.
- To monitor progress, including self-monitoring, based on individual needs.
- To easily assess, evaluate and report to parents in a meaningful manner.

It is evident, on the basis of the findings reported in Chapter Five and in the current chapter, that Central School is meeting a number of the above goals. While most of the goals are of a general nature, some relate directly to teaching and learning with ICT (and thus go further than any national directives). What, then, are the processes used at Central School to identify successes (or failures) and to facilitate further development of staff and students in teaching and learning with ICT?

Monitoring, Assessment and Data Gathering - As noted in section 6.3, teachers and students keep individualised records of learning related to a set of skills and applications for ICT on the reverse side of the three ICT certificates. Part of the role of the associate principal with responsibility for the coordination of ICT is to monitor these certificates and assist in the moderation, throughout the school, of the certificate content. As part of the monitoring process, a summary of the certificate data for each class is prepared. This data is then entered into graphs which display the performances of

individual classes, different year groups, male or females, different ethnic groups or any combination of these criteria (see Appendix 27).

Three teachers' views on the usefulness of graphic presentation of this data are presented below:

> *"The graphs are interesting and informative, without getting into a whole lot of reading. I know how my class is going at a glance and I can compare it to other classes in my year group as well as other year groups. I was really pleased to see how well my guys were going."* Teacher N

> *"The graphs have only been recently developed this year. They present the actual situation and the information shows some neat things and it also shows some areas where we need to work a whole lot harder. For such a simple tool, it provides a huge amount of information to share and act on."* Teacher A

> *"The graphed information is really important. We just have to know if we are getting anywhere. Teachers need to know, even if some of us are a little uncomfortable with the results. It is also important for senior management to consider where support could be provided. It is also important for the Board and the parents."* Teacher B

> *"One or two teachers were annoyed at having to provide more information. I can understand their concern but we have invested so heavily into ICT in a number of ways. The record keeping for ICT is so minimal and this information can be so valuable."* Teacher A

In addition, as discussed in Chapter Five, Central School has an active ICT team (see Appendices 9, 10 and 11). One of its tasks is to assist in the monitoring of teaching and learning with ICT so that the needs of staff and students can be met with targeted professional development.

Performance Management System/Professional Standards - Central School has conducted a number of ICT reviews on topics ranging from equipment access to available space for additional work stations. In addition, other school-wide reviews of identified and agreed elements in teaching and learning with ICT are conducted through the school's PMS (see Appendices 19 and 20). This process is concerned primarily with school-wide and individual teacher development based on elements selected by management and/or negotiated with all teaching staff. The PMS process is not an accountability appraisal of teaching and learning taking place; this occurs as part of a Professional Standards review (see below).

From the beginning of 1999, all state primary schools in New Zealand were required to conduct formal appraisals of individual teachers, associate/assistant/deputy principals and principals according to a set of national Professional Standards. The latter include a core set of performance dimensions. However, schools were encouraged to develop their own performance indicators related to each of the performance dimensions, and Central School has done so specifically in relation to teaching and learning with ICT. The purpose of the Professional Standards is to ensure that all qualified teaching staff have met required standards of performance as determined by a process of attestation. The following is an excerpt from Central School's required Professional Standards in relation to ICT for an experienced teacher:

Excerpt form Central School's Required Professional Standards relating to ICT

Performance Dimension	**Performance Indicator**
Use of resources and technology	Gathers appropriate resources, suggests and includes information and communication technologies to enable learning experiences to develop. Leads and demonstrates successful student learning with ICT based on the school's ICT Education Plan.

In-Class Support - Ongoing monitoring and observation of all classes is an important dimension of all three associate principals' performance agreements. In addition, however, one of the major performance agreement areas for the associate principal with responsibility for the coordination of teaching and learning with ICT throughout the school is provision of in-class support in ICT (see box below). This primarily involves provision of coaching support for teachers in the classroom, with the focus in 1999 being on information processing.

Excerpt from ICT Coordinating Associate Principal's Performance Agreement

Coordination of and delivery of an information processing support programme to provide: professional development on specific models of learning; teacher planning support; in-class modelling and coaching; in-class teaching support; organisation of and sharing of associated resources; ongoing review.

Staff Sharing - The staff reserves two professional development meetings during the year for sharing of teacher-student ICT teaching and learning experiences. A variety of ideas are presented at these meetings for other teachers to borrow, build on or consider. These sessions are informal and appear to be enjoyed by all staff (see Chapter Five, section 5.3.4, Table 5.4). As one teacher commented:

> *"I always enjoy the sharing sessions at staff meeting in all areas. It is one of the best places for professional development - and we have a lot of laughs as well."* Teacher L

Student Profiles - All students at Central School contribute to their individual record folder that includes a range of summative assessment information, report copies and work samples. As part of their collection of written work, students were previously required to submit a set number of word processed pieces for these folders. This sample afforded teachers and parents the opportunity to evaluate individual development and class/year level/school-wide trends. However, after two years of operation, staff agreed that this system did not adequately demonstrate the range of ICT work students were capable of and producing. Accordingly, each student is now developing his/her own ICT clear file portfolio which records their draft, planning, published, creative and design work, and stores their ICT certificates.

New Staff Induction and Ongoing Support - One of a number of vital roles carried out by the Central School ICT team is the induction of and provision of ongoing support for new staff members. Central School does not seek to recruit staff already proficient in teaching and learning with ICT. If new staff have the required professional abilities in the area, that is considered a bonus. If not, the only criterion Central School insists on is enthusiasm to learn. As one teacher has commented:

> *"Dependent upon the number of staff, time is allocated to group or 'one-on-one' support focusing on developing an understanding of the approach we apply here as identified in our education plan. Specific support is offered in the areas of upskilling, programme organisation, management and development as well as the certificate programme. We try to ensure they have a fairly good understanding of the core elements of our programme and support in getting them up and going. This is addressed by the ICT team; support comes from the liaison team member/s, the ICT coordinator and other teachers working within the area."* Teacher A

6.5 Reporting of Teaching and Learning

(v) *How are ICT student learning outcomes reported within the school and to parents/care givers?*

Reporting within the school takes the form of a general report and a specific report. Reporting to parents is carried out through the ICT certificates, a possible biannual report comment, and during parent/teacher conferences.

General Reporting to Board and Staff - This is carried out by way of monthly updates to the Board of Trustees and staff concerning ICT work conducted or planned throughout the school. This reports are prepared by the ICT team and in particular by the associate principal with responsibility for the coordination of ICT (see Appendices 25 and 26).

These reports can include information on new equipment or software, staff professional development options, classroom innovations, student achievements and technical support issues. These monthly reports serve a number of purposes, as one teacher notes:

> *"It is important that staff and the Board of Trustees are kept up to date with the things that are happening around our school [in ICT]. I want them to know what we are doing and what is possible, what we are working on and what we can help with. Often it is just a way of sharing success. I also need the Board to be aware of how we are doing so that when we need funding or policy support, they are 'up with the play' and can keep up the assistance they have already provided. ICT soaks up so much of our funds - the very least we can do is demonstrate where it goes to and how well it is or isn't used."* Teacher A

Specific Reporting to Board and Staff - This reporting is based on the student learning outcomes as noted on the school's three ICT certificates. Reference has already been made to the recent innovation (refer section 6.4, Monitoring, Assessment and Data Gathering) which allows staff to view graphically aspects of their students' achievements (see Appendix 27).

The Board of Trustees also receives this information biannually in the form of a summary of each year level at the school. This enables the Board to keep abreast of general progress in this area. It is intended that this data will be kept over successive years so that ongoing developments at respective year levels can be identified and reviewed.

Reporting to Parents and Care Givers - Central School parents have always been encouraged to contact their child's teacher at different times throughout the school year in order to discuss their child's progress and achievement in any area. However, an informal survey of all teaching staff revealed that prior to the development of the ICT

certificates, no instances of parents specifically asking teachers about students' learning with ICT could be recollected. Thus, the introduction of ICT certificates was accompanied by general agreement that parents should become more informed about their child's progress in learning with ICT.

Central School reports formally to parents and care givers four times every year. Two of the reports are presented in writing in terms two and four. The other two reports are presented in discussion at organised conferences in terms one and three.

Written Reports: These reports may include reference to learning with ICT. Of greater significance is the inclusion of a photocopy of the relevant ICT certificates. The reverse side of the certificates shows parents and care givers how much progress in this area their child has made, or 'how their child is travelling in his/her ICT journey'.

Conference Reports: The conferences provide an opportunity for parents, sometimes with the student present, to discuss with the teacher issues relating to their child's progress and achievement. It is a time when the partnership between home and school is emphasised and developed. Even here, however, parents and care givers tend not to ask about ICT-related learning. But they do have the opportunity to look through their child's individual folder, as well as his/her ICT clear file portfolio, which includes the child's ICT certificates and supporting work samples. Responses to this reporting format are usually very good. For example:

> *"It is not uncommon for my parents to say how good it is to look through the 'official records' and in particular to look at their child's 'best work'. They also make comment on how pleased they are that our school pushes computers and how the certificates give them a clear idea of what is going on. Some ask if we could do the same in other subjects and a couple asked if they could 'do the certificates'. It sure makes it easy for me to show where my kids are."* Teacher U

Having taken pains to develop an integrated process for teaching and learning with ICT which is then implemented across the school, the staff at Central School have committed themselves to ensuring that the Board of Trustees and, in particular, the parents are informed about what their children are doing. The data presented in Chapter Five relating to parent questionnaires reinforces the school's claim that it has kept all members of the learning community informed and involved in teaching and learning with ICT.

6.6 Summary

The information presented in this chapter provides clear evidence that teachers at Central School are planning for teaching and learning with ICT. Indeed, all teachers were found to be incorporating ICT into both their long term and daily planning. This planning was clearly linked to achievement of ICT certificate goals and the intentions of the school ICT Education Plan. Another particularly significant finding was that teachers were referring to teaching and learning with ICT in a variety of curriculum long term plans as opposed to simply planning for and teaching ICT *per se*. This shows that teachers at Central School have accepted ICT as a vehicle for teaching and learning across the curriculum; it is just part of the 'way they do things' there.

The In-Class Observations (all classes) and Teacher Diaries (selected classes) provided evidence of a wealth of engaged activity by students throughout the school. Without such data, it would not be possible to show (or claim) that actual teaching and learning with ICT was taking place at the school. While there were variations in activities and obvious contrasts in emphasis amongst teachers, the evidence arising from the specific research tools employed, and from informal classroom visits by the researcher over a period of 18 months, revealed consistent and substantial learner-engaged activity and experiences with ICT. The data presented in this chapter supports that presented in Chapter Five. Not only is there a strong belief at Central School that teaching and learning with ICT is taking place in classes and across the school, there is also clear evidence to substantiate this belief.

All assessment is aimed at a) informing and improving further teaching and learning, and b) monitoring and reporting on student achievement. Central School has instituted processes which allow it to take aim at, measure progress towards, and achieve its own set of ICT student learning outcomes. Furthermore, it is apparent that a significant amount of what the school achieves in teaching and learning with ICT is based on what the school wants its students to achieve; it is not determined by an accidental or piecemeal approach, it is not governed by the amount of hardware available, and it is not a function of non-stop teacher development. In addition, the variety of formal and informal evaluative processes utilised by Central School staff facilitate an evolution of teaching and learning with ICT.

Central School has demonstrated how it reports on ICT learning to the Board of Trustees and to parents in written and conference modalities. Data presented in Chapter Five shows how parents clearly appreciate being kept informed of what is happening for their child in class and throughout the school. There is, however, an indication that some parents do not feel as informed as others. This is a potential problem that Central School needs to be more aware of and prepared to take further action to rectify if possible.

The information presented in this chapter follows on logically from the description of Central School's intentions presented in Chapter Five. Taken together, Chapters Five

and Six uncover a clear trail of teacher planning, teacher and student activities/experiences, assessment, evaluation and reporting of ICT, largely based on a school-wide set of agreed ICT student learning outcomes. But most importantly, and not unlike the teaching of reading methodology used in most New Zealand schools, the model of teaching and learning with ICT at Central School is student-based.

Chapter Seven

Stage Three

7.0 Introduction

This chapter presents the findings of Stage Three of the research (see Chapter Four, section 4.3.4). The five selected teachers and the members of the Research Review Group were presented with edited copies of Chapters Five and Six. These individuals were then asked to review these chapters and respond to a summary questionnaire (*Su.Q.*, see Appendix 21).

The responses of the above-mentioned individuals are presented as a means of validating interpretations and observations made by the researcher concerning the implementation and practices of teaching and learning with ICT at Central School. Commentary on the responses of the five selected teachers and the Research Review Group is also provided by the researcher. Finally, the salient points of a follow-up discussion involving the researcher, the five selected teachers, and the members of the Research Review Group are presented in section 7.4.

The response from the researcher at the completion of each section is limited. This is because the comments made by the respondents largely stand by themselves. As expected in any case study situation, a range of perspectives has been put forward and no effort has been made to modify the responses. The 'real story' has thus been told. Where comments have been made by the researcher, the aim has been only to add to responses or clarify any possible confusion. All comments made by the researcher were included in the follow-up discussion reported in section 7.4 of this chapter.

7.1 Implementation of ICT - Positive and Negative Factors

(i) *What factors or characteristics within the influence of the school do the selected teacher research participants and the Research Review Group believe assist or detract from implementation of teaching and learning with ICT at Central School?*

This question was aimed at identifying the positive and negative influences on implementation of teaching and learning with ICT at Central School. The respondents were able to reflect upon the content of Chapters Five and Six then single out any pertinent issues. They were also able to reflect upon their personal experiences as participants in the processes of change that had taken place at Central School over the previous five years.

Given the open invitation to respondents to comment freely, and the assurance that their comments would form the substance of this chapter, it was anticipated that a wide variation of frank responses would ensue. The researcher contends that these responses will help readers identify the positive influences - and the pitfalls - relating to the implementation of teaching and learning with ICT at Central School.

Respondents were not required to comply with any specific response formats. As a consequence, there is some variation in the style of responses. Nevertheless, the respective responses in each case should be clear to the reader.

Teacher A

Influences assisting in the implementation of teaching and learning:

- *The right people to drive and support the teaching and learning processes for children.*
- *Compulsory component.*
- *Implementation of the certificate programme - identifying skills and related applications.*
- *Children generally knowing what it is they are doing and why.*
- *Having a coordinated school-wide process.*
- *Teachers receiving direct support in the teaching and learning processes.*
- *Impact in assisting with motivation to be engaged in learning.*
- *School-based documentation binding our school's approach to teaching and learning with ICT.*
- *Noted incidence of improvements in the quantity and quality of writing when using a word processor.*
- *Evidenced increases in cooperation during problem-solving exercises while working on the computer.*
- *In-class support programme targeting specific objectives with specific staff.*
- *Provision of resources/facilities to encourage further development - Information Centre, work stations - ensuring the environments within these areas are motivating and inviting, creating an atmosphere that children and teachers want to work in.*
- *The support of an ICT team to assist when planning, teaching and dealing with technical issues.*
- *The provision of in-house professional development tailored to the identified goals and needs.*
- *Lead coordinators working with staff to maintain focus and momentum - without this, things can slip.*
- *Having good management and organisational systems in place to allow for effective/ valuable use of resources. If these are not in place the likelihood of much happening on an ongoing, managed basis for all children in the class is diminished.*

Influences detracting from the implementation of teaching and learning:

- *Initial difficulty for a small number of staff to cope well with change, resulting in resistance and stress.*
- *Initial concerns as to whether there would be additional planning and paperwork.*
- *Technical issues ... if something goes wrong it needs to be addressed immediately, if not it allows for avoidance or frustration due to lack of access as part of a planned teaching sequence.*
- *Initial lack of exemplars providing quality examples of work at each level of the certificate programme and indicators as to targets to achieve with each year level (development of these well underway).*

Teacher B

Positive

- *Compulsory aspect, whole school change in one hit.*
- *Student learning outcomes identified. Guesswork is removed.*
- *Provision for support across all levels of the school as well as catering for levels of teacher ability.*
- *Clear direction, nothing left to chance.*
- *Provision of support for students, e.g. tutors trained in particular aspects.*
- *Visibility of ICT - in classrooms, community awareness, Board level*
- *ICT stated in charter as a local curriculum goal.*
- *Education Plan formulated - gives ICT status at the same level or above as other curriculum areas.*
- *A range of documentation as well as the ICT Education Plan, e.g. policies, school development plan.*
- *School-wide focus as a component of Performance Management System.*
- *Reporting to parents/caregivers.*

Negative

- *Compulsory aspect, whole school change, reluctant teachers and minimum requirements.*
- *Do teachers really know 'the why'? Or does the fact that ICT is compulsory mean that they only know 'the what' and 'the how'? If access to classroom computers was removed for a period of time would there be heartfelt relief? If ICT became non-compulsory, would all of our teachers have sufficient belief in the benefits that they would still continue with the current focus?*

Teacher L

The computers breaking down and not being able to complete things is a definite distraction! Children wanting to print and the printers not working, or not being able to access the server to solve problems, is frustrating when programs are still running and

things are not getting completed on time. When things are working and there are no problems, ICT is great, motivation is high and enthusiasm unlimited!

The certificates provide a great tracking record for the children to follow. They are simple and not too time-consuming to fill in, even at the junior level. Using buddy classes is not always easy or a viable option (depending on the age level or availability of the children to do the ongoing assessment) but as the year progresses children buddying up in the class makes the task of updating the certificates easier. Also, reading the cards/expectations to the children and understanding the tasks often takes more time than actually assessing the children's abilities.

I found that being a member of the ICT team was a big commitment, greater than being on other 'curriculum teams'. There were more meetings to attend, staff courses to prepare, greater responsibilities towards equipment, staff etc. With meetings, duties and classroom programmes to organise as well, it took up a lot of extra time.

Organising and using the equipment, especially time management of the computers in the class, was a difficult task to begin with, especially at the junior level. Children need a lot of teacher guidance and direction initially. Having the extra computers in the blocks has made management of these programs much easier. Also, children are getting more time on the computers and their skill and knowledge are increasing rapidly.

Teacher T

One of the major factors contributing to the implementation of teaching and learning with ICT is highlighted in Chapter Five, Infrastructure, where 'C.2' comments that our school has, "Identified personnel with specific responsibilities" linked to ICT. I think a significant part of our school's success in implementing ICT so broadly across the school relates directly to the fact that a non-teaching person in management has ICT as a major component of her role and responsibilities in the school. This allows her to continually monitor how ICT is being implemented across the curriculum, where staffing needs are, what professional development to offer, which classrooms are achieving successes, which need assistance, focus areas for the ICT team, purchasing needs etc.

I think another strength of this ICT coordinator position is that it allows the school to continually analyse and assess our systems in place across the school and ask: Are they working? The current ICT coordinator has been extremely creative and adaptable and this has enabled the school community to constantly rethink how it is accessing ICT across the curriculum. The environment is one of dynamics, innovation, change and adaptation to that change. Since this is the very nature of 'technology', I feel it has enabled our school to stay abreast of current ideas and approaches in teaching and learning with ICT.

A huge factor in my own successful implementation of ICT across the teaching and learning process directly relates to more experienced 'buddy' teachers who have taken time, informally and formally, to guide me in my own learning. Senior teachers and

other staff who are more comfortable with the various technologies available have incorporated training and planning with ICT into team meeting times... this has been invaluable because it is 'hands on', practical and relevant to the year level you are working at. It also creates the idea of a very active 'learning community' which learns and grows together, supporting each other along the way. It empowered me at a time when I felt very new to the world of ICT in the teaching and learning process and it made me quickly aware that I too have something to offer to others who are less experienced than myself in our learning community.

Perhaps ironically, the 'mandatory' or 'compulsory' nature of many aspects of our ICT Policy and Education Plan has seemed to both assist, yet also detract from, the successful implementation of teaching and learning with ICT. It has assisted because teachers will often not implement changes until they absolutely HAVE to (i.e. feel they are forced to!). However, this compulsory nature can also leave a 'bad taste' in the mouth at times. It tends to create a very high level of stress for less confident and competent teachers and I don't feel this has always been fully acknowledged and accepted by management at times. There have occasionally been initiatives introduced for staff to implement which feel rather beyond the realm of the 'real world' and this has created tensions for some staff. Support has been offered but it hasn't always been enough and for a sufficiently sustained period of time in order to allow staff to fully understand, experiment with, and finally implement the desired changes in teaching and learning with ICT. However, I have to acknowledge that in all cases of change, there is always a 'teething period' which can be difficult. This has certainly been the case for our school as it has moved to a model of teaching and learning with ICT fully integrated as a tool for learning. At the end of the day, for the staff who have remained open to the changes they have been presented with, and for those who have sought out support when they needed it, they have ended up coming out the other end with flying colours and have shown the incredible learning carried out by their students, and themselves, with various ICT tools to assist them.

Finally, I feel our school has been fairly successful in its implementation of teaching and learning with ICT because of the focus which has been put on the whole process of learning with ICT which includes: deciding learning outcomes; engaging in meaningful planning; accessing available and appropriate resources; planning classroom management strategies for successful implementation; carrying out ongoing assessment to guide instruction; utilising peer and group teaching and learning; encouraging collaboration among students, teachers and classes in our learning community; sharing successes and difficulties; and engaging in critical evaluation of systems to ensure effective learning is occurring.

Teacher Y

- *A Board of Trustees and staff that are of a common viewpoint that ICT is an integral part of children's learning.*
- *A planned, systematic implementation of a school-wide ICT programme.*
- *Readily available software/hardware to conduct the appropriate programs.*

- *Updating software/hardware on a regular basis.*
- *Key personnel to upskill teacher knowledge of ICT certificate programmes.*
- *Ongoing professional development covering different time-slots on different days of the week thereby allowing all staff members to upskill their knowledge at times that suit them.*
- *Sharing times at least twice a year - show own skills and learn from what other staff members are doing in their classes.*
- *Pupil tutors to assist their peers and free up teachers to concentrate on other tasks.*
- *Individual certificates - pupils know what skills they are proficient at and what they are aiming for next.*
- *An Information Centre that facilitates ICT teaching/learning programmes.*
- *Using ICT programs in areas across the curriculum.*
- *Highly supportive leadership from the top and throughout management - this has been the most important point for me.*
- *Consistent expectations of everyone involved so that we move as a school together.*

Teacher Q

- *Lack of access to computers.*
- *Sending the children to the Information Centre unsupervised - the children take longer to complete task on hand.*
- *The children rely upon the librarian's help too often.*
- *There is too much to cover when first introduced and [I was] unsure of the processes involved with the certificates.*
- *The children do not all arrive at the same level. Some even have certificates with nothing entered on them even though they have been with the school for some time.*

Teacher J

Central School has excellent leadership, coordination and strong infrastructure which all strongly assist in the teaching and implementation of ICT. Professional development courses for upskilling are crucial as well. I have just completed two information processing courses on spreadsheets and databases and my class has already dabbled with creating a class address book which has helped both students and myself to become familiar with these programs. Professional development for ICT at Central is always low stress. There are many times available for training and I am pleased that it has remained needs-based. I think that staff sharing of their work with ICT is also very beneficial in that it helps to build teacher faith and confidence in our own teaching of ICT and allows us the opportunity to see what else is out there. Lastly, the implementation of new certificates remains a slow and careful process.

We are being trained before the information certificates are introduced and classes have had sessions with ICT leaders to help the children understand the steps of information processing. I believe that our ICT leaders understand the level of stress that can be involved with incorporating another certificate into our programmes and are doing their best to help us 'grow' into the new certificate with as few 'growing pains' as possible.

I found it difficult to think of many issues that make implementing and teaching ICT difficult at our school. Most of my concerns about ICT implementation are beyond the school's control. For instance, I find it frustrating that no time allowance for teaching ICT has been incorporated into the curriculum and that I must try to fit ICT into other programmes. In most cases it is easy to fit ICT into other programmes but sometimes a new skill needs to be introduced and we need a full class focus but there is no time allotted for it. Within the school I think it would be beneficial to make some alterations to our professional development programmes. This year has been overwhelming, with too many professional development focuses. Teachers were becoming frustrated and it's crucial to keep up a positive attitude toward learning and teaching of ICT. This has been mentioned at the last staff meeting so I do feel that some change will be occurring, hopefully in the near future.

Researcher's Comments:

The seven respondents above have identified a variety of factors which positively influence the implementation of teaching and learning with ICT at Central School. Furthermore, a marked degree of concurrence was apparent among the respondents in this respect, and far more than was observed in their identification of negative influences. Examples of concurrence in relation to positive factors include:

• Certificate programme of student learning outcomes	5 respondents
• School-wide focus/development	5 respondents
• Professional development (in-school)	5 respondents
• Buddy teacher/in-class support	4 respondents
• Management/organisation systems/infrastructure	4 respondents
• Leadership	4 respondents
• Focus on people	4 respondents
• Compulsion	3 respondents
• Students supporting students (buddying)	3 respondents

The predominant negative factor may have been change. While only two respondents specifically identified this as a detracting factor, two others identified compulsion, or forced change, as a possible negative influence. Indeed, initiating change may be the major underlying concern for all members of a learning community charged with implementing teaching and learning with ICT throughout their school. This concern need not be peculiar to ICT, of course; change of any kind and in any area can be a concern to some individuals.

One respondent asked whether, if ICT were removed from the school, it would be missed by teachers compelled to include it as part of 'what they do at Central School.' The removal of any learning area from the curriculum would no doubt ease the load of primary school teachers and be welcomed by a number of them accordingly. Fortunately for the students, the teachers do not have this option.

However, the issue of time constraints raised by two respondents is a very reasonable concern. There is no question that the teaching and learning content of the National Curriculum in New Zealand has increased since the inception of the New Zealand Curriculum Framework (Ministry of Education, 1993). Expansion of this programme to include additional elements relating to planning, assessment, evaluation, reporting and systematic appraisal of teachers has further increased the workload of already busy teachers. However, the time available in the school day to accommodate these additional elements has not increased. In essence, the size of the bucket has remained the same while the amount it is required to hold has increased. Naturally, in this situation, something has to 'overflow'.

It is the school's responsibility to provide a balanced curriculum based on the New Zealand Curriculum Framework as well as on any local curriculum goals determined by the school community. But when a school such as Central School adds ICT to the curriculum, either as an integrated subject or one which 'stands alone' in its own right, something else must spill out of the bucket. This is clearly a dilemma for Central School but one which it must work with in order to provide what it considers to be important for its students.

7.2 Implementation of ICT - The Future

(ii) *What suggestions do the selected teacher research participants and the Research Review Group have regarding any future changes or developments related to teaching and learning with ICT at Central School?*

Recognising the dynamic nature of teaching and learning, and in particular the speed of changes related to ICT, the researcher asked staff members involved in teaching and learning with ICT at Central School to speculate on future developments in this area. Their comments are presented below.

Teacher A

- *Further development of the ICT liaison role - further localisation of planning, implementation, assessment, professional development, 'trouble-shooting' support, spreading the strength.*
- *Maintaining certificate focus, extension into other areas, achievement of certificate content at a speedier rate.*
- *Increased upskilling and access to valuable resources and opportunities to communicate through the development of the school Intranet.*
- *Increased availability of hardware when identified as a need - issues of portability, sturdiness, capability and allocation to be considered.*
- *Opportunities to extend the use of our resources - physical spaces and ICT resourcing, e.g. computer clubs.*
- *Streamlining to take advantage of positive and negative aspects of what is currently*

available to make it even more accessible, easier to work with, less likely to cause problems - all resulting in greater reliability.

Teacher B

- *Specific applications of skills included in long term plans - do we really want all our students at level 4 presenting a newspaper? Maybe development of an item bank of applications at the levels across the goals.*
- *As student confidence and competence is increased at lower levels, is there need for a further skill level? goal?*
- *Extension into creativity through the inclusion of simple programming, e.g. Logo/ Control technology, Midi Music.*

Teacher L

Because it is hard to send groups of children at the junior level over to the Information Centre without teacher or adult guidance, this area is underutilised by some classes in the junior school. A full time ICT person who could work with groups as required would be great. Smaller groups are easier to work with and are more ideal for learning than in a whole class situation.

I think it is important to remember that all teachers come into the school with varying backgrounds and expertise in ICT. Perhaps there could be some form of questionnaire for teachers to fill in concerning their knowledge of ICT when they arrive at our school, e.g. can they use ClarisWorks/Draw? Have they used the Web? Do they know where to locate certain equipment in our school?

There is great expectation for teachers in our school to be using ICT proficiently and new teachers often, understandably, don't know where to begin. They sometimes need more 'one-to-one' instruction or small group instruction on using shortcuts around the programs, before being left to trial for themselves. They become aware of ICT available in the school and work towards more detailed knowledge/achievement. Teachers only use ICT when they are confident with it and they need to gain that confidence first, whether it be by visiting other rooms to see programmes running, visiting other schools, or going on courses. There is lots of support at our school. Sometimes I feel courses offered at our school are aimed at the more able of us and that some people attending these courses are not ready to go on with them in their own classes.

I think even more in-school development and sharing of ICT would be good. It would also be good for me to look at other class programmes and organisations, visiting similar schools and attending courses outside school. Getting out and about often refreshes ideas. A lot of great things are happening in our classes but I would also like to see what others are doing.

Teacher T

- *Have more non-classroom time allocated to teachers for their own upskilling in using ICT and to carry out meaningful planning for implementing ICT across the curriculum (i.e. have in-class support, release time, peer teaching).*
- *Focus on only one or two major areas of staff development for the year... it can be incredibly overwhelming having staff meetings and courses on maths one week, phys ed/health the next, ICT the following, spellathons after that, reading intensives the next week and art weeks at the end! It really doesn't allow teachers time to implement meaningful changes and, in fact, it can detract from success since it degrades morale by making teachers feel they are failing.*
- *Continue to have an active, dynamic, motivated ICT team led by an organised and focused ICT coordinator... having representatives from across the school on the team has been a great strength... again, it would be helpful to see some release/non-contact time allocated to a few members of the team so that they could also carry out in-class training and support.*
- *Continue to have a consistency in terms of approach, learning outcomes and expectations... this has helped to create a very unified sense of purpose among staff... for new staff they can quickly see what is "the way we do things around here"... again, I'd like to see greater recognition of just how stressful this can be - coming to grips with the challenges of integrating ICT into a meaningful teaching and learning process - more support is needed for less confident staff.*
- *The commitment to greater technical support from experts - this is the single most frustrating thing as a teacher - having technology, trying to use it, and it doesn't work!*
- *The bottom line for me is mentioned in Chapter Five, Infrastructure (5.3.3): focus on a "coordinated human infrastructure above the 'thirst' for more technically able equipment".... at the end of the day, meaningful learning with ICT doesn't depend on the hardware, it depends on the engagement, expertise and creativity of the people working with the hardware!*

Teacher Y

- *Continued updating of programmes and tools which enable new skills to be taught.*
- *The possibility of having more than one computer per class (in addition to the pod of three in each block). From a personal point of view, it gives me greater control of learning and discipline.*
- *Ease of access to the Internet. At times this becomes difficult because the computers in our work station area are being used by the rest of the school as well as the year 5 team. Having said that, the situation may be eased by the proposed introduction of the Living Library and the Intranet.*
- *Continued emphasis on quality in-school professional development.*

Teacher Q

- *More than one computer in the classroom - one for word processing, the other for information retrieval.*

- *Computer fax capability.*
- *Keyboard skills program as our children tend to two-finger type when they should be touch typing.*
- *Improved memory capability as our computers are too slow with the work being done and expected at year 5 and 6 levels.*
- *Chairs need footstools for health and safety purposes (children need to know all correct safety practices).*
- *If each teacher had permanent access to a laptop that works - it could be used by the children in class.*
- *It would be good if all the staff knew what direction ICT was going in the next two years.*

Teacher J

I think a full time computer technician will some day become part of our school's daily functioning. With the networking and number of computers running (often with children moving things in and out of files) there are bound to be numerous difficulties. Things need to be fixed quickly when a problem occurs so that daily learning doesn't come to a standstill.

I also envisage more student leadership as older students master the Word Processing and ICT certificates. It would be excellent for students to consolidate their skills by buddying up with younger classes and either tutoring or having buddy class sharing of work that has been completed. Particularly with a school of our size, it would be great for children to meet with each other via technology.

More computer access will also be necessary in the future. The computer work stations that have been introduced this year are fantastic. In fact, I don't know how we ever managed without them. But, with three separate certificates running concurrently and close to 100 children using less than 10 computers I believe completion of certificates is going to be difficult. I find that my word processing program runs incredibly smoothly as we share time daily with the other classes in our area, but I must admit that it is difficult to ensure that all children are having opportunities to increase their skills in the areas of ICT, particularly research activities where they would be using the World Wide Web. I know that actual computer 'labs' are looked at somewhat negatively here but I think that labs can be incredibly beneficial, especially when teaching something like a database where all students need to get 'hands on' experience immediately in order for their new learning to be effective. I believe having 15-20 computers running in the same room would be extremely beneficial for our students and that the room would be booked constantly. It would probably be necessary to have a part time ICT teacher to go with it!

Researcher's Comments:

Many readers will be able to readily identify and empathise with the wide range of suggestions presented in this section. Some comments concern ICT-related practices and processes at Central School, others to ICT in general. For the most part, however, the

respondents have looked at where ICT has been and is today, and their conjecture is invariably focused on further fine tuning of the ICT *status quo* at Central School. And yet, the one issue that should be alarmingly apparent to all is that teaching and learning with ICT as everyone currently knows it will change dramatically in the future.

Another point to note is that most of the respondents' comments allude to changes which could further improve the conditions for teaching and learning with ICT at Central School. There is only limited comment about the process of change itself, with such comments that are included on this point tending to highlight a need to slow the pace of change and take into account the needs of all staff.

The researcher believes the key elements of future development of teaching and learning with ICT at Central School are a) management of change, and b) acceptance by all participants that *everyone* involved must accept responsibility for, and exercise leadership in, the implementation of such change. By offering suggestions for the future, all respondents have already shown that they wish to be involved in the latter process.

7.3 ICT - 'The Way We Do Things Around Here'

(iii) *Do the selected teacher research participants and the Research Review Group consider the content of Chapters Five and Six to be an accurate interpretation of the implementation and processes of teaching and learning with ICT at Central School?*

The responses to this question were perhaps the most vital of all responses to questions asked as part of this research. Having completed the collection, analysis, interpretation and presentation of data, the concern for any case study researcher remains: "Has 'the way they do things around there' been accurately presented?"

It was vital that respondents had open access to the presented findings, together with an absolute commitment from the researcher that their responses to the above question would be accorded critical importance. The respondents were also given editorial responsibility for comments attributed to them, that is, they were empowered and encouraged to suggest or make changes to points of fact or opinion as they saw fit.

The responses of the selected teacher research participants and the members of the Research Review Group to the above question were as follows:

Teacher A
I think this is a tremendous representation of the way we do things.

Teacher B

The content of Chapters Five and Six represents an accurate interpretation of the implementation of ICT at Central School. I don't believe there was anything that was not accurate in this interpretation.

Teacher L

I think Chapters Five and Six do give an accurate interpretation of what we are doing at our school. I also think that the certificates aren't marked off one column at a time, however. I have children working at level 2/3 and they are sending a fax, yet they haven't looked at email in level 1. I think there is a crossover similar to our reading and maths profile cards.

I think there is high expectation for the children to get the stickers and I think that maybe in some cases children are being shown what to do and then quickly demonstrate back to have the achievement marked off. I like to give children plenty of practice time so that I can observe the knowledge learned or the expertise evident as opposed to a 'sit down and show me approach'.

Teacher T

Overall, I think the chapters reflect our school situation quite well and with a large degree of accuracy. I feel that because the research includes elements of such a varied nature - in-class observations, surveys of teachers, students, parents, management, data collection and analysis - it is therefore compelling and suggests an authenticity that couldn't have otherwise been achieved through strict number-crunching of data. It is the linking of the 'perceived and actual learning' that makes the research so valid. The data speaks for itself in the voices of the students, the teachers and the wider community and this voice we do hear is an extremely consistent and confident one which speaks of the meaningful and engaged teaching and learning with ICT which is continually occurring throughout Central School.

Teacher Y

Chapters Five and Six present an accurate, comprehensive and informative interpretation of the implementation and process of teaching and learning with ICT at Central School.

Teacher Q

Yes, I do think Chapters Five and Six are true of what we do at Central School.

Teacher J

In one word, yes. I found both Chapters Five and Six to be extremely accurate in content. Both sides of the coin have been seen. ICT at Central has obviously not always been plain sailing, but the benefits are clearly evident. The ICT Education Plan is crucial. Learning is occurring and has not been left to chance. Goals are being met. We use ICT tools to assist with other learning and curriculum areas. This is successful! Students are applying their knowledge in a tremendous amount of ways and since they are curriculum-

based, the students are demonstrating their knowledge in meaningful ways. Needs are being met. Teacher enthusiasm is increasing. Student enthusiasm has been there from the start. The level of engagement and excitement is incredible. Cooperation between students, classes and the school as a whole is at a premium.

The teacher's role as noted in Chapter Five is to oversee and manage these learning processes and although organisation can be something of a juggling act, learning is occurring on a daily basis.

One of the school's main goals was for students to be independent learners who are at ease with and apply the tools of ICT. Our children will move on to intermediate school, high school, and eventually the work force. As they grow, the computer systems will differ and technology will continue to change at an incredible rate. But the upshot is that our students have been given the opportunity to use ICT in an enormous variety of ways. Their experiences will help them to adapt to new systems and learn new skills quickly. This can only be beneficial to their futures in a technological society.

Researcher's Comments:
These responses speak for themselves. From the researcher's point of view, it is particularly reassuring to know that what is recorded in Chapters Five and Six is unanimously considered to be a true representation by the respondents of ICT teaching and learning in action at Central School.

7.4 Group Discussion

The purpose of this group discussion, which centred on three specific discussion points (see Appendix 13), was to consider whether the content of this chapter was an accurate account of material presented to the researcher by the selected teachers and the members of the Research Review Group. All discussion group participants were given the opportunity to alter their contributions if they felt this was necessary. In addition, all participants were asked to consider the comments made by the researcher in this chapter and to offer their thoughts on these.

Discussion group members had prior access to the contents of this chapter, up to and including section 7.3. The group discussion was recorded on audiotape to assist the researcher in the transcription of comments and to provide a verifiable record. Verbal consent to record the discussion was obtained from participants prior to the discussion. Members were also invited to meet with the researcher individually within a seven day period immediately following the group discussion if they had additional thoughts to put forward. No such meeting was required.

Discussion Points:

1. *Do you agree that your comments presented in this chapter are an accurate transcript of those you presented to the researcher in relation to Chapters Five and Six of this thesis?*

All members of the group agreed that their comments had been presented accurately.

2. *Do you wish to alter the comments attributed to you in any way?*

No one wished to alter their comments.

3. *Do you have any follow-up contributions you would like to make to the comments made by the researcher at the completion of each section in this chapter?*

One follow-up point was made, as follows:

Teacher B

I raised the issues of compulsion and the 'why' part of ICT at Central School. I'm not sure that your [the researcher's] comments address what I meant. The point I was trying to make concerned the issue of the 'way we do things here'. If it is an agreed way of doing things and we are all clear as to why, then we shouldn't have to make ICT compulsory. Surely everyone would want to do it? Why not spend more time on getting agreement on why we are teaching ICT? Our children want to do it and they are not worried about compulsion.

Researcher's Response:

It would appear that the staff at many schools 'agree' on why they include teaching and learning with ICT at their school - "So that the children can use computers", for example. Other schools have less explicitly stated views on the subject but would doubtless be able to offer similar explanations. Of significance, however, is the fact that student learning with ICT in these schools is often suboptimal, and the reason for this may simply be that these schools do not *have* to teach (with) ICT. Schools in England *have* to teach ICT, and their efforts and results in this regard are regularly inspected. It is an approach that appears more likely to encourage 'cooperation' and bring about successful outcomes, in English or New Zealand schools.

The great advantage of 'compulsion' is that when a learning community has agreed that ICT should be a mandatory part of the curriculum (and has reached agreement as to why this should be the case), the issue of teaching and learning with ICT is not then left to chance. And if the only reason that a teacher is working with students on ICT is because he or she *has* to, then so be it. It would be hoped that in time that extrinsic requirement would give way to intrinsic motivation. But in any case, the students are not missing out.

4. *Do you have any other contributions you would like to present related to the research components of this thesis?*

Teacher T

I found it interesting that all teachers agreed in section 7.3. I found Chapters Five and Six so compelling ... because it was students, and teachers, and parents all responding to the questions and that there was such consistency. So that what students were saying they were doing, what we said we were doing and what students were doing, and what parents said we were all doing, was all so related. It was just so compelling and quite valid.

Teacher Q

Looking at your comments concerning the future, I think it is important to remember that not only will there be changes to the technology, but there will also be changes to the levels of skill and knowledge that children will bring to school. Things that we are now doing with an eight-year-old student will perhaps be needed to be addressed in years to come with a six-year-old simply because they will have adapted to their changing world of ICT.

Researcher's response:

As noted previously, the question which begins section 7.3 is the most important question asked in this research. Therefore, the unanimity of the responses to this question is gratifying to the researcher. With respect to the second point raised, that is, the changing needs of the students, this has not been fully addressed in this research. It is certainly an important point, however, particularly when it is realised that many students are better prepared for their technological futures than their respective teachers.

7.5 Summary

The 'voices' presented in this chapter belong to a representative group of people directly involved in all elements of the implementation of teaching and learning with ICT at Central School. The weight of their opinion adds credence to the findings of the array of research carried out within the scope of this thesis. In addition, the respondents have been able to add more colour, contrast and definition to the picture already presented.

The evidence shows that the respondents consistently recognise a number of similar positive influences on the implementation of teaching and learning with ICT at Central School. While negative influences were also identified, these were fewer in number. They are nevertheless of critical importance. Factors perceived as possibly detracting from implementation of teaching and learning with ICT at Central School included the pace of change and the impact of such change on the school's overall environment. Indeed, Central School staff have had to travel on a difficult and often uncharted journey. That they have managed to do so is a tribute to their individual and collective abilities.

Furthermore, there is perhaps a realisation amongst a number of staff that, having made their commitment to ICT at Central School, there is no turning back. Unfortunately, the course ahead may be every bit as frenetic as has been the course behind at times. It is of absolute importance, however, that the focus in the future remains on people and the management of considered change, not for the sake of ICT, but for the learning of students.

Attempts to look into the future of teaching and learning with ICT at Central School produced no major surprises. Perhaps this is wishful thinking on behalf of those offering such views, their hope being that future changes can be easily assimilated into existing practice. But Central School will need to look beyond the current range of ICT teaching and learning tools. Just as the school foresaw and captured the ICT teaching and learning modalities on offer today, so too must the school carefully monitor ongoing technological change and anticipate the ICT teaching and learning applications of tomorrow. This is the only way that Central School will be able to continue to provide learning opportunities and experiences for its students, thereby helping them understand and develop further in the worlds of tomorrow.

A particularly important finding was that all members of the Research Review Group and the five selected teachers considered that the research information presented in Chapters Five and Six was indeed an accurate representation of the 'way we do things with ICT at Central School'. Moreover, their own responses within this chapter further elaborate upon and confirm the developing nature of successful implementation of teaching and learning with ICT at the school.

The group discussion presented an opportunity to close the 'teacher participatory' phase of the research. While some important issues were raised and discussed, no changes to the research were suggested. It was the unanimous belief of members of the discussion group that the research was a valid and reliable interpretation of the way teaching and learning with ICT takes place at Central School.

Chapter Eight

Issues, Reflections and Implications

8.0 Introduction

This chapter reviews the main findings of the research, and how these relate to the major and secondary aims of the study. Key elements of the research relating to the major aim are discussed with reference to the Key Characteristics of Effective Schools (Sammons *et al,* 1995) noted in Chapter Two. Supporting elements of the research relating to secondary aims are reviewed in relation to the relevant findings in Chapters Five, Six and Seven.

This chapter also presents some of the researcher's thoughts concerning the implementation and possible future directions of teaching and learning with ICT in schools. The implications of this research are considered in terms of recommendations to the Ministry of Education, suggested actions for schools, and possibilities for future research concerned with the implementation of school-wide teaching and learning with ICT.

8.1 Key Elements

The major aim of this research was:

- *To identify elements in a selected contributing primary school that have facilitated the successful implementation of school-wide teaching and learning with ICT.*

Whether the research achieved this aim is discussed below in relation to a number of key considerations.

8.1.1 Why Teach and Learn With ICT?

Schools need to be clear about the reasons they are teaching and learning with ICT. There needs to be a philosophical base, a rationale, underlying their decisions and approach. Most importantly, schools must ask what they are trying to achieve with, for, and by their students in regard to ICT learning. Any of the rationales listed in Chapter One, section 1.1, or combinations thereof, may appeal to schools, or they may develop their own rationales. But the key question must always be: "Are the interests of our students being served?"

Central School has built its approach to teaching and learning with ICT on a set of agreed aims and objectives for students, as noted in the school's ICT Education Plan. For readers convenience, the relevant sections of this plan are reproduced below (see Chapter Five, section 5.2.2, for a full reproduction of the plan).

Central School

Information and Communication Technology Education Plan

Introduction

This Education Plan is a statement of intent as to how the teaching and learning of ICT will be carried out at Central School. It is important to note that ICT is acknowledged formally as compulsory at Central School. Our school Charter also notes information technology as a local curriculum goal and objective.

This Education Plan is consistent with our school philosophy and is based on:

- The needs of our children.
- *Technology in the New Zealand Curriculum.*
- *English in the New Zealand Curriculum.*
- The New Zealand Curriculum Framework.
- The strengths of our teachers.
- The creatED Education Solutions programme.
- Other resources available.

As a compulsory component of the curriculum at Central School, learning experiences and opportunities will be created using the various tools of ICT available. Learners at Central School are not being allowed to wait for outside intervention to determine the scope of learning opportunity. Our community has signalled, both in voice and financially, their commitment to ICT. There is a clear expectation by the parents/caregivers and learners to learn through the experiences and opportunities possible in ICT. This education plan has been designed to meet these understandings and the goals and objectives noted below.

ICT is therefore to be treated as a curriculum area in its own right. While integration with other curriculum areas has to happen by the very nature of the learning contexts involved, integration must not result in ICT being left to chance. A clear set of interrelated skills and applications in ICT have been developed to ensure that specific student learning outcomes occur.

1. Learning Needs

There is an established and lifelong need for ICT in our society. ICT is considered an essential vehicle for learning, enabling those of us with access and a range of skills to explore and expand our understanding of our world. It is the responsibility of our school to translate this assumption into reality.

All learners at Central School will therefore develop confidence and competence through a graduated range of skills and applications in ICT based on the agreed interrelated goals of:

- Word processing.
- Telecommunication.
- Information processing.

Attainment of the above goals, which incorporate sets of sequential skill development related to their respective ICT content (see section 3), e.g. email, will move the learner from simple to more complex operations. The most important element of this process is directing the learner to apply the skills learned and consequently encouraging further applications independently of the programme.

2. Goals

- To develop independent learners who are at ease with and can apply the tools of ICT.
- To encourage learning through ICT as an enjoyable and successful experience.
- To provide appropriate sequential skill development integrated within our curriculum through selected applications.
- To emphasise that ICT is a range of vehicles to enable learning.
- To teach the skills and strategies that will encourage all learners to take responsibility for further application of their knowledge and understanding.
- To provide an integrated curriculum in ICT that will be easily interpreted and applied by children and teachers.
- To directly relate the curriculum in ICT to the national statements and Essential Skills.
- To monitor progress, including self-monitoring, based on individual needs.
- To easily assess, evaluate and report to parents in a meaningful manner.

(Ramsay, Shere and Jefferies, 1997).

Central School has developed this rationale for teaching and learning with ICT by consulting with staff, parents and students. The school then legitimised the intentions of the learning community within the school's charter. Thus, a foundation was laid on which the learning community of Central School clearly set its expectations regarding ICT teaching and learning.

This research identifies the shared purpose of the Central School learning community with regard to ICT teaching and learning. It also presents compelling evidence that the expectations of staff, parents and students in this area have been met.

8.1.2 What to Teach and Learn with ICT?

In the absence of any set ICT curriculum and with the aid of only recently established, non-specific national directions (Ministry of Education, 1999), schools have been left to either reinvent what others have been doing successfully or simply drift along. A major contention of this research is that schools must take responsibility for teaching and learning with ICT. Therefore, schools must be clear about what they expect their students to achieve with ICT. At some point, the school must be able to answer the following questions: Where were its students? Where they are now? Where are they going to?

Central School has committed itself to a pedagogical approach which seeks to create, establish and build ICT learning outcomes with and for students. As a result, a very clear set of learning outcomes with ICT has been established for its students. Furthermore, if staff are to be competent and confident with ICT, they must also be familiar with what is expected of students. The research indicates that professional development at Central School focuses primarily on developing this familiarity, while also extending staff skill and knowledge to enable further application of ICT with students. The research also highlights the ICT teaching and learning documentation developed by Central School, and it reports, through the participants in this process, on the implementation of the intentions outlined in these documents. As revealed in Chapter Five, there is a resounding concurrence between parents, staff and students as to what they are doing collectively with ICT.

The research also sounds a warning to Central School about the importance of regularly updating parents about what is taking place in the school with ICT. Every year the school accepts over 130 new students. Given all the work that has taken place with ICT at Central School, it is vital that new parents in particular are kept informed of the school's ICT teaching and learning rationale and what their child is doing with ICT.

It is equally important that the school's ICT teaching and learning rationale, as well as its ICT practices and processes, continue to be the focus of ongoing sharing of experiences and ideas amongst staff. The research identifies a number of means through which this sharing and discussion of ideas takes place at Central School, including: new staff induction processes; in-school staff development; staff sharing and discussion at staff meetings; and the 'buddy teacher' process. The greatest strength of Central School's ICT culture is the collective consideration, agreement, review and renewal by staff of the school's ICT teaching and learning rationale, practices, and processes.

8.1.3 How to Teach and Learn With ICT?

Schools that have agreed on *why* to do something and have established the thrust of *what* to do should then be in a position to consider *how* to go about the process of actually doing it.

This situation is not unlike preparing for and going on a journey. There is agreement on a destination and the reasons for the journey to be taken. There is a need to map out the route in advance. There is the process of looking for signposts that should confirm, for all concerned, that they are headed in the right direction and will ultimately arrive at their destination.

As a learning community, Central School has an identified destination with an agreed reason for wishing to arrive at that destination. Most importantly, perhaps, the school has *documented* these elements of their journey with ICT. It has also constructed an explicit set of signposts in the form of graduated learning outcomes. These elements have all been translated into the parameters (see section 5.2.2, Central School Information and Communication Technology Education Plan) within which teachers must manage teaching and learning processes with ICT and provide learning opportunities and experiences for their students.

These requirements of teachers are crucial to the success of any teaching and learning. Staff must be aware of, and attend to, a variety of issues, such as the often diverse needs and abilities of their students, the content of the wider school curriculum, the expected school-wide outcomes for students, and the question of resources. Central School has established processes whereby it can review what teachers are doing with and for their students, and how teachers' performances in this respect compare with the school's expectations. This research provides a wealth of evidence of teacher planning, assessment, evaluation, school-wide monitoring, support and moderation in the field of teaching and learning with ICT at Central School. What is more difficult to demonstrate is the level of engagement and enjoyment that the students are experiencing. While this is alluded to in the data collected from the in-class observations, perhaps the most compelling indication that the journey is proving successful and enjoyable to its most important participants is the direct feedback to this effect gathered from the students themselves and reinforced in turn by parents and staff.

Central School's ICT travellers are moving in the right direction, so far as the staff can ascertain. Staff can point to success with ICT in terms of the acquisition of skills and the application of these ICT skills in context across the curriculum. And while staff are unable to state specifically that ICT is making a difference to learning across the curriculum, they do note, based on their professional opinion, that they believe this to be the case.

It is also worth noting that while students at Central School learn with ICT by going on journeys that are mapped out for and with them, there is still room and encouragement for them to emerge as navigators, explorers, adventurers and trail-blazers. If learning is a set of psychologica, rather than paper sequences, it follows that the learning process cannot be planned to the last detail. Accepting this reality does not mean that schools should abdicate their professional responsibility and leave all development to chance. There should, however, be room for variation, deviation and exploration. To this end, schools

must establish review processes which can confirm where they have been, establish where they are presently, and consider the next steps to be taken in relation to the changing horizon. The boldest of human discoveries and the most creative inventions occurred as a result of thought and careful planning; they were not the result of haphazard and totally accidental occurrences.

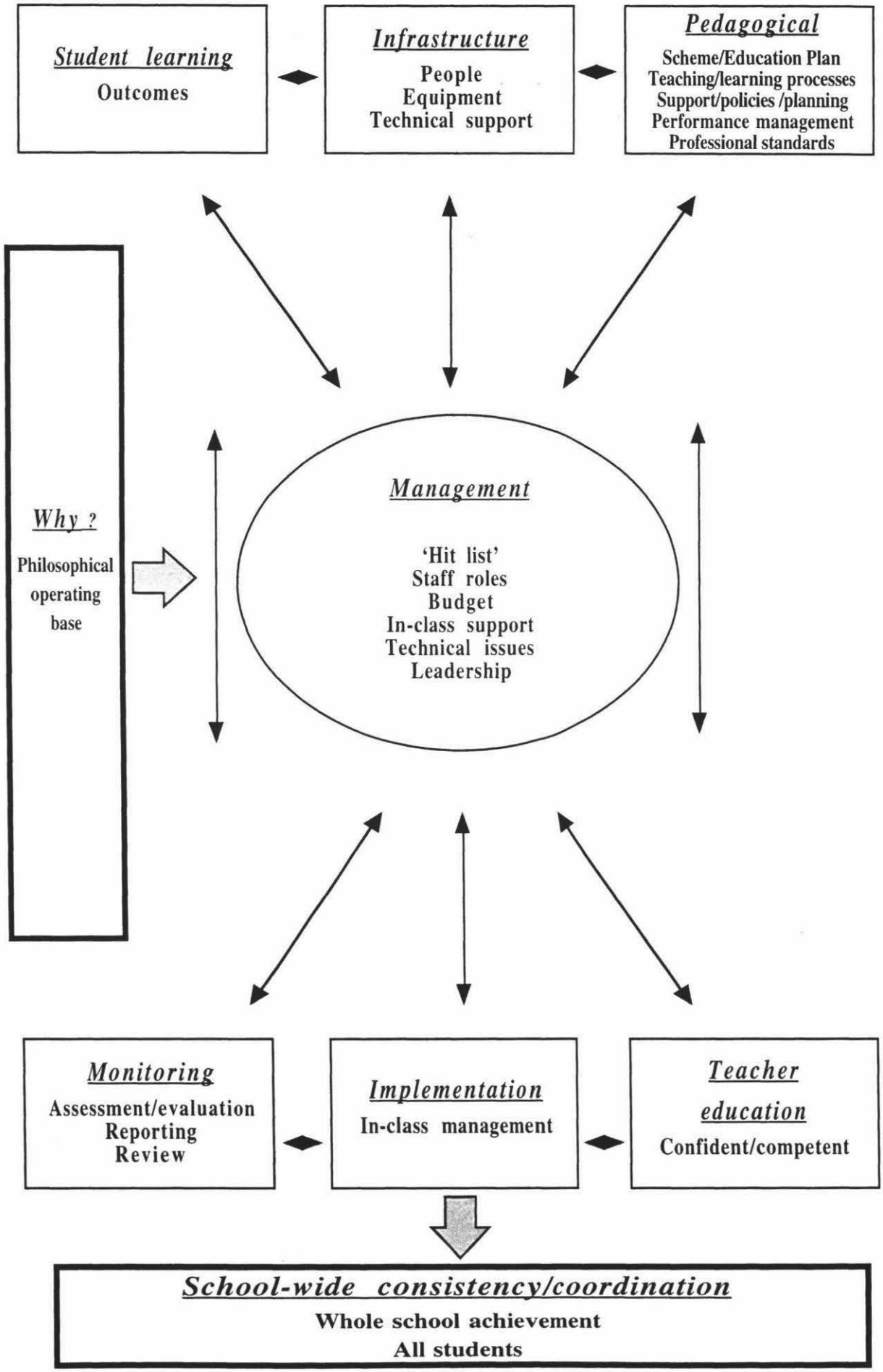
Planning is therefore vital. However, in their attempts to develop approaches to teaching and learning with ICT, schools can sometimes be confused by the variety of views expressed about ICT teaching and learning. Such debate, while of value to educationalists, sometimes fails to serve our students. Schools have a responsibility to provide 'rockets' for learners so that they all have the capacity to 'shoot for the stars'. Irrespective of the approach taken, students will continue to need direction and guidance in order to learn successfully.

On this point, it is important to recognise that there is no 'one size that fits all' in terms of teaching and learning approaches for students. Schools must be encouraged to consider and agree on an approach to teaching and learning with ICT that relates to the identified needs and intended outcomes for their students. Inaction by schools in the face of often diverse teaching and learning methods is unacceptable. For some students, learning will occur despite the teaching put in front of them; others will require coercive guidance. But whatever the school's method, process or style, all students need to assimilate skills and apply them in meaningful context. Teachers must remember that endlessly debating method, process or style preferences is far less important than ensuring that learning occurs.

Central School may not have the best answer for its students, but it has an answer that is working. This does not mean that the school's methods and results should not continue to undergo constant review by the community. Nor does it mean that Central School's practices and processes of teaching and learning with ICT are beyond criticism. Indeed, Central School's ICT methodology has been criticised by a few self-appointed 'ICT experts' in the commercial sector. But this has not discouraged the school from openly presenting the *why*, *what* and *how* elements of its processes and practice with ICT to others.

8.1.4 A Model for School-Wide Implementation of ICT

Figure 8.1 presents an overview of the ICT teaching and learning in application model operating at Central School. The model identifies all the elements which support and build the successful implementation of school-wide achievement in teaching and learning with ICT. The model begins with the need for an agreed philosophical operating base and identifies the elements of the operating processes. These operating processes are intended to facilitate consistent and coordinated whole-school achievement for all students in teaching and learning with ICT. For Central School, as indicated by the results of this research, this is a reality today.


Student learning
Outcomes
Infrastructure
People
Equipment
Technical support
Pedagogical
Scheme/Education Plan
Teaching/learning processes
Support/policies /planning
Performance management
Professional standards
Why ?
Philosophical
operating
base
Management
'Hit list'
Staff roles
Budget
In-class support
Technical issues
Leadership
Monitoring
Assessment/evaluation
Reporting
Review
Implementation
In-class management
Teacher
education
Confident/competent
School-wide consistency/coordination
Whole school achievement
All students

The elements of this model are now considered in relation to the research carried out at Central School.

Student Learning - This research shows that student learning is a key outcome of ICT teaching and learning. Indeed, the approach to teaching and learning with ICT at Central School is built on and around student learning. All planning and action considers the interests of the students. While this may seem alarmingly obvious to most readers, the primary emphasis of ICT in many New Zealand schools, and indeed the historical focus of the Ministry of Education, has been on teacher professional development. This emphasis, while applauded for its broad intentions of assisting the development of ICT in schools, has failed to consider what schools should be expected to deliver in terms of student learning outcomes. Furthermore, this failure to insist upon and ensure that student learning outcomes have been identified and are being achieved continues to be a major weakness of most attempts to implement ICT teaching and learning in New Zealand schools today.

By concentrating on student learning outcomes, Central School has been able to establish agreed signposts for its 'ICT travellers' as they go about their journeys of discovery. By setting out its intentions for students, Central School has been able to delineate a set of skills to be acquired and a series of applications which allow students to demonstrate their skills in a meaningful context. The school has also specified its intention to develop learners who can process information and learn independently through ICT modalities. Thus, learning with ICT is not considered to be an end in itself. Rather, it is considered to be a means of fostering meaningful communication, creativity, design and problem-solving. Students at Central School are challenged to construct and apply knowledge in a powerful 'one-stop' operating environment. They are also encouraged to learn about learning, for which there is no better tool than ICT.

Infrastructure - This research points to the continued emphasis by New Zealand and international schools on access to equipment as the most important determinant of implementation of teaching and learning with ICT. Obviously, in the absence of hardware equipment, little can be achieved with ICT. However, the amount of equipment the school has is not the primary determinant of success. While Central School now has a large amount of ICT hardware throughout the school which is available to students, staff and parents, the school has not always experienced the level of equipment resourcing it currently has. Conversely, its national and international reputations for working with ICT have been in place for a number of years, irrespective of the amount of hardware at the school. Predictably, as in other schools, staff at Central School continue to press for additional equipment. Unlike in some other schools, however, Central School staff can justify increased access to equipment by pointing to clearly identifiable associated ICT learning in their students.

More important than equipment, however, is the role of the 'human infrastructure'. While equipment helps facilitate the processes of learning, *people* make all the processes

work. Thus, staff 'voices' at Central School emphasise the value of the ICT team, the sharing of leadership by many, the role of the ICT coordinator, and the 'buddy teacher' system as examples of the school's vitally important'human infrastructure'. This infrastructure was initiated, developed and continues to evolve in response to the needs of ICT operation. Central School recognises that, whatever the level of equipment infrastructure, any school-wide implementation of teaching and learning with ICT is unlikely to succeed without the 'human infrastructure' in place and working.

Technical support is another important issue. Too many breakdowns in equipment guarantee an eventual breakdown in teacher patience and enthusiasm. When the complexity of possible problems with computers is added to the wide range and number of users, there is no doubt that technical problems will occur. For the past three years, Central School has invested in a technical solutions programme that has cut down the 'fix it' time, such that it is very unusual that equipment needs to be taken off site, and even more importantly prevented many previously 'regular' breakdowns from occurring at all. Furthermore, and as a result of using this programme, the school has been able to reduce its total maintenance budget and free up teaching staff who were previously required to give up their time trying to fix problems about which they had limited knowledge. Even worse, these teachers would often inadvertently exacerbate the problem. The need for schools to ensure ongoing and effective technical support must be built into any ICT budgeting process.

Pedagogical - In keeping with the student-focused approach at Central School, clear emphasis has been placed on attending to pedagogical issues. Having an agreed, documented, consistent school-wide approach to teaching and learning with ICT ensures that staff are clear about what to do. However, while the specific purpose and outcomes for students are clearly documented, there is also scope for variation so that staff can make the journey fun, as well as challenging and meaningful.

Central School has made teaching and learning with ICT a compulsory part of what it offers all students. This is seen by parents and staff to be a significant factor in ensuring school-wide and consistent implementation of ICT. Essentially, the school has assumed responsibility for this in the absence of any Government directive. Central School has shown that it is not prepared to leave teaching and learning with ICT to chance, and has accorded ICT the importance of other learning areas already made compulsory by the Government through National Curriculum statements.

Another important aspect of Central School's ICT pedagogy is the fact that it has singled out ICT as a specific area for teaching and learning, as opposed to taking the view that ICT should simply be integrated. Of course there is clear evidence in school documentation and from staff 'voices' that ICT is used across the curriculum and can therefore be considered to be integrated. But Central School in fact treats ICT as it does reading. Both learning areas can be considered as tools for learning across the curriculum. Yet at a primary school level, the teaching and learning of reading is

considered a subject in its own right, in which students are expected to master a series of skills to be put into a series of meaningful applications. Students are encouraged to process information, to create, enjoy and design as they go about making sense of their world through reading. The learning community of Central School has decided that ICT must be afforded similar importance to reading and applied in practice within similar operating parameters.

Leaving teaching and learning with ICT to chance, or suggesting that ICT be simply integrated into what schools are already doing, often consigns any aspirations for school-wide implementation of ICT teaching and learning to the scrapheap. The focus for schools must be pedagogical, not technological.

Monitoring - Schools are required to monitor student progress and achievement and to report to parents and the Board of Trustees on such progress in relation to the achievement objectives listed in the seven Essential Learning Areas of the New Zealand Curriculum Framework (Ministry of Education, 1993a). Schools are also required to review their processes and practices in these Learning Areas in order to, for example, identify barriers to learning or to ensure student progress. Central School has extended these practices into teaching and learning with ICT.

It is also evident that all schools which aim for student achievement with ICT should extend their monitoring practices to cover student ICT learning outcomes. Moreover, parents and the wider school community have a right to know how any ICT funds have been used and the extent to which successful achievement of ICT learning outcomes with their children has resulted from the use of these funds. It is also not too unreasonable to suggest that the Ministry of Education should be held accountable, through schools that have received ICT-related funding, for identifiable student learning with ICT. This research clearly indicates that Central School can present and validate such outcomes data through its monitoring processes.

Implementation - Managing teaching and learning with ICT in their classrooms is one of the most difficult tasks teachers face. When added to the demands on time taken by teaching the Essential Learning Areas, implementation of ICT teaching and learning in the classroom creates very real time pressures. The situation can be aggravated further by the absence of agreed student learning outcomes and established pedagogy, or by recurring infrastructural problems. Limited learning experiences and opportunities with ICT may result.

Conversely, if these contributing elements are addressed on a consistent school-wide basis, teachers are likely to be more inclined, and able to be assisted in their attempts, to carry out teaching and learning with ICT in the classroom. Staff at Central School report a high usage of ICT during classroom time over the week. While other teaching and learning is obviously taking place simultaneously, teachers are also clearly carrying out the in-class implementation of ICT at Central School at these times.

The observations reported in this research, together with the responses from teachers, parents and students, confirm the existence of a community of practice with ICT centred around Central School. Furthermore, one of the key findings of this research is that successes achieved by a learning community working together in teaching and learning with ICT lead on to further successes. Teachers, for example, are able to learn quickly from others, to discover what works for them and what does not. They can look at processes and practices in place in other classes. They can present and share ideas in small and large groups. They have access to in-class support for problem-solving and development. They have 'buddy teachers' to work with, access to an active ICT team, and are part of a staff whose members are all involved in the pursuit of similarly agreed goals and objectives. It is the whole school approach at Central School that brings about and complements the daily reality of teaching and learning with ICT for all teachers, that is, managing learning with their students in their classroom and beyond the school.

Teacher Education - Schools should not settle for endless professional development in ICT aimed at increasing teacher confidence and competence. While professional development is an important element in the process of implementing teaching and learning with ICT, such development should be in response to *why* schools are teaching and learning with ICT, *what* the schools are intent on achieving with and by students, and *how* the management of ICT processes and practices could occur.

There are constant claims throughout the education sector in New Zealand that the key to success in teaching and learning with ICT is teacher education through professional development. The experience of Central School would indicate that while professional development is *a* key to the successful implementation of teaching and learning with ICT, it is not *the* key.

This research shows that Central School considers teacher confidence and competence in ICT to be as important prerequisites for student learning as student confidence and competence. However, ICT presents some unique problems for teachers in this regard. Some teachers have had limited exposure to the tools of ICT, and any exposure they might have had may have affected them adversely. Furthermore, while many teachers today will have had some experience in using the tools of ICT, their involvement in the processes of teaching and learning with ICT will often have been limited.

Central School assumes the latter is the case, particularly with new staff. As a learning community, however, the school has put in place a series of contributing processes and practices which are consistent with the *why*, *what* and *how* of teaching and learning with ICT. Staff members have affirmed in this research that avenues for personal and professional development in teaching and learning with ICT are available and have been utilised. Furthermore, the focus of this professional development is school-based. This does not mean that professional development occurs only at the school; rather, it means that it is based on what is happening within the school with and for students.

The emphasis on students' needs cannot be overstated. While there will always be a need to extend teachers' thinking with ICT into new and developing areas, it is vital that the focus of their work remains firmly grounded in what they are looking to do with their students, and how they will go about doing this in their classroom and beyond the school. But professional development must also ensure that the teacher gains confidence and competence at each level of teaching and learning with ICT before he/she is moved on to the next level. Just as students demonstrate a range of abilities in a classroom, so do teachers. Thus, the processes of professional development for staff must recognise this range of abilities and constantly look for ways of establishing communities of practice which ensure that teaching and learning with ICT is recognised by all as an important part of 'the way we do things around here'.

To this end, Central School presents a wide variety of professional development options, both in terms of content and approach, to its staff. The content focuses on what is expected to take place with students. Part of this content focus requires staff to master the learning outcomes of the student 'certificate programme content'. Examples of professional development include: 'one-off' sessions for large and small groups, usually out of classroom teaching time; individual tutorials from ICT team members; 'just in time' assistance (that is, at the time the need occurs) from an ICT 'buddy teacher'; and in-class coaching from the ICT coordinator. Staff consider in-class coaching and the time made available through the school for the coordinator to carry out her role and responsibilities to be major contributors to the successes enjoyed with ICT at Central School.

However, perhaps the key components of ICT professional development at Central School are that teachers *want* to learn, and that they want to *apply* what they learn in the classroom. For teachers at Central School professional development in ICT does not mean 'going through the motions' on some external course which may or may not have relevance to their own situation or students. Rather, it means taking responsibility for teaching and learning themselves, sharing skills and experiences with colleagues, and being a willing participant in - rather than merely a passive consumer of - ICT professional development. As a consequence, teachers at Central School are more likely to impart the benefits of their professional development to their students. Again, it is an aspect of the ICT culture at Central School, of 'the way they do things there'. Teachers who take responsibility for their professional development, who are proud of their ability to teach themselves and learn from each other, and who make every effort to solve their own problems within their own learning community, feel they have a vested interest in ensuring their new ICT knowledge and skills translate into benefits for their students.

Management - All elements of the model presented in Figure 8.1 are interrelated and complementary; they contribute collectively to the continued development and improvement of learning with ICT for and by students. The elements all serve the needs of the students at Central School, and removal of any one of them would result in an end to the successes the school enjoys with ICT.
At the centre of this model is management. Indeed, the processes of management of ICT

at Central School provide the 'oil and glue' for the operation. Oiling the elements allows movement to take place throughout the school; the 'glue' ensures that the elements hold together in a relationship that allows complementary development to take place.

Central School has an ICT management team charged with the responsibility for providing the 'oil and glue' and ensuring that school-wide implementation of teaching and learning with ICT takes place. The team attends to planning issues, budgeting, equipment distribution, maintenance, professional development and documentation. Its role is often reactive and 'hands on'. However, another major part of the ICT management team's role is to inform, advise and lead. To this end, the team is proactive, looking to future developments for the school through the provision of professional development, equipment and new ideas. The team's leadership role requires it to consider immediate and medium term issues, as well as possible distant changes on the horizon. The team also serves as an agent of change within the school. Importantly, the ICT team is comprised of practising classroom teachers and administrative staff members with a range of experience with ICT. Team members are thus able to test ideas and often represent the best means within the school of effecting change because they understand both ICT and the real world of the classroom.

This research shows that Central School utilises a range of ICT teaching and learning elements and management skills, all founded on an agreed operating base, to bring about identifiable school-wide achievement with ICT for all its students.

8.2 Effective Schools and ICT

One aim of this research was to determine whether the ICT processes and practices at Central School could be related to the Key Characteristics of Effective Schools presented by Sammons *et al* (1995) and reviewed in Chapter Two. Readers will be able to decide for themselves, after examining this research, whether they believe such correlations exist. However, the researcher is in no doubt that there are many areas of correlation, as the following brief comments suggest.

8.2.1 Professional Leadership

Leadership in the provision of teaching and learning with ICT at Central School is identified as a key factor for success by a number of the research participants. Clearly, nothing could have developed in the ICT area to the extent that it has at Central School in the absence of determined leadership. It is also very evident from staff 'voices' in this research that leadership is evident not only at the more senior levels of the school, but also, and perhaps, more importantly, at 'ground level'. This is vitally important because all changes in teaching and learning with ICT must ultimately be implemented by the participants in the process.

From an external point of view, Central School has shown that it is a national leader in the development of teaching and learning with ICT. In 1999, the Ministry of Education recognised Central School as one of 23 leading New Zealand schools in teaching and learning with ICT. These schools were identified by the Ministry as being suitable for rendering assistance to other New Zealand schools in the area of ICT teaching and learning.

8.2.2 Shared Vision and Goals

The evidence presented in this research clearly shows that Central School has an agreed school-wide approach to teaching and learning with ICT. The documented aims of the school are supported by actual practice, as evidenced by observations in classrooms and comments by staff, parents and students. Together, these findings show that teaching and learning with ICT at Central School is the function of an entire learning community, rather than the domain of a few 'decision-makers'. While Central School has accepted full responsibility for teaching and learning with ICT it has also recognised that sharing ownership of the associated processes with the learning community is the best way of ensuring optimal learning outcomes for students.

8.2.3 A Learning Environment

Students at Central School are aware of what is required of them in relation to ICT. They are also encouraged to take responsibility for their learning, as evidenced by their responses in this study and their self-monitoring of progress on their ICT certificates.

8.2.4 Concentration on Teaching and Learning

Central School has a very strong focus on teaching and learning with ICT. The ICT learning content is not simply integrated across the curriculum in the hope that ICT learning will occur 'naturally'. Rather, the school explicitly focuses on what it expects students to learn with ICT and how it intends to ensure this happens. There is an emphasis on engaged learning time with ICT and clear expectations of achievement in specified areas.

8.2.5 Purposeful Teaching

The research shows that staff and students at Central School know what is happening with ICT. The learning experiences are designed to relate to the worlds of today and tomorrow. Teachers are responsible for developing the elements of an exciting and challenging ICT journey for and with their students.

8.2.6 High Expectations

This research confirms that staff and parents have high expectations of student learning with ICT at Central School. The students are expected to learn, and the staff takes responsibility for ensuring they do.

8.2.7 Positive Reinforcement

The ICT 'certificate programme' provides extrinsic and immediate recognition of students' achievements. The programme also ensures that expectations for all are clear and consistent.

8.2.8 Monitoring Progress

Central School pays careful attention to monitoring student progress and achievement with ICT. This research identifies consistent school-wide formal and informal processes that contribute to the review of student, staff and school performance in ICT. The results of this review process serve to inform future practice with students and create professional development opportunities for staff.

8.2.9 Pupil Rights and Responsibilities

Central School's ICT 'certificate programme' encourages students to take responsibility for their work. Not surprisingly, therefore, the research shows that students are aware of what they are doing in ICT. Furthermore, students' enthusiastic participation in the self-assessment processes within the skills elements of these certificates indicates that they have not only taken responsibility for elements of their ICT learning but are actually insisting on taking ownership of these elements.

8.2.10 Home-School Partnership

The research identifies a strong partnership between parents and staff concerning ICT at Central School. The concurrence of their views is a feature of this research, and every effort must be made by Central School to maintain and enhance this important partnership. There is no doubt that twice-yearly specific reporting to parents on the individual ICT learning progress of their child through the ICT 'certificate programme' is a major component of this successful partnership.

8.2.11 A Learning Organisation

This research clearly shows that Central School has a consistent and coordinated approach to teaching and learning with ICT. A community of practice is in operation. Furthermore, the school emphasises the importance of teacher education with ICT, and the staff have indicated a clear preference for school-based professional development.

8.2.12 Summary

The Key Characteristics of Effective Schools are independently established criteria by which readers can consider whether Central School has achieved effective school-wide implementation of teaching and learning with ICT. The evidence presented in this research strongly suggests that this is the case, since the Key Characteristics of Effective Schools are easily identifiable in this learning community's collective processes and practices. Central School clearly has a successful ICT culture; in simple terms, "it is the way they do things around there."

8.3 Supporting Elements

The secondary aims of this research were formulated in order to elucidate more clearly the operational activities of Central School. These aims were extended into questions posed at the three stages of the research. The data obtained in response to the questions in these stages is presented in Chapters Five, Six and Seven. The secondary aims of the research and a brief review of the related relevant findings are summarised below.

- *To establish evidence of links between the stated national requirements of schools, for example, achievement objectives in gazetted national statements, and consequential student learning outcomes through ICT.*

There are limited and arguably limiting national requirements of schools in relation to ICT. Despite enormous, even excessive, expenditure by schools and the Government on ICT, there continues to be a blatant failure to formulate required ICT student learning outcomes. Furthermore, while the Ministry of Education's (1999) establishment of criteria for accessing funds for ICT in schools has been encouraging, there has still been no attempt to make ICT or its contributing elements an actual requirement of schools.

Another concern is the continued focus on teacher professional development. This is not to deny that teacher professional development in ICT is important. However, as has been the case for the past 15 years, teacher professional development with ICT in the absence of any identifiable student learning outcomes is a waste of time, effort and funding.

- *To examine and describe all of the case study school's documentation relating to teaching and learning with ICT.*

Central School has a clear and robust set of statements, presented in detail in this research, that establish the agreed school-wide processes for the implementation of ICT teaching and learning practice. The statements are predicated solely on student learning and achievement with ICT and they encapsulate the school's desire for student success with ICT. The evidence presented in this research confirms that this success has been achieved.

- *To consider how the management and operational processes in place support teaching and learning with ICT.*

Examples of management and operational processes that support teaching and learning with ICT identified in this research include the ICT coordinator, the provision of appropriate levels of technical support, the roles and responsibilities of the ICT team, and the coordination of ICT-related documentation.

Central School staff also consider teacher professional development to be a major supporting element in teaching and learning with ICT. Professional development at Central School is 'needs-based' for teachers but strongly linked to the school-wide determination to develop learning opportunities and experiences for students.

Central School has managed to purchase and build many ICT resources for teaching and learning, and in the process developed an infrastructure which ensures substantial student and staff access, staff support, repair, replacement, and the upgrading of equipment etc. However, this research clearly shows that 'human infrastructure' is considered more important than equipment infrastructure at Central School.

Central School is also very aware that developments in ICT at the school have not occurred by accident. Rather, they have been and are the result of coordinated efforts by all staff responsible for ICT learning by and with their students. Staff also acknowledge the importance of the significant resourcing allocated to ICT leadership and staff support through the school's ICT coordinator. Indeed, some staff members believe this factor to be the most important determinant of success in teaching and learning with ICT at Central School.

- *To examine how teacher competence and confidence contribute to teachers' understanding, use of, and ability to teach and learn with ICT.*

Approximately 80% of staff at Central School were found to be confident and competent in their personal use of ICT and capacity to teach with ICT. The research also presents convincing data arising from staff questionnaires which supports the notion that teaching and learning with ICT is being successfully implemented at Central School. This data is supported by the diary records of selected teachers, which constitute a colourful account of the diversity and quality of ICT teaching and learning taking place with their students.

The research also shows that the staff attitude to ICT at Central School is generally positive and well-informed. Nor should the reader be in any doubt that success with ICT could have occurred at Central School without this level of support from staff members. The staff are the vital element.

- *To identify and examine evidence of links between teacher planning and teaching objectives, learning activities/experiences, and student learning outcomes with ICT.*

- *To identify and describe assessment data, evaluation information and reporting on student learning outcomes through ICT.*

The agreed school-wide intentions with ICT have been identified in teacher planning, assessment, evaluation and reporting. This teacher documentation highlights what is taking place with students and the consequent levels of achievement. Of critical importance is the consistency observed between teacher documentation and programmes of learning in action.

In addition to individualised reporting of student progress and achievement in ICT to parents, Central School reports on school-wide achievement with ICT to the staff and Board of Trustees. This is further evidence of the firm commitment to teaching and learning with ICT that has been undertaken by the learning community of Central School.

- *To identify and describe the behaviour and perceptions of students engaged in teacher-planned learning with ICT.*

Chapter Six identifies a wealth of ICT-related engaged learning activity by students at Central School. Chapters Five and Six show that staff, parents and students strongly believe that teaching and learning with ICT is occurring.

- *To discover and describe parents' and care givers' perceptions of their child's learning with ICT.*

Parents strongly articulated high expectations for their child's learning with ICT at Central School. They affirmed their beliefs that ICT would enhance their child's learning and that their child needed to acquire ICT skills and the ability to apply knowledge through ICT. Parents also confirmed their belief in the importance of ICT being compulsory at Central School.

The importance of a strong school-parent partnership must be emphasised. The success of any student learning is influenced to a major degree by the attitude and commitment to that learning by parents.

8.4 General Reflections of the Researcher

It is hoped that the following views of the researcher add usefully to the research data and findings of this thesis. The views expressed are in no particular order of priority and are directed to teachers and other school personnel responsible for ICT teaching and learning in schools.

8.4.1 Researcher's Observations

Trust Oneself with Change - People in schools should trust what they know and what they do, trust their inventiveness and creativity, trust their judgement, and most importantly, trust themselves and their capacity to manage change. They should keep their feet on the ground and their eyes on the ever-changing horizon. The one guarantee for the future is change. Those teachers - and students - who can adapt to and manage change will enjoy success in their endeavours, and in turn become agents of further development, improvement and change. Change can be an enemy or an ally. Careful management of change is a major determinant of success in schools.

Learn About Learning - People in schools must look to build students' awareness of how they can go about the processes of learning. Students should be equipped with the skills and strategies of learning, using the media of ICT as tools to this end. People in schools must search out means of processing information so that learners can access and discern meaning.

Hard Work - People in schools should not be under any illusion that implementing teaching and learning with ICT, especially given the barrage of issues confronting schools in New Zealand, is anything other than plain hard work. However, it is *people* work, not *machine* work; it is *pedagogical*, not *technological*.

Look to the Students - People in schools should not be aiming simply to 'reach' more learners in their schools. Rather, they should be aiming to reach all learners in a way and at a pace that is appropriate for each student. Students must be able to take on the responsibility asked of them, just as teachers must be able to accept their responsibility to develop and coordinate the processes of teaching and learning with ICT.

Learning with ICT - Learning with ICT should not be an end in itself. The technology offers a very accessible means for collaborative learning and working together to solve problems and create ideas. It facilitates connected learning, enabling far distant people to communicate with ease, speed and in real time, placing students in what can be termed a 'global classroom'. Learning with ICT also brings about constructive learning. It enables students to develop their own questions, and affords them a greater range of opportunities to find answers to those questions and so build on their understandings of their world.

Accountability - People in schools must provide evidence that they are achieving something. They are in danger of losing the critical support of their communities unless they can demonstrate the successes they know they are experiencing. But rather than having externally imposed assessment and evaluation criteria placed on their learning with ICT, it would be more productive for schools to develop their own indicators of success. It is important for schools to realise that if they do not identify successful student learning with ICT, the time will come when schools will have difficulty convincing their communities of the need for additional ICT funds.

ICT Super Highway - The highway has been constructed and has already conducted a great deal of traffic. Schools need the navigators, the explorers, the adventurers, the trail-blazers, the creators, the designers and the discoverers who will erect the signposts as they search out new frontiers and future horizons. But people in schools should always be mindful that the journey is of greater importance than any destination. Teaching and learning with ICT should, by its very nature, point us to infinite destinations and horizons.

8.4.2 Researcher's View of the Future

Learning Methods with ICT - Schools continue their search for the 'Holy Grail' of teaching and learning with ICT. Battles rage over skill acquisitions, information literacy, creativity, and new learning styles through ICT. Are these approaches mutually exclusive or interdependent, and does this really matter anyway? Perhaps not, and if we continue to argue over these issues, we put at risk the ICT successes that students deserve. As an analogy, readers might consider the phonics versus sight words and 'whole language' debate. In the researcher's experience, perhaps the best approach is to place all elements at the disposal of teachers, so that the varying needs of students can be met. After all, is the aim to teach children to read, or to win an esoteric and pointless debate? Similarly, is the aim with ICT teaching and learning to bring about student learning or to prove our theories?

Need for Greater National Direction - In the continued and conspicuous absence of national directives for teaching and learning with ICT, a range of approaches will continue to be tried and discarded or developed. Perhaps the 'strategy' of leaving schools to their own devices will, in the long run, contribute to the greater good of all schools when the successes achieved by some schools are made available to all others. Unfortunately, there is no evidence to date that this phenomenon is occurring to even a moderate degree. While a small number of schools are making substantive progress in teaching and learning with ICT, the researcher's view is that most are merely 'fiddling around', maintaining appearances and saying the right things while producing extremely limited demonstrable results. Still other schools have been justifiably hesitant, unsure of why they should commit to teaching and learning with ICT, what they should do, and how they should go about the process of implementing teaching and learning with ICT on a school-wide basis. There is a need for clear national directives to schools about what is

expected of them with regard to student learning with ICT.

National Research - As noted in section 8.5.2, the time has come for meaningful nationally-based research in and with schools that have shown they can successfully implement teaching and learning with ICT. The current political climate is receptive to increased support for ICT in schools. However, there is a real danger that even greater sums of money will be poured down the waste pipe as schools are funded for further development in ICT but not provided with the very necessary direction about how to ensure that these funds actually translate into successful learning for our students.

The fact is that far too many mistakes have been made since the initial forays into ICT teaching and learning in 1985. And yet, despite the benefits of hindsight and recent news of encouraging funding initiatives in this area (Ministry of Education, 1999), it still appears that previous mistakes concerning teaching and learning with ICT will be repeated and indeed exacerbated.

One reason for this is public ignorance. Indeed, if the financial waste observed in ICT teaching and learning had occurred in the subject areas of mathematics or reading (though some would argue that it has), there would have been a public outcry. That there has been no such outcry reflects the fact that the public has very limited awareness of what schools are specifically trying to achieve through teaching and learning with ICT. Indeed, no one appears to have a clue as to what is really going on at present, in terms of ICT teaching and learning in schools throughout the country, let alone what should be happening in the future.

Technological Issues - Changes in ICT technology continue at breathtaking speed. Schools are currently 'future proofing' their network installations. It is possible that related wired networking will be obsolete with the increasing availability of computers with wireless network connections. Forms of voice recognition are now available, making the keyboard an endangered tool. Digital cell phones can already deliver a host of facilities that suggest that the personal computer will reduce to cell phone size, eventually with a live screen for global connection and network interaction. The issues of access and the power of the tools available will overwhelm schools once again, quite probably within the next five years.

The challenge for schools to keep up with change is constant. A clear focus on the horizon is necessary if schools are to have any chance of getting and staying 'up to speed'.

8.5 Implications of the Research

8.5.1 Schools

The major aim of this research is to identify key elements of the case study school that are responsible for the successful implementation of teaching and learning with ICT in that school. The researcher has assumed that those elements which contribute to successful implementation of ICT in the case study school may be applicable, with similar outcomes, to other schools. To this end, the researcher has identified a number of points which schools should address when considering the future implementation of teaching and learning with ICT at their schools. These are as follows:

- **Why** Establish agreed reasons in the learning community as to why the school is teaching and learning with ICT.
- **What** Develop a range of learning outcomes for student achievement with ICT.
- **How** Provide clear management guidance relating to the implementation of practices and processes that support the provision of ICT learning opportunities and experiences.
- **Responsibility** Take responsibility for students' learning with ICT, rather than wait for external requirements to be handed down.
- **Compulsion** Make ICT a compulsory learning area.
- **Leadership** Provide leadership at the top and encourage leadership in all participants.
- **Management** Maintain both the flexibility ('oil') and interrelatedness ('glue') of the complementary elements of teaching and learning with ICT.
- **Change** Expect, be aware of, and manage the daunting but very necessary processes of change with, for and by people.
- **Expectations** Agree upon and set high expectations for all - especially the students - involved in teaching and learning with ICT.
- **Staff Confidence** Recognise the importance of staff confidence and competence with ICT for bringing about change and coping with the stresses change will undoubtedly present.
- **Teacher Education** Ensure professional development for staff is school-based and designed to help the school implement its processes/achieve its goals for students.
- **Student Awareness** Ensure that students are aware of what the school wants them to achieve, both in the immediate and long term.
- **Independence** Aim for students to become independent learners with ICT who are aware of the learning process and have the skills to apply it.

- **Documentation** Initiate, develop and review documentation which outlines and supports the agreed school-wide processes associated with teaching and learning with ICT.
- **Infrastructure** Be aware that ICT 'human infrastructure' is more important than equipment infrastructure.
- **Technical Support** Ensure that technical support is part of ICT processes and practices.
- **Monitor/Report** Plan, assess, evaluate and report on student achievement with ICT to parents and the Board of Trustees.
- **Review** Establish tools for reviewing current processes in order to guide future development.
- **Communicate** Keep all members of the learning community informed about developments and regularly revisit the agreed elements of the plan.
- **Costs** Be aware of the human, financial and time costs; this will help ensure that the huge investment into ICT can and will pay off for students.
- **Whole School** Ensure sure that *all* students and staff are learning with ICT.

As major stakeholders in the processes of teaching and learning, principals and Boards of Trustees must take responsibility for ensuring that their learning community is moving in a considered manner towards the successful implementation of teaching and learning with ICT.

Principals must coordinate all people in the learning community and inspire them to achieve success with ICT by their students. They must have the desire to bring about the necessary changes and be prepared to take bold, albeit measured, action when appropriate. They also must win the confidence of their staff by giving staff members the responsibility to take ownership of the change process. There will undoubtedly be difficulties and casualties along the way. However, if students' needs are kept at the forefront, and an agreed rationale for action is in place, principals will find that bringing about changes in teaching and learning with ICT can be achieved.

Boards of Trustees should consider their governing role in relation to teaching and learning with ICT. They are responsible for the development and approval of policy and practice in their respective schools. They are required to approve the school's budget and are entitled to receive information about the primary purpose of their school, that is, the progress and achievement of student learning. However, the focus of Boards of Trustees should be on governance, rather than considering which brand of hardware to purchase and at what cost. Boards need to ensure (via their principal and staff) that all elements are in place, and that all students in the school not only have access to learning experiences and opportunities with ICT but that they also achieve and make progress with such learning.

A learning community which is determined to bring about change and implement or further develop teaching and learning with ICT in its school should find these goals easier to achieve if it utilises the elements in practice at Central School.

8.5.2 Ministry of Education

All national developments in ICT teaching and learning in schools are the result of political decisions. It is the Ministry of Education's role to advise the Government and to help it develop the political will to make these decisions. Unfortunately, the Government has displayed a poor understanding of teaching and learning with ICT in New Zealand schools, a situation which has had a 'flow on' effect in terms of limited ICT initiatives from the Ministry of Education. Thus, the Government must accept a large measure of responsibility for the lack of identifiable success in student learning with ICT. At the same time, the Ministry of Education must also be made aware of and accept its responsibility for its lack of success through its failure to advise the Government appropriately. In the researcher's opinion, the Ministry's advice to the Government about teaching and learning with ICT in New Zealand schools has been misguided and ineffective.

This research has uncovered an unhealthy emphasis on ICT teacher professional development which has continued, largely unabated, from the early days of exploratory studies in ICT in the mid-1980s until today. Fortunately, and as a direct result of the consultative process associated with development of the Interactive Education: An Information and Communications Technologies Strategy for Schools (Ministry of Education, 1998), there has been some movement towards recognition of the importance of clarifying what schools should be trying to do in terms of student learning with ICT. Unfortunately, this strategy does not go far enough; it does not recognise and insist that student learning is the most important issue for ICT in New Zealand schools. This means that we are condemned to repeat past actions, and we will therefore be compelled to again witness a lack of student-oriented action in our schools in the future.

Nevertheless, the efforts made recently by those in the outgoing Government and by those leading the Ministry's current strategy for change should be applauded. Their initiatives have helped secure additional ICT funding, on a per student basis, for schools in 1999 and beyond. Furthermore, schools are now required to submit a plan as to how they intend to use this extra funding for ICT. This is the first time that New Zealand schools have been asked to explain, albeit in advance, their intentions in regard to ICT teaching and learning. Moreover, the plan the school is required to submit must indicate any identifiable student learning that is intended to result from the funding made available.

As noted above, while this latest initiative is encouraging, it is nonetheless late and still too limited. All funding allocated to ICT should be tied to specific student achievement and be able to be validated by schools accordingly. It is one thing for schools to submit a

set of intentions regarding expenditure of ICT funding. It is a totally different thing for schools to be able to specifically identify how that expenditure has improved student learning with ICT.

For this reason, the Ministry of Education must make a concerted effort to conduct research and identify the key elements responsible for successful achievement of teaching and learning with ICT in selected schools. It is encouraging that the Ministry is seeking to identify changes resulting from its lead schools initiative, as part of the Interactive Education strategy. However, the research project currently underway has only recently added a student learning component to its protocol.

For nearly 15 years, the Ministry of Education has had the opportunity to identify and report on 'best practice' with ICT teaching and learning in New Zealand schools. Most research in this area has focused on the outcome of pouring funds into associated teacher professional development, with success generally having been measured according to how much the teachers concerned 'felt' they had benefited from the experience. Only in some cases were teachers asked to state how this professional development may have brought about changes in student learning with ICT, but even then, the teachers' claims were not tested by researchers. Thus, there has been a serious lack of meaningful research on what is actually happening in those schools which are the leading providers of ICT teaching and learning in the country. These schools exist in a small but growing number, and their numbers would have been much larger if anything more than 15 years of tinkering with ICT in New Zealand schools had occurred. But they can be found, and their experience with ICT should be studied. If such research is to be meaningful, however, it must be designed to show how these schools have brought about demonstrable improvements in student learning with ICT.

If the Ministry of Education is to advise Government as to what constitutes good practice in New Zealand schools, it is incumbent on the Ministry to obtain the most meaningful data available. Thus, the Ministry must investigate schools that have brought about favourable changes in teaching and learning with ICT and establish why and how these changes have resulted in success for the students concerned. Only with the results of such qualitative and quantitative research will the Ministry be able to provide information to Governments which will force them to act.

8.6 Summary

This chapter reviews the main findings of this research carried out at Central School. These findings have been correlated with the aims of the research and linked to the information presented in the earlier literature review. The main message of the research is that schools must consider *why* they include teaching and learning with ICT in the curriculum; *what* outcomes, through learning experiences and opportunities, they intend for their students; and *how* the processes and practices of teaching and learning with ICT

should be implemented. The focus of the research carried out at Central School has been firmly placed on student learning. All elements of the research have been filtered through the question: "How does/will this serve our students?"

A model of the interrelated elements of the school-wide implementation of teaching and learning at Central School has been presented and discussed. The model emphasises the importance of recognising the complementary nature of its elements, and the need, through management, to ensure each element is in motion while maintaining its dynamic relationship with other elements.

The ICT processes and practices at Central School identified in this research were considered in the light of the Key Characteristics of Effective Schools (Sammons *et al*, 1995). It was not difficult to identify aspects of Central School's ICT operations which closely matched these Key Characteristics of Effective Schools.

This research has important implications for schools and the Ministry of Education. The researcher contends that schools, through their principals and Boards of Trustees, must become more accountable for student learning with ICT. To this end, a range of ICT teaching and learning issues have been listed for the consideration of schools. The researcher also argues that the Ministry of Education must move more quickly to recognise the importance of student learning with ICT. Immediate research conducted in schools already known to be successful providers of teaching and learning with ICT is required. Such research is likely to form the basis of far more meaningful information for schools and Governments, and ultimately for more specific national directives in ICT teaching and learning. We are not likely to obtain the information we need, that is, what we should be doing in ICT with our students today and tomorrow in New Zealand, any other way.

In conclusion, this research shows how one school, in a typical urban setting, has taken responsibility for teaching and learning with ICT. The research presents and interprets the compelling reports and experiences of the people of the Central School ICT learning community. Their stories, their voices, their data, and their teaching and learning in practice provide a rich account of the 'way they do things' with ICT. But when all is said and done, the key to success in this field is the *people* involved in leading, managing and changing the processes and practices of teaching and learning with ICT. If the 'human infrastructure' is in place, and the ultimate goal of successful student learning remains paramount, it should be possible for any school to adopt and apply the elements of teaching and learning with ICT observed at Central School, with the same successful outcomes.

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A Learning Community Through Information and Communication Technology
Characteristics of Success in a Contributing Primary School

Dear

I am seeking your assistance with case study based research on the implementation of information and communication technology in a primary school. I am currently completing a Masters of Educational Administration through Massey University and I hope that this research will form a significant part of my thesis.

The focus of the research is on identifying the key characteristics of any successful implementation related to information and communication technology in a primary school environment. Accordingly I am seeking the assistance of all staff who have direct involvement with information and communication technology at our school. The information gathered has the potential to help other educators in their school setting identify and work towards the possible characteristics of successful implementation related to information and communication technology.

Your participation, in terms of the research, is purely voluntary. Some of the data to be gathered will take place through questionnaires, surveys, interviews and observations. Some data gathering will apply to all staff, while other data gathering will apply to randomly selected staff or to staff selected by the Research Advisory Group. The Research Advisory Group will be made up of the two Associate Principals who have led the information and communication technology team and a current practising classroom teacher.

Any information that you provide will be treated as confidential. While I will be aware of who has been involved in each piece of data gathering, I guarantee that you will not be identified in any report of the research.

If you have any questions concerning the research or any element of the actual data gathering please do not hesitate to contact me. I will ask each of you to sign a memorandum of agreement to participate in the data gathering process of the research.

I wish to thank you in anticipation of your assistance and cooperation. Your participation is critical to the outcomes of the research and I will endeavour to keep you informed of the results. A summary of the outcomes will be made available to you at the completion of my work.

Regards

Grant Ramsay

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

by Grant Ramsay

Introduction to the Study - Aims of the Research

Major Aim

- *To identify elements in a selected contributing primary school that have facilitated the successful implementation of school-wide teaching and learning with ICT.*

Is there a set of identifiable success-guaranteeing elements that can be applied in a generic format to a range of schools? Perhaps, according to Sammons *et al* (1995), who have identified a number of 'Key Characteristics of Effective Schools'. These researchers argue that such 'key characteristics' are consistently found in successful schools. Unfortunately, they provide no clues as to how these characteristics were established in these schools.

The major aim of this research is to identify any key elements of the case study school that are responsible for the successful implementation of teaching and learning with ICT in one school. The researcher has undertaken this case study under the assumption that those elements which contribute to successful implementation of ICT in the study school may be applicable, with similar outcomes, to other schools.

The intention of this research is not necessarily to establish causal links between any key elements identified and the attainment of achievable student learning outcomes. It is intended however to examine any student learning outcomes related to ICT. Rather, the aim is simply to identify any elements that appear to facilitate successful implementation of teaching and learning with ICT in one school. It is hoped that this research might provide schools with clearly identifiable and successful procedures and practices which they may choose to adopt or adapt in their attempts to improve ICT student learning outcomes.

It is also important to point out that this research does not focus on technologies and the actual operation of the equipment. Rather, the focus is very definitely on the people, the processes, the procedures and the culture of a learning community which has used the available technologies as vehicles for learning.

Secondary Aims

- *To establish evidence of links between the stated national requirements of schools, for example achievement objectives in gazetted national statements and consequential teaching and learning with ICT.*

It is important to establish that the case study school has identified any legal requirements related to ICT, through gazetted national statements, and has made clear provision to address these accordingly. There is a difficulty in that there are limited requirements of schools in ICT. This issue must also be considered in the light of the school's own desire or determination to put programmes of work or learning opportunities, with ICT, in place for its students.

- *To establish evidence of links between the stated national requirements of schools, for example, achievement objectives in gazetted national statements, and consequential teaching and learning with ICT.*

It is important to examine the school's position on the implementation of ICT as outlined in specific and documented policy statements. Such policy statements are likely to identify the practices, procedures and processes that bring about ICT student achievement.

- *To consider how the management and operational processes in place support teaching and learning with ICT.*

The actual operation of the school's contributory ICT related processes will have a clear impact on any possible problems and successes. The school's management procedures and operational processes need to be presented in order to provide an understanding of the ICT environment that this learning community works with.

- *To examine how teacher competence and confidence contribute to teachers' understanding, use of, and ability to teach and learn with ICT.ß*

It is argued that teachers are vitally important to most successful teaching and learning with ICT in a school setting. Competence and confidence in teaching and learning with ICT can not be assumed. Teachers are also the students of learning with ICT. There is a need in this research to 'hear their voice', to identify their experiences and expectations. There is also a need for the reader to consider whether the case study school views the teacher as the most important component or as a critical partner in the school wide implementation of teaching and learning with ICT.

- *To identify and examine evidence of links between teacher planning and teaching objectives, learning activities/experiences, and student learning outcomes with ICT.*

Teachers are required to interpret school policy statements into meaningful programmes of work for their students. Such programmes of work should reflect the school's considered and agreed position while addressing and catering for the needs of students. It is standard practice for teachers to develop a sequential plan which begins with a statement of aims and the desired student learning outcomes in important learning areas. Learning processes and experiences can then be captured, student's progress assessed and evaluated, and the results reported back to parents.

- *To identify and describe assessment data, evaluation information and reporting on student learning outcomes through ICT.*

If ICT learning is considered to be of genuine importance, it follows that the content and outcomes of teaching and learning in this area should also be considered, planned for, actioned, assessed, evaluated and reported - just as it is in other important learning areas.

- *To identify and describe the behaviour and perceptions of students engaged in teacher-planned learning with ICT.*

Having examined the declared ICT teaching and learning intentions of the school (in relation to both external requirements and internal needs), together with the planning, implementation, assessment, evaluation and reporting of programmes of work by the teacher, there is a need to observe actual ICT learning in students. This is the only way to determine whether what teachers say or think is happening is actually happening in the classroom, and whether students are learning what the teacher intended.

- *To discover and describe parents' and care givers' perceptions of their child's learning with ICT.*

Since the expectations of parents and care givers have a very real effect on their children's achievements, the research is also interested in the perceptions of parents or care givers about their child's learning through ICT.

Having presented an interpretation of how teaching and learning with ICT operates in the case study school, the selected teacher research participants as well as members of the Research Review Group will be asked to review chapters five and six. They will be asked a number of questions in order to consider any positive and negative influences they felt influence the implementation of teaching and learning with ICT. They will have an opportunity to suggest ideas for future direction / development and most importantly they will be asked if the interpretation presented in chapters five and six accurately describes ICT in their learning community.

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

Board of Trustees Approval

The Board of Trustees at Papatoetoe Central School is satisfied that they have been fully informed concerning the nature and purpose of the research noted above. The researcher has provided us with information related to the aims and focus of the research. We therefore agree to our school's participation as the sole case study focus related to the research provided that:

- all of the information provided concerning participating staff, students and parents or caregivers remains anonymous;
- no information that may identify participating staff, students and parents or caregivers will be published in any presentations or reports related to the research;
- all the information provided through our school is completely confidential to the researcher, where required the Research Advisory Group and where necessary the supervising researcher. A sharing of such information will only be carried out in order to maintain the integrity of the research;
- participants can refuse to respond to any element of the research;
- the Board of Trustees can ask further questions of the researcher at any time during the school's participation;
- the Board of Trustees is free to withdraw the school from the research at any time;
- the Board of Trustees will be given access to the findings and the Board of Trustees will be presented with a summary of the research when the research has been completed;
- all participants in the research must be made aware of their involvement and their approval sought and given accordingly.

In addition the Board of Trustees further understands that the school's participation could include: completion of questionnaires and surveys; participation in interviews; participation of in class observations by the researcher in classrooms and / or at other sites in the school.

Signed: _____ _____

Chairperson - Board of Trustees Researcher

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

by Grant Ramsay

Memorandum of Agreement to Participate

I am satisfied that I have been fully informed concerning the nature and purpose of the research noted above. The researcher has provided me with information related to the aims and focus of the research. I therefore agree to participate in the range of data gathering processes requested of me provided that:

- all of the information I provide remains anonymous;
- no information that may identify me will be published in any presentations or reports related to the research;
- all the information I provide is completely confidential to the researcher, where required the Research Advisory Group and where necessary the supervising researcher. A sharing of such information will only be carried out in order to maintain the integrity of the research;
- I can refuse to respond to any element of the research;
- I can ask further questions of the researcher at any time during my participation;
- I am free to withdraw from the research at any time;
- I will be given access to the findings and I will be presented with a summary of the research findings when the research has been completed;
- the Board of Trustees agrees to the research being carried out in our school.

In addition I further understand that my participation could include: completion of questionnaires and surveys; participation in interviews; participation of in class observations by the researcher while I am teaching in my classroom and / or at other sites in the school.

Participant's Name: _____

Participant's Signature: _____

A Learning Community Through Information and Communication Technology
Characteristics of Success in a Contributing Primary School

Dear Parents / Care giver

I am seeking your assistance with a case study based research on the implementation of information and communication technology in a primary school. I am currently completing a Masters of Educational Administration through Massey University and I hope that this research will form a significant part of my thesis. The Board of Trustees has approved this research to be carried out at our school as part of my thesis and also to serve as a means of school review.

The focus of the research is on identifying the key characteristics of any successful implementation related to information and communication technology in a primary school environment. The attitudes and understandings of parents and care givers is an important part of this research. The information gathered has the potential to assist our school and to help other educators in their school setting identify and work towards the possible characteristics of successful implementation related to information and communication technology.

Your participation, in terms of the research, is purely voluntary. It is important that I have your permission to include the data you provide into the research. The return of the attached questionnaire will signal that your permission has been given.

Some data gathering will apply to all staff, while other data gathering will apply to selected groups of parents and children. Once again, I will seek permission where applicable, for your's or your child's participation. Any information that you provide will be treated as confidential. The research will not attempt or be able to identify any participant. I guarantee that you will not be identified in any report of the research. If you have any questions concerning the research or any element of the actual data gathering, please do not hesitate to contact me.

I wish to thank you in anticipation of your assistance and cooperation. Your participation is critical to the outcomes of the research and I will endeavour to keep you informed of the results. A summary of the outcomes will be made available to you, at school, upon the completion of my work.

Regards

Grant Ramsay

Please return to the school office or your classroom teacher as soon as possible.
Thank you

A Learning Community Through Information and Communication Technology
Characteristics of Success in a Contributing Primary School

Management Questionnaire

The following questions are being asked of you in order to gather data on your school's implementation of teaching and learning with ICT. The focus of the question is on issues concerned with the processes and practises of management as they relate to teaching and learning with ICT. The specific research question of the study is as follows:

iii) *What management processes in the school are considered to be contributory to the implementation of teaching and learning with ICT?*

Please do not feel restricted by the questions below that will be asked of you. If there is any other information you regard as relevant to the focus, please add to or elaborate upon the section in the space provided accordingly.

As discussed, the questionnaire will be filed for further reference to ensure the accuracy and integrity of any transposed text. I refer you again to the Memorandum of Agreement to Participate and remind you of the provisions noted within.

1.0 Leadership

1.1 Who are the people that you identify in a leadership capacity, relating to the school wide implementation of teaching and learning with ICT, in your school?

1.2 Could you outline the roles and / or issues associated with the leaders identified in the previous question, as they relate to your school?

1.3 On a scale of 1 to 10 (1 being the lowest) where would you rank the importance of leadership in relation to the successful school wide implementation of teaching and learning with ICT, in your school?

1.4 In the previous question you rated the level of importance as ___ . Could you give reasons for this rating?

1.5 Please note any other information you consider to be relevant.

2.0 Professional Development

2.1 On a scale of 1 to 10 (1 being the lowest) where would you rank the importance of professional development, in relation to the successful school wide implementation of teaching and learning with ICT, in your school?

2.2 In the previous question you rated the level of importance as ___ . Could you give reasons for this rating?

2.3 Could you outline examples of professional development that the school has carried out over the past three years in your school, and provide reasons for the delivery / facilitation processes and the actual content?

2.4 Who is responsible for deciding on what professional development in ICT takes place in your school and for how it is delivered / facilitated?

2.5 How can you be sure that the professional development in ICT has been successful in your school?

2.6 Please note any other information you consider to be relevant.

3.0 Infrastructure

3.1 What do you consider to be the infrastructural elements of ICT as they relate to your school?

3.2 What infrastructure development / initiatives have taken place at your school over the past three years?

3.3 Could you explain why these development / initiatives were carried out?

3.4 What importance do you place on infrastructure, in relation to the total implementation of teaching and learning with ICT in your school?

3.5 Please note any other information you consider to be relevant.

Thank you again for your cooperation and contribution to this research.

Grant Ramsay

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

Introduction to Staff Questionnaire

It is hoped that when a questionnaire is submitted to the participants, the intention and content of the questionnaire is clear and understood. Unfortunately the only guarantee in this situation is that no assumptions can be made. The questionnaire has been carefully developed relating to the intentions of the research *(refer to the: Letter of Introduction; Memorandum of Agreement to Participate; Aims of the Research)*. The questionnaire has been proofread by three members of the Research Advisory Group and it has been trialed by staff.

By way of further clarification please note that:

- the questionnaires are numbered for administrative purposes of the researcher;
- personal use refers to your own use for your own purpose that may or may not include your teaching related roles;
- the term information and communication technology relates primarily to the computer and its associated applications but for the purposes of this case study, the term also relates to other information and communication technology tools in use at this school (eg facsimile, telephone);
- the term professional development relates to any organised and / or incidental professional assistance aimed at improving your confidence and competence as learner, user and teacher of information and communication technology;
- your responses are your subjective interpretation and the validity of this research relies on the accuracy and completeness of your contribution;
- please do not feel that you have to either complete any written response according to the number of lines provided or conversely be restricted by the number of lines.

Please contact me if I can be of any further assistance. Your cooperation is valued and appreciated.

Grant Ramsay

Staff Perceptions in Information and Communication Technology

Purpose: This questionnaire has been designed to gather information from school staff concerning their: background in; experiences with; attitude towards; perceived understanding of; use of and learning through information and communication technology in their school. The data gathered may provide some potentially useful information for other teachers and schools in their implementation of information and communication technology.

Instructions: Please read each question / statement carefully and where appropriate enter your answer or comment in the space provided, tick the box or circle your response. This questionnaire should take about 15 minutes to complete.

THE INFORMATION THAT YOU PROVIDE WILL BE TREATED AS CONFIDENTIAL

1.0 Background information:

1.1 Number of years teaching in this school: _____ years

1.2 Number of years teaching in all schools: _____ years

1.3 Current teaching level *(eg NE, year 4)*: _____

2.0 Experiences with and attitude to information and communication technology:

2.1 As a teacher, in what year did you first use information and communication technology for student teaching and learning in school? 19____

2.2 What do you personally use a computer for? _____

_____

_____

_____

2.3 What specific uses of information and communication technology occur in your current classroom? _____

_____

_____

_____

_____

2.4 What in school professional development have you received in information and communication technology at this school? _____

_____

_____

_____

2.5 What out of school professional development have you received in information and communication technology while at this school? _____

_____

_____

_____

2.6 Which form of professional development has been the the most beneficial to you?

(circle the most appropriate answer)

in school PD out of school PD both

2.7 Have you been involved in training or sharing of ideas with other teachers in this school relating to information and communication technology? Yes ☐ No ☐

If yes, briefly outline your involvement. _____

_____

_____

_____

2.8 How many hours were information and communication technologies used by students in your class last week? _____ hours

(eg 3 hours of a school day x 5 school days of the school week = 15 hours)

(circle the most appropriate answer for each of the following statements)

2.9 How often do children in your classroom use information and communication technology tools for learning?

Never Some days Most days Every day

2.10 I am confident and competent in applying information and communication technology as a tool for student learning.

Strongly agree Agree Not Sure Disagree Strongly Disagree

2.11 I believe information and communication technologies are successfully implemented as tools for learning by students and staff across the school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

2.12 I believe information and communication technologies are successfully implemented as tools for learning by students in my classroom.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.0 Understanding of information and communication technology at this school:

3.1 This school provides me with clear direction as to the requirements and aims for teachers in information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.2 This school provides me with clear direction as to the aims for students learning in information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.3 Making information and communication technology a compulsory component of the curriculum at this school has contributed to its successful implementation school wide.

Strongly agree Agree Not Sure Disagree Strongly Disagree

4.0 Use of information and communication technology:

4.1 This school provides good support for staff in the applications of information and communication technology tools for learning across the curriculum.

Strongly agree Agree Not Sure Disagree Strongly Disagree

4.2 I am a competent and confident user of information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

4.3 I am a competent and confident teacher of information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

5.0 Learning through information and communication technology:

5.1 This school provides very good opportunities for my personal learning through information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

5.2 This school provides very good opportunities for professional development related to teaching and learning through information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

6.0 Expectations through information and communication technology:

6.1 This school places high expectation on teachers to successfully implement information and communication technology as a tool for student learning across the curriculum.

Strongly agree Agree Not Sure Disagree Strongly Disagree

6.2 I place high expectations on my capacity to successfully implement information and communication technology as a tool for student learning across the curriculum.

Strongly agree Agree Not Sure Disagree Strongly Disagree

6.3 Students at this school expect to learn using information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

6.4 Parents / care givers expect their children to learn using information and communication technology at this school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

6.5 I believe student learning is positively enhanced through using information and communication technology in my classroom.

Strongly agree Agree Not Sure Disagree Strongly Disagree

7.0 Additional Comments:

7.1 Do you have any other comments you wish to make concerning the implementation of information and communication technology at this school? _____

_____

_____

_____

When you have completed this questionnaire please return it to Grant Ramsay. My sincere thanks for your cooperation and assistance.

Student Questionnaire

Information and communication technology (ICT) is about learning with computers, telephones and faxes. Please complete the following questions. The questions will be read out to you. Please ask if you need help.

1. I use ICT at our school to:

- ☐ learn about using computers
- ☐ learn about using email
- ☐ learn about using the Internet
- ☐ learn about using spreadsheets
- ☐ learn about using telephones
- ☐ learn about using faxes
- ☐ learn about using databases

2. Using ICT, I have learned to:

- ☐ write on the computer
- ☐ send messages to people
- ☐ publish stories
- ☐ make pictures on the computer
- ☐ find information from .....
- ☐ make and send faxes

I can also

_____

_____

_____

3. I am making progress on my:

- ☐ word processing certificate and I am at level ____ .
- ☐ telecommunications certificate and I am at level ____ .
- ☐ information processing certificate and I am at level ____ .

4. When I use the computer, I think I am:

- ☐ very good
- ☐ okay
- ☐ not very good

Why ...

_____

_____

_____

5. I like using the computers at school:

- ☐ as much as possible
- ☐ some of the time
- ☐ not at all

6. I expect to have time using the computer to learn ...

- ☐ every day
- ☐ some days
- ☐ not at all

Parent Perceptions in Information and Communication Technology

Room __

Purpose: This questionnaire has been designed to gather information from parents and care givers concerning the use of and learning through information and communication technology (ICT) in their school and relates to their: attitude towards ICT; understanding and expectations of what is happening with ICT for their children. The data gathered may provide some potentially useful information for our school and for other teachers and schools in their implementation of information and communication technology.

Note: For the purposes of this questionnaire, information and communication technology relates to your child's use of some or all of the following for learning: telephone, fax, computer (may include: word processing, publishing, designing, creating, data handling, simulation games, email, internet and the world wide web).

Instructions: Please read each question / statement carefully and where appropriate enter your answer or comment in the space provided, tick the box or circle your response. This questionnaire should take about 10 minutes to complete.

THE INFORMATION THAT YOU PROVIDE WILL BE TREATED AS CONFIDENTIAL

The number on the questionnaire is your child's classroom number. It is required for statistical return purposes only.

1.0 General Information:

1.1 Does your child have access at home to information and communication technologies (see the **note** above)? Yes ☐ No ☐

2.0 Attitude Towards ICT:

(circle the most appropriate answer for each of the following statements)

2.1 I believe that my child needs to learn the skills of and knowledge about using information and communication technology at our school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

2.2 I believe that my child needs the skills of and knowledge about using information and communication technology today and for her / his future.

Strongly agree Agree Not Sure Disagree Strongly Disagree

2.3 I believe my child's learning is positively enhanced through using information and communication technology in her / his classroom.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.0 Understanding and Expectations of ICT:

3.1 I believe information and communication technologies are successfully implemented as tools for learning by my child in her / his classroom.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.2 I believe information and communication technologies are successfully implemented as tools for learning by students throughout our school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.3 It has been important to make information and communication technology a compulsory component of the curriculum at our school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.4 Our school provides me with information about my child's progress and learning in information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.5 Our school places high expectation on teachers to successfully implement information and communication technology as a tool for student learning across the curriculum.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.6 Students at our school expect to learn using information and communication technology.

Strongly agree Agree Not Sure Disagree Strongly Disagree

3.7 I / we expect our children to learn using information and communication technology at our school.

Strongly agree Agree Not Sure Disagree Strongly Disagree

4.0 Additional Comments:

4.1 Do you have any other comments you wish to make concerning the implementation of information and communication technology at our school? _____

_____

_____

_____

When you have completed this questionnaire please return it to your child's teacher. My sincere thanks for your cooperation and assistance.

Grant Ramsay

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

In Class Observation

Teacher: _____ Year: ____ Room: _____
Date:

1.0 Questions related to the observation:

1.1 What curriculum area was the student activity related to?

1.2 What element of the Information and Communication Technology Education Plan was the student activity related to?

2.0 Observation: From: To:

3.0 Student Interview:

3.1 What is the activity you are doing at the moment?

3.2 What do you understand about the certificates?

3.3 Who are the people that tell or show you what to do?

3.4 What do you do when you need help?

A Learning Community Through Information and Communication Technology Characteristics of Success in a Contributing Primary School

Teacher Diary

The following data is being gathered in order to develop information on your school's implementation of teaching and learning with ICT. The focus of this diary is on issues concerned with the practises of in class implementation as they relate to teaching and learning with ICT. For you general information, the specific research questions of the study concerned with this stage are as follows:

(i) *How are teachers incorporating any school ICT intentions/objectives in their planning for student learning outcomes?*

(ii) *What ICT learning opportunities/activities are created for, captured and experienced by students?*

(iii) *How does the school assess ICT student learning outcomes?*

(iv) *What evaluation of teaching and learning with ICT is carried out?*

(v) *How are ICT student learning outcomes reported within the school and to parents/care givers?*

As discussed, the diary will be filed for further reference to ensure the accuracy and integrity of any transposed text. I refer you again to the Memorandum of Agreement to Participate and remind you of the provisions noted within.

Could you complete brief notes in this diary for each of the five consecutive school days under the respective headings provided for you. A brief explanation of the sort of data requested under each question is as follows:

1.1 What ICT related activities occurred in your class today?

Simply record the actual ICT activities in general terms to best describe your class or groups engaged practise, e.g:
In groups of three, students completed final copies of faxes on the computer about things we use and play with at school, printed and faxed them to ..... OR
Students entered drafted text on stories / poems / letters about .... OR
Student individually emailed a communication to a friend in Washington on the favourite food our class eats for lunch at school, etc.

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

Note the relevant essential learning area and strand if possible, e.g.
English - (writing) and social studies - (resources and economic activity) OR
English - (writing - transactional) OR
English - (writing / reading) and mathematics - (statistics) etc.

Note the ICT goal as either word processing, telecommunication, information processing. It could be just one goal or any combination of the three.

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

This one is a little tricky. It involves a subjective call on your part as to any individual or group achievement in learning with ICT. The learning could be related directly to the processes of the technology i.e. X learned how to save and print a fax, OR Y addressed, completed and sent an email. The learning could also be related to a process or content objective in a current unit - you would need to simply transpose this from the current unit of work.

In all questions I need your responses to be brief and to the point.

Day One:

1.1 What ICT related activities occurred in your class today?

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

Day Two:

1.1 What ICT related activities occurred in your class today?

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

Day Three:

1.1 What ICT related activities occurred in your class today?

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

Day Four:

1.1 What ICT related activities occurred in your class today?

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

Day Five:

1.1 What ICT related activities occurred in your class today?

1.2 Where did these activities "best fit" in terms of an essential learning area and in terms of the school's three ICT goals?

1.3 Were there any significant student behaviours that indicated successful learning with ICT?

Thank you again for your cooperation and contribution to this research.

Grant Ramsay

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

Summary Questionnaire

Introduction

This questionnaire is being presented to the five teachers selected by the research review group and to the members of the research review group, eight people in total. I would like your responses to the questions below based on the content of chapters five and six of the research. As always your responses used in any way in the research will treated confidentially. All responses entered into the research will be coded.

Could you please complete the following research questions and email them to me as an attachment.

Thank you for your vital support in this research.

Grant Ramsay

7.1 Implementation of ICT - positive and negative

(i) What factors or characteristics within the influence of the school did you as a teacher research participant identify as assisting or detracting from the implementation of teaching and learning with ICT?

7.2 Implementation of ICT - the future

(ii) What suggestions do you as a teacher research participants have for any future changes or developments related to teaching and learning with ICT at Central School?

7.3 ICT - 'the way we do things around here'

(iii) Does the content in chapters five and six present an accurate interpretation of the implementation and processes of teaching and learning with ICT at Central School?

SCHOOL

INFORMATION TECHNOLOGY DEVELOPMENT PLAN

Phase 1 - Establishment of General Overview - as at March 1995

- Review implementation to date concerning: staff development; hardware; software.
- Review classroom programmes in action and student involvement / achievement.
- Advertise the position of Assistant Principal to include the areas of responsibility of the proposed Information Centre, information technology, text resources.
- Establish the I.T. Team and various roles under the direction of the Assistant Principal.
- Guide the I.T. Team to consult, consider and establish a plan for school / staff development relating to actual programme content (refer to separate plan).
- Review and update or replace the pupil database with Kidbase.
- Confirm and update school" relationship.
- Review and amend current "I.T. in Class" policy to reflect the mandatory requirement of I.T. in the classrooms. Review also the hardware and software purchase / replacement policies.
- Reconsider and plan for the applications of the proposed Information Centre to include: staffing; proposed learning opportunities; resource management; resourcing; hardware; software; building design.
- Review and coordinate the storage, recording, loan and applications of all available software.
- Review and purchase as required additional printers and portable computers.
- Review and update the evaluation / reporting process and report format.
- Following the I.T. Teams's development plan consider medium and long term application and implications e.g. telecommunications - (telephones, email, internet, audiographics), networking - (fileserver, netstackers, wiring, CD access), additional classrooms, increase of powerbooks / printers.
- Establish and advertise for the senior teacher position of technology support / trainer and troubleshooter.
- Implement staff development plan for I.T.

- Implement the Information Centre plan.
- Implement the classroom programmes consistent with school goals and any policy requirements.
- Implement the revised reporting process.
- Develop and implement the school networking plan concurrent with the Information Centre Plan.

Information Technology Centre

Background - see March 1995 Development Plan

So far:

The building development over the last year has involved -

consultation with the architects and builders
coordination of colour schemes and floor coverings
organisation of furnishings
negotiations with ıtion to develop a computer equipment purchase plan
consultation with : regarding the development of a school wide computer network
contracting of nunications to install our computer network and a new school wide phone system
involvement in the s library development programme
moving of all library resources into the centre
weeding of resources stored in the hall and the moving of the resources to the information centre

What's happening now?

organisation and data basing of all computer hardware
organisation and data basing of all computer software
cleaning of all computer equipment
setting up of the school library and opening it for borrowing
cataloguing of remaining library resources and starting to catalogue and bar code the resource room resources
development of the 1995 I.T. team - roles, responsibilities
maintenance checks on all hardware and installation of software to ensure all computers are able to operate a word processing programme
planning for an initial staff development session focusing on upskilling new staff to be able to competently use the word processor in the classroom
school wide introduction to the CDi player on loan to the school
review of software on loan for the CDi and planning of units of work that will allow for the incorporation of the CDi into the units of learning in the classroom
completion of school wide network installation
completion of all school wide phone installation

planning for professional development for network use, reporting and e-mail use

Where to next?

employment of two teacher aides to assist with staffing the centre, working with groups of children and organising resources

establishing the I.C. environment

getting the furniture and equipment in

putting together both long and short term overviews to allow for specific planning to support classroom programmes school wide

development of the professional development programme focusing on -

staff - further use of Clarisworks

use of the computer network

reporting

e-mail

special abilities - enrichment groups

children as tutors

setting up of the resource area

setting up of the teacher library and meeting centre

multimedia focus - use of text, sound, graphics, video to full potential

Appendix 16

FROM :

EDUCATION ADVISORY SERVICE

Fax Message To

Organisation: Central School Date:March 20
FAX Number: Pages Sent: (3)

Here are the notes from our meeting. I'd like to follow up with another meeting in order to start planning the Professional Development Plan with you. Before that happens you'll need to gain some information from your Management team.

1. Establish the three focusses for school wide implementation

2. Amount of resourcing available for teacher release

Remember, as we discussed, that it is possible to cater for teachers already competent in using the writing process and Information Technology in their classrooms to still follow this focus by eg extending the audience through electronic mail.
There are still some areas that we need to discuss in terms of Policy and Organisation. This area should be able to be dealt with as we go through the PD development process.

Can you ring or fax me when you are ready to have the next meeting.

Regards

discuss on Thurs?

Needs Analysis

8 March

What are we doing for all learners

Points Covered

A Establish current classroom practice (children and teachers)

Actual Classroom Practice

What all children can do and are doing
and at what levels?
eg emergent early & fluent writers?

Confidence and competence of all teachers in
(use a continuum)

Communicating Information

WP & DTP

Email

Handling Information

Databases & Spreadsheets including Access It in the Library

Investigations/Simulations

Control & Measurement - Logo , Robotics & Data logging

Multimedia - Authoring Tool & Utilising existing CD eg Encarta
integrating into the curriculum schemes

B Agreed School Wide Implementation
(Emphasis on 3 for this year)

1. Word Processing

2 Investigations - Thematic Unit approach

3 Perhaps accessing information - Access It

Draft Board Staff Community Agreement

INFORMATION TECHNOLOGY EDUCATION PLAN (draft)

Introduction

This Education Plan is a statement of intent as to how the teaching and learning of Information Technology will be carried out at School.

This Education Plan is consistent with our school philosophy and is based on:

- the needs of our children
- *Technology in the New Zealand Curriculum*
- *English in the New Zealand Curriculum*
- the New Zealand Curriculum Framework
- the strengths of our teachers
- the resources available

Information technology has been determined as a compulsory component of the curriculum at . As such, learning experiences and opportunities will be created using the various tools of information technology. Learners at are not being allowed to wait for outside intervention to determine the scope of learning opportunity. Our community has signalled, both in voice and financially, their commitment to information technology. There is a clear expectation by the parents / caregivers and learners to learn through the experiences and opportunities possible in information technology. The challenge for all staff at is to convert this expectation into reality.

In establishing New Zealand's our learning community has decided not to mark time with mediocrity. We want a school of the future in action today.

1. Learning Needs

There is an established and lifelong need for information technology in our society. Information technology is an essential vehicle for learning about and accessing information and communication, enabling us to explore and expand our understanding of the world.

Based on this, all learners at will develop confidence, competence and enjoyment in the applications of information technology through their environment, practices and the resources made available.

2. Objectives

- to develop independent, life-long learners who are are ease with and apply the tools of information technology
- to make learning through information technology an enjoyable and successful experience
- to monitor progress, determine individual needs and provide appropriate sequential skill development integrated throughout the curriculum programmes
- to emphasise that information technology is a set of tools to enable learning
- to teach the skills and strategies that will encourage the learners to take responsibility to further apply their knowledge and understanding

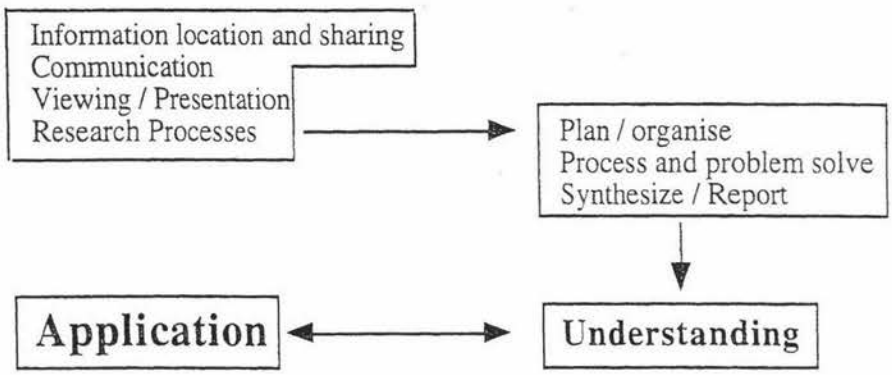
3. Content

Children learn about information technology by being immersed in an environment that encourages and expects active learning to take place.. Learning through information technology should be purposeful, meaningful, child centred and enjoyable.

We will have an Information Centre that facilitates / provides:

- a resource base for storage and retrieval
- a communication centre that encourages sending and receiving throughout the centre, school, nationally and global;
- learning how to learn by the learners

Through:



Refer to the Essential Skills NZCF

Determined through

INFORMATION COMMUNICATION

Please refer to the following set of skills, stated as **learning outcomes**. Learners will encounter experiences and opportunities related to this set of skills determined by their individual needs and achievements.

Please note that the Stages described are generalised in that no one learner will necessarily progress according to the set. Learners progress according to their accumulated experiences and assessed needs.

Emergent Stage:

Early Stage:

Fluency Stage:

4. Learning Experience - Teaching Approach

In developing children's skills and understanding in information technology, we believe that children best learn by

5. Planning

Refer to the School Planning Policy

Planning should centre on what the learner will do, not what the teacher will do.

Planning will include:

A written term overview of the approaches to be used, with reference to themes/topics to be included.

6. Assessment / Evaluation

Refer to the School Assessment / Evaluation policy.

Assessment / Evaluation will include:

7. Resources

The following resources are available and to be used in conjunction with this policy:

What: The Information Centre

Where:

Who: Associate Principal - head of information technology
- Senior Teacher - hardware / software solutions
; - Associate Principal - head of technology
?? - teacher - I.T. Team
?? - teacher - I.T. Team
?? - teacher - I.T. Team
; - School Secretary - school administration

Staff Meeting

24 April 1995

1. General Sharing of information.

2. Information Technology - Professional Development

The meeting focussed on the introduction of the IT professional development plan overview. A number of points were covered which I would like you to think about:

- Thank you to the IT team for their careful work in coordinating the planning that is specific to our school.
- I am very aware of the number of professional development options already presented and of the teachers who have pursued this area individually.
- It is pleasing to observe the quality work already underway.
- I am not convinced that IT is being consistently and comfortably handled throughout the school - nor am I convinced that we have consistency in e.g. planning, content, management.
- The need for IT to be an **integral and compulsory** part of learning organisation within the curriculum at has been established.
- No assumptions about individual ability are being made. I am very keen to see our school goals as they relate to IT, clarified and for individual teachers to develop their own **action plans** related to these goals.
- There has been a call to see specific learner outcomes established to provide a base level of expected skill / knowledge.
- Expectation is everywhere, from the computer industry and the wider business community, to our local school community, our parents and of course our children. I also expect that IT is being included as an integral part of the learning environments of all rooms. **It is to be considered a compulsory element of our teaching and learning programmes in all classes**.
- The area of "Computer" is to be included as part of the term overviews for term two. Given the goals set by the IT team it is important to include at least two four week sessions on word processing as part of your writing programmes.
- Individual teachers, through their action plans may wish to note additional areas for exploration. This is fine so long as the schools goals have been addressed for all learners in your class.
- We have an abundance, by comparison to most other state primary schools, of computer hardware and software. We have expertise on our staff. We have access to support from , we have access to the District Adviser in Technology and most importantly we have motivated and highly competent classroom teachers.

Lets make sure that we are systematical in our approach and determined to access the technology we have available to all of learners.

ß3. took teachers through the proposed plan and some exercises related to IT. Teachers were asked to complete and hand back a Teacher Reflection Sheet by Friday 28 April.

Board of Trustees
Principal
Staff

Papatoetoe Central School

Job Profile of: Miss

Position: Scale A Teacher

Responsible to: Management Team

Major Responsibilities

- As a practising classroom teacher be conversant with and implement policy and procedures as noted in the Charter, Education Plans, General Policy, Assessment and Long Term Planning folders.

- To support and implement the 1998 School Development Plan.

- To assist in the area of English

- To assist in the area of Library

Appraiser _____ **Teacher** _____

Date _____ _____ **Principal** _____

Key Performance Areas	Key Performance Indicators	Review Date
Teaching and Learning **Science:** • To implement the planning and assessment requirement of the science education plan.	• long term plans up to date according to the long term planning folder introduction. • weekly planning up to date according to section 5 of the science education plan. • assessment processes up to date according to the assessment folder introduction. • identify observable links from long term plans to daily plans to assessment data based on programmes of work.	Progress and planning meeting by 26 June
Information and Communication Technology: • To implement the requirements of our two school wide goals of Word Processing and Telecommunications.	• the requirements for word processing on the writing long term plan is evidenced. • samples of word processing are evidenced in the individual profiles. • the individual certificates of Word Processing and Telecommunications are being implemented an are up to date. • evidence of information technology being planned for in units of workers science (use of the IT planning template is optional). • links established between long term plans, weekly plan and certificates. • resource reference list is up dated and used during planning.	Data Collection by 28 August
Curriculum / Programmes in Action: • To receive in class support in selected curriculum areas to assist with and ensure consistent high quality of programmes in action.	• the quality of children's work evidenced at our expected high standard to be consistent in the class and other classes at the year level throughout the year. • an expected high quantity of children's work evidenced in books and in respective class areas to be consistently developed throughout the year. • management / approaches of individual and grouped learning evidenced according to education plans and to the selected curriculum focus (curriculum programme criteria in consultation with ı).	In class visits by
Personal • To implement an activity based rotational maths programme.	• ability to use a task board effectively so that children can work independently. • ability to group children appropriately and with consideration to children's differing abilities from strand to strand evidenced in daily plan book. • ability to use assessment tasks and daily observation to record children's progress evidenced with daily monitoring sheet.	

Key Performance Areas	Key Performance Indicators	Review Date
Wider Contributions		
• To assist in the area of English	• Read and be familiar with the English National Curriculum Statement. • To assist with Team planning. • Assist in the maintenance, storage and distribution of English resources.	
• To assist in the area of Library	• Help prepare an annual development plan • Liaise with the Teacher Aide and supervise library related work accordingly. • Liaise with the Executive Officer regarding the Library Asset register. • Assist with the purchases and maintenance of stock - liaise with booksellers. • Assist with the system of operation - liaise with	

STAFF FEEDBACK

Performance Management System
Planning Data Collection

Name: **Date: 26.8.98**

Long Term Plans

Consistent evidence of:	**Reading**	**Science**
Simplified achievement objectives / learning outcomes highlighted	Evidenced	Evidenced
Process objectives / Content learning outcomes identified	Evidenced	Evidenced
Inclusion of Information Technology focus	Evidenced	Evidenced
Groups of learners identified	Evidenced	N/A
Relevant learning experiences for grps	Evidenced	Evidenced
Assessment task identified	Evidenced	Evidenced
Essential skills identified	Evidenced	Evidenced

Comment Assessment tasks in reading identified very clearly and detailed. Your long term planning is meeting all requirements - well done and thank you. We need to ascertain the process objectives matched to a particular group of learners. It appears to be the whole class working on the same set of objectives? Very good ICT focus- well done

Assessment:	**Reading**	**Science**
Folders		
Links to LTP - Ach levels	Evidenced	Evidenced
Links to groups of learners	Evidenced	N/A
- Learning outcomes	N/A	Evidenced
- Process objectives	N/A	Evidenced

General

Individual profiles, dated signed up to date All done, well organised and labelled.

Word Processed samples included Yes

Information and Communication Technology certificates up to date - All in place

Comment
Anecdotal notes included on assessment sheets very comprehensive especially in science. Thank you for maintaining a high standard with the keeping of all your records. Some work on the ICT certificates is exemplary - two students yet to make a start?

Weekly Plans

Evidence of	**Reading**	**Science**
Links to LTP	Evidenced	Evidenced
Grps of learners identified	Evidenced	N/A
Overall consistent completion	Very good	

Comment
A well kept set of weekly plans with detailed information. It is easy to identify the relevant learning experiences. A very good record of where your students have been and what they have been doing. There are very clear links to your long term planning and to your assessment. Well done.

General
We were most impressed at the detail and quality of your work in all areas examined. Your conscientious approach to record keeping is amplified in the actual programmes of work in action. You have every reason to be very proud of your work, just as we we are so proud of your achievements. Thank you for your effort and commitment to our school wide systems and processes.

Papatoetoe Central School - Long Term Plan

Essential Learning Area : English / Reading

Achievement Level 1 **Personal** Term Four Weeks 1-11

Simplified Achievement Objectives	Learning Outcomes	Process Objectives	Learning Experiences
Has begun to select and read for enjoyment a range of written texts. Has begun to select and read for information a range of written texts. Has begun to use: - semantic cues; - syntactic cues; - grapho-phonic cues.	**Students should be able to:** select with assistance / direction from written texts including library fiction and non-fiction, class readers, poem cards, own and other's stories, living books and computer based texts to demonstrate engagement; select with assistance / direction from written texts noted above to demonstrate literal understanding of initial questions; expect reading to make sense; understand that words have meaning; understand that words have some similar structures; understand that letters or groups of letters have associated sounds; have met criteria for an emergent reader and started on criteria for an early reader (ref. Ind. Rdg Rec).	**Selected from Ind. Rdg. Record criteria:** Is able to demonstrate, front, back and spine of book. Is able to recognise print. Has correct directional movement. Has One to one correspondence. Is able to demonstrate first and last parts of a story. Is able to recognise capital letters and lower case correspondence. Is able to show one letter in a word. Understands the purpose of: fullstops, question marks, commas and speech marks and how they affect meaning. Can recognise the difference between a word and a letter. Is able to recognise some heavy duty words. Is able to recognise similarities in words and word families.	<u>Group Readers</u> Readers at appropriate levels with follow-up activities to reinforce high frequency words and other specific learning outcomes. <u>Task board</u> Poem cards Big books Class Library TARP - Listening Post Alphabet Games Reading around the room Book Boxes Jigsaw Puzzles <u>ICT related activites</u> Living books Reading each others stories Specific CD's to strengthen reading skills) Generating reading books related to guided texts using digital photos, claris draw and word processing - these to be used as independent reading material <u>Visit to School Library</u> Support of identified reading record criteria, parts of a book and the use of the electronic catalogue to search for resources. <u>Weekly Big book and Poems</u> Monday - Teacher Introduce book Tuesday - Read together Wednesday - Children read to teacher Thursday - Tricking (Teacher makes errors and children correct) Friday - Activity related to big books

Essential Skills:	Assessment	Individual Running Records Teacher Observations Alphabet Knowledge Tests Word Test
Full Conference Learners ALL CHILDREN		

Jo Abernethy 1999

Information and Communications Technology Programme

Information and Communications Technology Team

Rationale:
The I.C.T. team is a key element in the establishment of your information and communications technology programme. The team can play a vital role in emphasising the importance of information and communication technology school wide, assisting in the development, coordination and management of the programme in both the short and long term. The advantages of having an I.C.T. team actively in place are:

- empowering staff to willingly share their enthusiasm and expertise in a managed and coordinated way;
- establishment of a planned professional development programme and ongoing support programme providing school wide leadership;
- functioning as a advisory team to support all learners in the application of information and communication technology tools;
- providing creative solutions to software, hardware and networking issues;
- development of an innovative approach to budget management and revenue raising.

Examples of specific team roles:

I.C.T. coordinator:
Coordinating the I.C.T. team:

- developing specific roles responsive to and in anticipation of needs;
- organising professional development for and with the team.

Coordinating the operation of and delivery of programmes of work:

- provide an ongoing in class support programme throughout the school;
- operation of and learning and teaching associated with the library / resource area;
- development of multimedia projects with staff and children;
- assist with the facilitation of information access and effective communication throughout the school and beyond;
- coordinate the planning for staff development relating to the Information technologies available throughout the school;
- coordination of and responsibility for staff supporting the development of the information and communication technology programme;
- purchase, administration, distribution and maintenance of all information and communication technology associated products;
- budget management and funding responsibility;
- network management and content back up;
- responsibility for public relations - Board of Trustees, community;

- coordinating reviews of programmes in action;
- coordinating the implementation, application and evaluation of the creatED information and communication technology programme;

Hardware and software solutions coordinator:

- coordinating the school wide report writing programme;
- maintaining software and hardware databases;
- implementing a lunchtime enrichment programme;
- assisting in the development of the professional development overview for the year;
- assisting in the planning and implementation of whole staff and individual professional development sessions;
- assisting in the development of hardware and software purchase plans;
- developing and sharing expertise in the use of specific software packages;
- assisting with the weekly backups of the server content;
- managing bookings and maintenance of power books.

The following roles to be completed by members of the I.C.T. team:

Hardware and software maintenance programmes:

- maintaining the staff computer help book;
- coordinating responses to the staff needs in the computer help book;
- assisting in the planning and implementation of staff professional development sessions;
- assist in the coordination of fund raising schemes to support information and communication technology development within the school.

Cleaning and maintenance programmes:

- staff training - mouse, phones and external computer cleaning;
- monitoring of the above;
- regularly rebuilding the desktops;
- running a regular maintenance software programme;
- assisting with the planning and implementation of staff professional development programmes.

Software installation / maintenance programmes:

- installing software;
- assisting with the planning and implementation of staff professional development programmes;
- running a regular maintenance software programme.

Administration centre management:

- maintenance of machines within the administration area;
- developing and sharing expertise in the use of the selected administration
- software;
- developing and sharing expertise in the use of the school wide network;
- contributing to aspects of the delivery of the staff professional development sessions.

INFORMATION COMMUNICATION TECHNOLOGY TEAM MEETING
10.3.98

Matters for discussion:

- **Upgrading of machines - Laser printer, 475's machine for foyer, server for Kidbase / Filemaker Pro server software**

Check with Max as to the upgrading of RAM for 475's and whether these are worth it in terms of speed. Maybe these machines can become the second machine in rooms. Laserwriter is going to need replacing. Discuss with #### to see if it is worth keeping and putting into the Info Centre or is it worth more as a trade in as it appears that the drum is going to need replacing again. Prices will be sought for a server to have Filemaker Pro Server placed on it.

- **Telecommunication certificate training**

Training has been organised with three groups of staff. March 17, 18, 25. 3.30 pm - 5.30 pm. Skills / application / management aspect covered within these sessions.
March 17 - ##### and #####; March 18 - ##### & #####; March 25 - ##### & #####.
will provide training in transferring calls at the beginning of each Wednesday session.
All staff to attend one of the sessions. ###### will upskill herself ready for the Tuesday session on transferring calls.

- **Cleaning kits and oversight / Covers**

All team groups have been given the cleaning kits. ##### will supervise and oversee the cleaning in the junior school and ##### will oversee in the middle school. Monitors to clean the Info Centre and also check on a Monday.

- **In class support - projects**

R 23 currently working on a Hyperstudio stack Our school - Past ,Present and Future. Discussion arose on other aspects of involving a wide range of classes and teachers in incorporating other aspects of IT in their class programme. Members of the IT team who would like to put together a ' project' to plan and discuss with #####

- **Colour cartridges - use of / storage.**

Decision made to allocate colour cartridges to the following people so that staff have ready access if they need the colour cartridges. #####, #####, #####, #####. will check as to the purpose of using colour before handing them out.

Thanks everyone

#####

ICT Team Meeting Notes 30.6.98

Apologies: #####

- **Training for Community**

to discuss with ##### and ##### on Thursday when they have a planning day.

- **Sponsorship Drive**

to stamp froms. ##### to ask ##### to construct a class graph for targets. Prizes to include one for the class with the most, one for every three sponsors and one for the family with the most. ##### to check out the $2.00 shop to make up surprise packages for the sets of three sponsors.

- **Certificates** - setting targerts for Year levels to achieve

Quick discussion on this to be raised at management mtg on Thursday. ##### offered ideas on the age levels and achievements. ##### also discussed the publishing of work on the computer. This to be raised at management meeting. The centre should be being used 'correctly'..

- **Show and Tell Staff Meeting - Week Nine**

Discuss at team level and organise timetable closer to the day. Booked already on the noticeboard.

- **Cleaning of machines.**

Room 3 only one not cleaned. ##### suggested we need to have a ballerina cloth and a wide paintbrush in the buckets. Each ICT team member to keep the bucket until cleaning week. This to prevent acquiring of contents for other purposes.
Allocation of buckets as follows:
- Admin Rms 1 - 4
- Rms 18 - 21
- Rms 22 - 24
- Rms 13 - 16
- Rms 9 - 12
- Rms 5 - 8
- Info Centre

- **Other**

Booking sheets for the areas and equipment in the centre to be placed in a folder on the staff disk. ##### to do this over the holidays.

Have a great break team

Thanks everyone

#####

ICT UPDATE - June 1999

Staff and BOT Information

Hi everyone - things are continuing to race along on the ICT front.

E-mail documentary:
Four Auckland College of Education students spent half a day in the school filming and interviewing last month. They were investigating the value of e-mail in schools, spending time in junior and senior classes observing teachers modelling and collaboratively composing e-mail as well as interviewing teachers and children about the ways in which they use e-mail. The group will be putting together a video documentary as their assignment ... fingers crossed they get an A!

Visitors to our school:
We have had two out of town schools visiting us over the last month to find out more about the way we do things related to ICT. school. a small rural school in the King Country and diate. Both schools would like me to pass on their thanks for sharing such a special place with them.
We also had the Minister of Education here for a brief visit. If you would like to find out more about his visit please check the Herald article in the media folder.

New Purchase:
Our library team has purchased the latest World Book Encyclopaedia on CD Rom. It is an awesome new resource available for use in the information centre. Please take the time to introduce it to your class and show them how to navigate around it.

Disks for teachers:
All classroom teachers should have received a floppy disk to support their backups of class reports.

Professional Development Review:
It has been another busy term with the ICT team running a range of courses to help further upscale our staff. We are now more competent in the use of the digital camera, the report writing programme, using eMates, setting up an appropriate computer environment and using the Journal Search program.

Next term will see a focus on organisation and management of the server disks, further word processing and telecommunication work and the introduction of the information processing certificate to all staff.

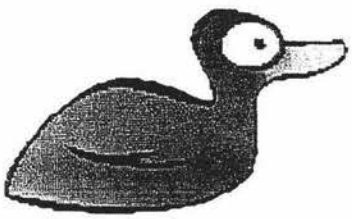
In class support:
Thank you to all staff for the willing and enthusiastic way in which you have worked with me on your ICT in class support programme. I have been really impressed with the work both during the support time and the follow up.

One of the areas of focus for a number of rooms has been to look at including the teaching workstation and computer on the mat area. This allows for greater opportunity to model on the computer, to allow for teaching points and incidental teaching moments. A number of classes have already rearranged their furniture to allow for this and their rooms are looking great and are functioning successfully. For those of you who haven't considered this issue it may be worth looking into when you address the holiday change around of furniture for the new term.

Mrs and are going over the correct process for k with the rest of the class.

End of term reminders:
Between now and the end of the week could you please complete the following:
- All of our computer covers need washing. Ideally this should happen either side of the holidays so that computers remain covered during the holiday period. If you can, please take home your cover to wash and return.
- Please transfer any digital photos you have stored in the student disk to your computer hard drive as the back up process is a near impossibility at the moment. This MUST be done before the end of the week.
- DEATH ROW!!! is incredibly full. Please check in the folder before the end of the week to remove anything that may have been incorrectly saved. It will be emptied during the holidays.

Thanks - and the ICT team.



ICT UPDATE - July 1999

Staff and BOT Information

Hi everyone - the ICT team are already preparing your **professional development** programme for the term. We will organise a timetable for you to book into during the next week or so ... as always it will be available in the photocopier room for you to book into.

There is ongoing demand for more training and support, unfortunately the team cannot meet all requests through the before school, lunchtime and after school training sessions. We have tried to come up with additional ways in which to provide you with further information or support.

This term will see the introduction of the 'software update sheets'. These sheets will give you information on two or three pieces of software that we have available at school. The software will be briefly introduced and suggestions as to the appropriate area of the school to use it in will be made. The first sheet has just been issued and covers 'Creative Explorer' and 'Cliptoonz' clip art.

We will also increase the circulation of 'how to...' sheets. These will cover a range of things from using specific hardware in the school to developing presentations to useful internet sites and how to access them.

For your reference I have set up two folders to be kept in my office containing copies of these information sheets ... in case you misplace your own.

Your feedback on these initiatives would be appreciated.

Living Library:
Thank you for taking the time to look at this teaching and learning resource at our last staff meeting. The feedback so far has been extremely positive. A number of people have the trial user ID and password to delve further into it. I suggest you use the iMacs in the information centre for this.
We have the trial password for another couple of weeks. Please take another look at it if you haven't done so already. We will make a decision on purchasing licences for it once the trial is complete.

Clear file folders:
We would like to formalise the clear file folder system school wide during this term.

To provide a clear record of children's progress with examples in the area of ICT each child's existing clear file will be used as a type of portfolio.

The word processing and telecommunication certificates will be placed in the front of the folders followed by draft and published pieces.

This will mean you don't have to keep flicking through the word processing and telecommunication folders to find specific certificates, instead each child will have all information in one folder.

Once this system is in place you will no longer need to place word processed samples in the individual folders as they will already be in the clear files. All sample requirements must still be met.

Once you have emptied your existing word processing and telecommunication clear files of class sets of certificates you will have somewhere to file your ICT help sheets and software updates.

Please come and see me if you need any further explanation.

Word Processing Exemplars:
The development of the exemplar booklets in the area of word processing are underway. Thank you to those staff who have already sent at least two of their best class examples (draft and published) through to me. If you haven't yet done so please send them through as soon as possible.

These booklets will provide quality examples and assist you in setting expectations within each of the four word processing levels.

Max:
As you are all aware Max, our technician, has accepted a new position. Max has asked me to pass on his goodbyes to you all and to thank you for being 'the best school he has ever worked in'.

We are looking into the issue of providing further technical support for the school.

Useful Internet Site:

Have a look at the English on line site (http://english.unitecnology.ac.nz). It is a fantastic resource site including English units, a forum for teachers, an internet tutorial, on line projects, a resource centre, ESOL support and more. Any relevant units and teaching support is organised into year groups from primary through to secondary.
It really is a great resource to assist you in your planning with some wonderful exemplar units that have been trialled and tested by teachers for you to develop for your own use.

Printing help:

1. Please talk to your classes about only sending a message to print once. If their work doesn't print there is a problem, by selecting print over and over again a queue is built in the print monitor that only adds to the problem.
2. Check your printer is on and that paper is loaded.
3. Go to the finder .... small icon at the top right hand side of the screen in the menu bar to see if there is a message in the print monitor (this may give you a clue as to what is wrong).
4. Check your printer is chosen. Go to the apple menu - chooser - click on your type of printer. If it is a work station printer it will have AT beside it to indicate that it is a printer shared across the network.
5. Printing requires memory. Occasionally you will get a message telling you that you have not got enough memory to complete the process. If this is the case check in the finder again to see if you have left other applications open. Quit these to free up additional memory.

Please encourage your children to quit an application when finished rather than just clicking on the close box which merely shuts the window but leaves the programme running.

Peer Tutoring:

We have some extremely able children in the senior school who can work in with children school wide to provide additional tutorage in the skill development on the certificates. Please remember that only teachers are to check the applications boxes assessing the application of the skills in planned studies or tasks.

New Resource:

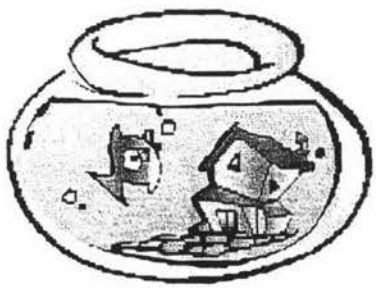
We have purchased a great new resource for you all to make use of. It is a folder containing over 1000 of the best internet sites for educators.
The folder is divided into curriculum areas. Within each area you are given an internet address, comments, a presentation grade, a content grade and a guide as to the most appropriate age group to use the site with.
The folder will live upstairs in the information centre once it has been processed.

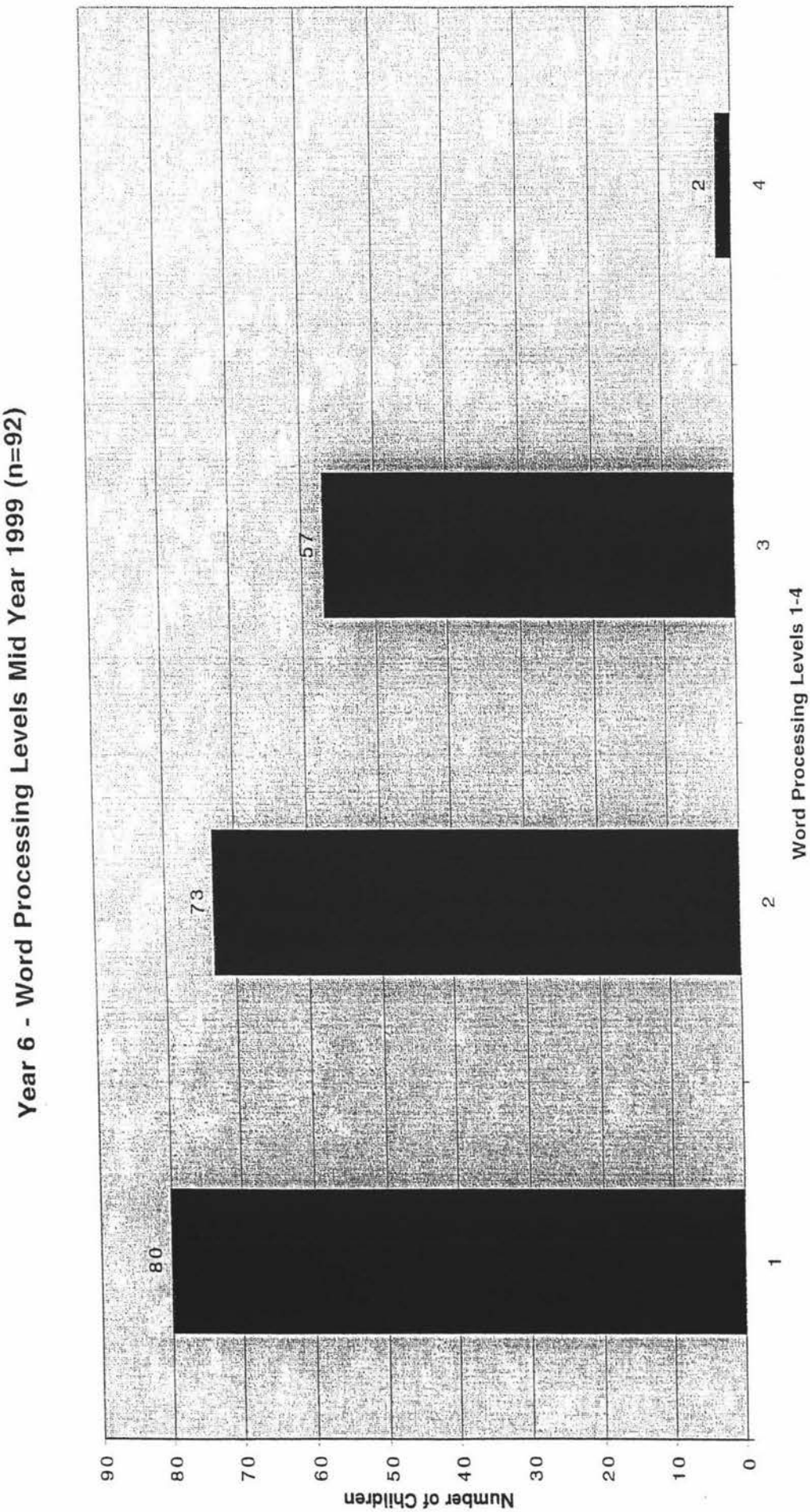
Word Processing and Telecommunication Sticker check:

Thank you to those of you who regularly send children to see me or invite me to your rooms to celebrate the completion of levels on their certificates. There are, however, a small number of classes who need to update the certificates. In some cases the certificates note the completion of levels but need the stickers issued. To check on this and to encourage any updating I will be circulating a checklist to all classroom teachers asking you to sign if your certificates are all up to date including stickers ... most children from year 2 upwards should have completed a level over the year so far. Please take the time to stop and think about the work you have been doing, look at the certificates and indicate on the form if you need me to arrange a visit to get the stickers up to date.

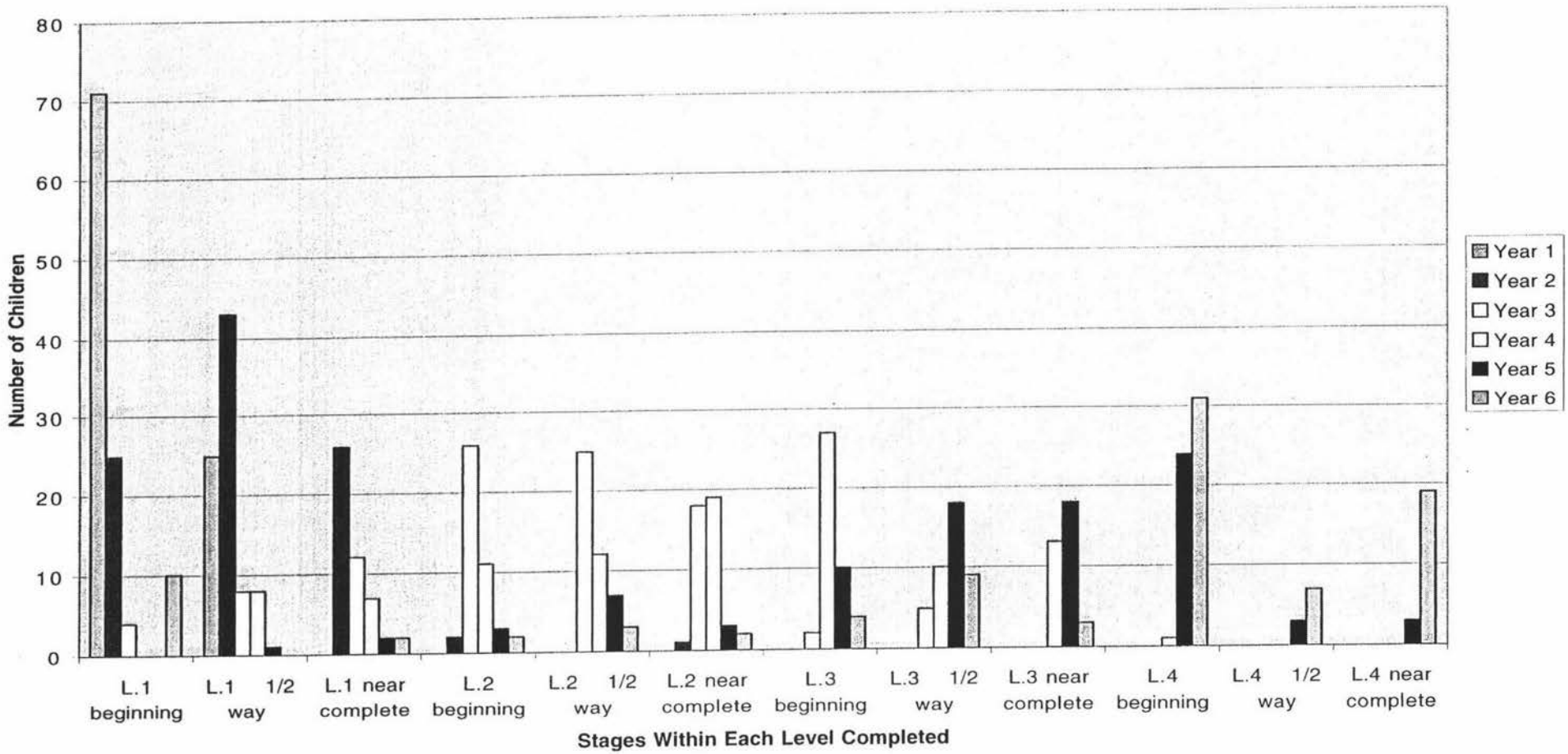
Thanks for all your ongoing efforts in the area of I.C.T.

and the I.C.T. team




Year 6 - Word Processing Levels Mid Year 1999 (n=92)
Number of Children
0
10
20
30
40
50
60
70
80
90
80
73
57
2
1
2
3
4
Word Processing Levels 1-4

Years 1-6 Current Word Processing Position Mid Year 1999



STAFF INDUCTION

Information and Communication Technology (ICT)

Information and communication technology is an integral component of our school. There is a reasonable amount to learn related to the systems that we operate and the way in which ICT can be utilised to support the programmes of learning you plan for your class. The important thing to remember is that the development of a range of ICT skills and the opportunity to meaningfully apply them is one way in which we can provide for better learning.

ICT is a compulsory element of our curriculum at Central School.

We are fortunate to have an ICT staffing support component and an ICT team to assist in a variety of ways. Over the year a number of professional development opportunities will be offered to support your professional growth and the implementation of successful classroom programmes. As always, please ask if you are unsure about anything.

e-mail
Each of you has a personal e-mail address:

eg: @ cs.school.nz

You have e-mail access from your classroom computer school wide, nationally and internationally. Training sessions will be provided for you in the use of our e-mail programme should you need it.

Please make sure you check your mail at least once a day as it is one of our main sources of school wide communication.

Day Sheet
We circulate a daily notices sheet for staff and students each morning. If you wish to contribute a notice please use the computer in the photocopier room before 8:45 am. The day sheet can be found in the staff disk. Please incorporate the access of the day sheet into your morning programme. It may be of value to train a number of children in your class to access it for you if you feel they can manage it.

Staff Disk
The staff disk is a folder housed on the computer network. It contains a folder for each of you in which you can store important files. It also contains other files that need to be accessed by everyone such as the education plans, general policies and the long term planning templates. The content of the staff disk is regularly backed up. You are responsible for regularly checking your folder to ensure only necessary information is stored in it as there is limited space available.
A training session will be provided for you on the accessing and use of the staff disk.

Student Disk
A similar disk is found on the network containing class folders for students work. This is particularly valuable if the children wish to access their work in more than one location in the school. Once again, please ensure you regularly weed the content of the student disk.

Information Centre
The Information Centre has been designed to be a centralised resource and learning centre. It combines a number of specific features that are used to support enrichment programmes and enhance learning programmes in all classrooms across the school. The centre is staffed on a part time basis and is linked into the school wide computer network. It includes:

The **school library** consisting of picture books, fiction, non fiction, reference material and a living book library. The library resources are electronically catalogued, this catalogue can be accessed by staff and children. A computer is based in the library area predominantly for catalogue access and use of the living books. The library timetable allows for each class to have a regular weekly booking to address the development of library skills and for flexible use of the remaining time.

A **central resource area** containing a range of resources to support learning programmes. They are organised into curriculum areas and are stored on the lundia shelves. It also contains study tables,

accessed by staff and children. A computer is based in the library area predominantly for catalogue access and use of the living books. The library timetable allows for each class to have a regular weekly booking to address the development of library skills and for flexible use of the remaining time.

A **central resource area** containing a range of resources to support learning programmes. They are organised into curriculum areas and are stored on the lundia shelves. It also contains study tables, displays and learning centre activities, quiet reading areas, a flatbed scanner and a TV / video viewing area that requires booking on the booking sheets held on the staff disk. A computer is based in this area, it is predominantly used for digital video development and to display things on the larger TV screen.

A **multi media area**. This area contains four multi media capable machines, they are also connected to the Internet. The area also contains an interactive CD player, a speaker phone and fax machine, the video camera and will house our later in the year. The use of resources in this area needs to be booked on the booking sheets held on the staff disk.

A **mezzanine floor** which houses the teacher's reference library and provides an area for meetings or work groups and has a networked computer available for staff use only. This space is also to be used by the ICT PD tutor to hold training sessions.

A **server room / software/ peripherals store room**. This space contains the email server, the main school file server and one of the network hubs for the computer network. It also houses the school's software and additional equipment. This space will also be used by as her office during 1999.

Booking sheets are held in the staff disk and can be accessed by all staff.

It is important to encourage your class to treat the information centre as you would like your own class to be treated...respect for the resources, displays etc., clean up when you have finished, respect others using the centre, work responsibly and encourage an appreciation for the wonderful resource we have available. It really is an extension to your classroom and can be used for numerous purposes.

ICT Certificates

We currently have two certificates in place school wide: word processing and telecommunications. These certificates are provided for every child and outline the required skills and suggested contexts in which to apply the skills once they have been developed. You will be provided with professional development support in the implementation of the certificates with your class.

Please make the effort to begin incorporating elements of ICT into your programme as soon as possible so that you can continually increase your confidence and competence as the year progresses. And remember to ask whenever you are unsure or just feel like you need a little support in getting your ideas underway.

Thanks

A Learning Community Through Information and Communication Technology: Characteristics of Success in a Contributing Primary School

Discussion Group

Introduction

This discussion group is being held to briefly review your contributions in Chapter Seven and to consider my comments. I would like you to read the following questions prior to checking Chapter Seven.

- Do you agree that your comments presented in this chapter are an accurate transcript of those you presented to the researcher in relation to Chapters Five and Six of this thesis?
- Do you wish to alter the comments attributed to you in any way?
- Do you have any follow up contributions you would like to make to the comments made by the researcher at the completion of each section in this chapter?
- Do you have any other contributions you would like to present related to the research components of this thesis?

Could you:

- quickly scan any text marked with one line in the margin;
- check over your comments;
- read the text marked with a double line in the margin;
- answer the questions as read to you.

Please note that the discussion is being recorded on audio tape to facilitate any transcribing of the content and to provide verifiable evidence.

If you wish to pass any further comments to me after our discussion, please feel welcomed to do so.

Once again, thank you all for your help in all of this research. I will be arranging a small thank you next week. The work will be completed by the end of this month and I am extremely grateful to all of you for the considered assistance.

Grant Ramsay