Exploring New Depths to Learning

Through the Use of

Information and Communication Technology (ICT)

in a

Junior Primary School

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Declaration

I hereby declare that this dissertation is entirely my own work and that it has not been submitted as an exercise for a degree at any other university or institute of education.

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Acknowledgements

Abstract

In this research the experience of the integration of Information and Communication Technology (ICT) that is being development in a junior primary school is presented. The computer, its importance and potential, if any, for characterising and defining not only the work of schools and teachers, but also the experiences of children is investigated and assessed.

Many of the key research writings in the areas of ICT in education, and ICT and the curriculum are presented. Through the processes of participant observation, documentary analysis and a question and answer session with children, it was found that in spite of certain concerns, there is evidence to suggest that effectively used technology can enhance the teaching and the learning process.

The process of integrating ICT and the experience of change for teachers are also illustrated using responses to a questionnaire, observations made during working sessions and finally discussion in a focus group with teachers. Conclusions are drawn as to the current factors that may determine the extent to which ICT is used by teachers, their respective competence levels, and also factors which contribute to positive outcomes to the integration of ICT.

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Chapter 1: Introduction

With the unfolding speed of technological change in the 21st century and subsequent transformation of our need for knowledge, Information and Communications Technology (ICT) increasingly impacts on all areas of people's lives. It becomes impossible, therefore, to ignore the need to integrate it into schools. Identifying the true value of technology in schools is proving, however, a challenging undertaking for educational researchers. In recent times books have been written and many articles have appeared providing evidence of changes that educational technology seems to make in schools. In light of the current emphasis on technology integration, putting technology to work to improve teaching and learning in a junior primary school is the important goal of this study. The study is two-fold; firstly, it investigates the capacity of ICT to help children learn and analyses the learning gains, if any, that are evidenced when using technology. Secondly, it seeks to establish what will encourage teachers to adopt ICT in the classroom. Teachers' ICT skills and knowledge needs are looked at closely, and their priorities for future technology development in the school are explored. Within this context, the ultimate aim is to examine the challenges involved in developing a model of good practice for the use of ICT in education.

1.1 ICT Culture in Society

There is little doubt that information and communication technologies are a central part of the changes that are occurring throughout the world, and exert a profound impact on societies, enterprises and governments (Information Society Ireland, 1996: 49). ICT's influence on banking and shopping services, mobile phone and Internet

connections, satellite and military resources illustrate this clearly. Interestingly, in the recent ISC Report, 2003, it was noted that nearly one in every two adults now have access to the Internet in Ireland, compared with only one in twenty in 1996 (Hanafin, 2003: 2). Quite literally, computers, unknown to our parents in the 1950s are now essential to the way we live, learn, and carry out our work. Computer technology has become so thoroughly 'naturalised' throughout society that we have reached the point whereby, "It is now a case of having to use computers; it would be too chaotic to revert to the old way of doing things" (Evans *et al.*, 1996). Such a radical change is considered by some a turning point in our culture that parallels and is as profound as the invention of the printing press (Provenzo *et al.*, 1999: 3). Thus, like it or not, we live in the era of the Information Society where:

- Information is produced, communicated and used intensively;
- The constraints of time, distance and location are considerably reduced;
- Transactions of all sorts are processed electronically;
- Life and work are dramatically altered by the use of information and communication technologies.

(Information Society Ireland, 1996: 3)

Undoubtedly, the society in which children in the 21st century are growing up, is very different from that of previous generations, and the National Council for Curriculum and Assessment (NCCA) suggests that the increasing importance of computers is a trend that is expected to continue, to the extent that, "technological literacy will become a functional requirement for people's work, social, and personal lives" (2004: 1). Accordingly, we need to understand it more often in our normal lives and children must be prepared for such an environment.

1.2   ICT Challenging Education

> Pressure on education to be the agent of change is common across the world, because most societies and governments believe that education can make a difference to the cohesive culture of a nation.
>
> (Leask, 2001: 192)

It is not surprising then that education is being fundamentally challenged to assist in promoting the imaginative educational use of ICT in schools. Accordingly, a good way of establishing a rationale for ICT use, and thus situating this research is to go back to 'source' – to examine the forces of change that are pulling us towards a future transformed by information and communication technology and assess the implications generally for education. In doing so the question will be raised if we can endure an education system that is unsympathetic to the realities of contemporary life?

The OECD argues that the introduction of ICT is a necessity premised on social, economic and pedagogical rationales (2001: 10). In 1997 the Department of Education and Science (DES) had advanced similar arguments in 'Schools IT 2000: A Policy Framework for the New Millennium'.

Firstly, a reference to social benefits or the moral imperative as described by Caperton and Papert (1999: 5) propose that ICT in education has the potential to prevent a two-tier society of 'haves' and 'have-nots' from developing. Similarly, others feel that given the socio-economic divide that exists in society, some children enter school with an obvious advantage to computer access (Selwyn & Bullon, 2000; Alexander, 2000; Leask 2001). It must be stated that schools have to compensate for the

'vacuum' or some children may be lost. The new world of knowledge must be accessible to all children!

Secondly, economic benefits relate to the increased employability of young people and subsequent enhancement of the country's position in economic terms (DES, 1997; Gardner *et al.*, 1993; Alexander, 2000). The creation of new jobs that are strongly influenced by the new technologies are an inevitable feature of the future workplace. With the transformation of work, a new definition of skills is required. Caperton and Papert for example, suggest that as distinct from learning in an inherited fixed curriculum, technology-aided learning may equip people to do well what they were "not taught to do" (1999: 5). Technology has the potential to open new directions for learning. The necessity for ICT in education is particularly emphasised when one considers that many people are now working in jobs that did not exist when they were in schools.

Finally, introducing ICT promotes pedagogic benefits. These include the promotion of an improved quality of educational experience for children, resulting in higher motivation and the "development of creativity, imagination and self-expression" (DES, 1997:15). A number of research studies firmly believe that successful integration can produce, and in some cases have produced similar educational benefits for children (Galvin, 2002; Apple Classrooms of Tomorrow (ACOT), 1985-1998). However the true impact of ICT is hard to measure and there is "a general lack of evidence concerning young children's experience using computers" (Cuban, 2001: 29). It is also apparent that many schools have not made progress towards meeting the requirement of ICT development and a disparity in opportunity is visible. Regrettably,

this highlights the context in which the school here in question finds itself. Accordingly, this research intends to contribute in a constructive and honest way to the future of new learning and teaching technology in our school. It also intends to promote it as a means of increasing the quality of people's lives, enabling them to achieve their full potential as citizens in this new "Information Society". Indeed, while the educational changes may seem technologically understandable, they are socially complex and the people dimension cannot be ignored.

1.3   The Change Process

Change has undoubtedly formed part of the human experience since ancient times, the irony being that change is probably one of the few constants in life. However it is the speed at which circumstances seem to evolve that characterizes the modern era. Education has been equally subject to change and its complexities have been well documented (Fullan, 1991). Regrettably, it is increasingly the case that government and a variety of social institutions are claiming the right to at least some measure of control over the content of the curriculum and what teachers do in classroom activities. Change will not necessarily be brought about in a meaningful way simply because the external environment decrees that it should occur. This is particularly true in circumstances where many of those who will be required to implement the changes have little knowledge of the new areas in which they are required to operate. Rather a shared understanding between the internal and external environment on the need for change, will be proposed. Furthermore, with regard to the introduction of technology, it will be suggested that the nature of the change that is required, should be clearly defined. Evidence will be identified which clearly shows how such change will

contribute to improvement. Indeed, efforts to identify existing factors that militate against successful implementation of change will equally be identified.

1.4   Examining the Context of the School

Nicholls (1983: 63) states that:

> No two schools are identical nor do they function in identical ways. Some manifest an ability to develop and implement innovation while others show little or no interest in innovation. Yet still others try to innovate but fail.

Nicholls goes onto suggest that responses to innovation may be influenced by the social context in which individuals operate. Examining the context of the school in question, therefore, is a necessary requirement in this study.

The school referred to in this dissertation is a co-educational junior primary school with a full-time staff of twenty-two. It caters for a rapidly expanding mixed residential area in suburban Dublin with children coming from a middle-to-working class background. Generally, parental interest in, and expectations for their children's education appears genuine. Financially, parents have always contributed generously to the school. Indeed last September 2003 additional funding was offered to set up a computer room with networked computers. Children now have weekly access to this room for periods ranging from forty minutes for Junior Infants to one hour for second classes. A free fifty-minute period is available daily, to facilitate a class that may inadvertently miss its allotted time. Prior to this innovation every effort was also made to ensure that each classroom had an operational computer. This comprises of mostly old IBM models, with a printer shared at every level i.e. one printer between four

rooms. As ICT co-ordinator, the researcher is currently responsible for co-ordinating activities related to ICT in the school. However, until the present academic year 'patchy' ICT adoption merely focused on educational software that emphasised drill and practice activities. The school is now at the stage, however, whereby, the use of computers could be extended to all areas of education if guided with a good model of practice. The researcher believes that there is a strong willingness by the teachers to engage in, develop, and initiate educational innovations within the school. Many have already attended computer courses. Significantly, the school's principal is seen by staff as someone showing strong leadership and a definite sense of both direction and purpose with regard to the promotion of ICT use.

1.5 Aims of the Research

As we enter the educational upheaval of the 21st century ICT will play a key role in improving education practices and preparing our children for the future. It will soon be clear that a quality education in this Information Age requires quality teachers who are using quality tools. Hence, the main aim in carrying out this research is to do something that will benefit pupils, teachers, and her own practice. In seeking to develop new approaches to teaching and learning issues, action research is undertaken. Whitehead (2000) sees seeking to improve practice as the fundamental question of Action Research.

In the first part of the research a Second class teacher is supported daily in delivering various lessons on ICT to children. The professional aspiration strives to develop verifiable knowledge from this process by systematically researching into the

proposed action at the same time and gathering relevant samples of work. Children are also tested before and after the research period, and their views and opinions on ICT are finally sought in a question and answer type session. Accordingly, with the children in mind the action research aims are:

- to evaluate the extent to which ICT enhances children's learning;
- to harness children's exuberance by identifying other applications which will make greater use of the potential of the computer and facilitate learning in new and innovative ways;
- to encourage creativity and thinking on a higher level while using an application or software;
- to foster continued motivation and enjoyment in learning.

In the second part of the research an initial survey of all the teachers is carried out. Subsequently, during fortnightly sessions different aspects of ICT practice are explored with teachers, observations are collated, and analysed. Efforts to cultivate a culture of computer use are further strengthened by a visit from an ICT tutor. This professional strategy is designed to offer teachers time to reflect on practice and discuss ways in which they feel appropriate training might support ICT use. Building new perspectives on ICT are central to these deliberations. The website offers a refreshing alternative genre for teachers to present children's work, and it is hoped that it will have a motivating effect and raise levels of achievement for both children and teachers. Finally, discussion with a selected number of teachers in a focus group is held. Data is gathered as to their opinions on the potential and feasibility of ICT as a teaching and learning tool. With regard to teachers, the study aims are:

- to examine the development of ICT in education in general, in order to gain a clearer understanding of the context within which the introduction of ICT into the researcher's school is set;

- to explore the possible reasons for the teachers' apparent hesitancy to use ICT;

- to assess the current level of readiness, in terms of teachers' beliefs and expertise, within the school to take advantage of ICT's potential;

- to investigate the potential of staff training to help support teachers' endeavours to introduce ICT change into classroom activities;

- to present an on-line school website displaying samples of work from each classroom, as an example of teachers' efforts to introduce technology into learning;

- to develop a framework of good practice for ICT use in the school.

Finally on a personal level, thinking about developing the school begins at the level of teacher understanding. The ultimate aim is to improve that practice and involving herself in this ICT project is part of that process for the researcher.

1.6   Study Overview

In order to inform inquiry for the research, the literature relevant to the study is reviewed in chapters two and three. Chapter two discusses the value of ICT, if any, on education and then proceeds to examine certain obstacles that may inhibit technology use in schools. References to literature from international and national perspectives are included. Chapter three considers the complex nature of change in education. It

subsequently deals with change issues involved in managing and directing the successful introduction of ICT into schools.

Next the focus of attention concentrates not only on aspects of the research but also on concluding reflections. Chapter four leads into a presentation of my action plan detailing the methods to be used to gather evidence relating to the main foci of my project. In chapter five the findings of the action research carried out with a Second class are analysed with a view to identifying associated results or emerging trends in children's learning. Chapter six engages in the analysis and results of the second part of the data; the significant factors of the change process that inhibit and support teachers' use of ICT in their teaching practices are highlighted here. Discussion and reflections on the most revealing findings will be explored in chapter seven. In the final chapter conclusions and recommendations for the future development of a model of good practice for ICT in a junior primary school, will be proposed.

Chapter 2: ICT in Education

2.1 Introduction

The use of computers in schools is now a phenomenon experienced throughout the world (Pelgrum, 2001). The researcher suggests that it is necessary to explore the literature and appraise core issues related to computer-assisted learning. Accordingly, the first part of this chapter examines both the opportunities offered by technology to enhance learning and the added-value dimension in education from ICT. Ideas and findings, on how ICT has the potential to deliver a more effective curriculum in the classroom, are also explored. Finally, this chapter concludes with a look at concerns surrounding the use of ICT – the implications of a new role definition for teachers, and the importance of teachers' beliefs and competence. The ultimate aim is to make sense of the technological imperative to use computers in education. The argument regrettably makes clear that the framework to support the development of genuine quality in our schools through the use of ICT is presently incomplete.

2.2 The Value of ICT

It is clear that ICT is well financed and enthusiastically supported by major corporations and government officials throughout the world (Pelgrum, 2001; Mulkeen, 2003; BECTA, 2003). Significantly, for Irish education, it was recently announced that with the help of industry and state funding of €18 million, all primary and secondary school will be connected to Broadband (high-speed Internet access link) by the end of 2005 (DES, 2004). In light of all this expenditure, assessing the

value of ICT in education is necessary. As Falbel suggests, "People use computers to do things. If we are to say anything meaningful about the thinking and learning involved, then we should look at what people are doing with computers and not what "the computer is allegedly doing to them" (1990: 30).

Learning to Learn

Considered an expert on how technology can provide new ways to learn, Papert has written widely on children's use of computers as instruments for learning and enhancing creativity. He collaborated for many years with Jean Piaget and we note how in 'Mindstorms' (1980) he incorporates theories of Piaget in his vision of how computers might be used in education. For instance, Piaget (1973: 37) believes that discovery is the fundamental basis of learning. Similarly, Papert (1980) sees the emergence of the computer as having the potential to modify the learning environment. In fact, a strong belief that children can learn to use computers "in a masterful way, and that learning to use computers can change the way they learn everything else" was central to shaping his research (1980: 8). Although much debate surrounds Papert's thinking, in terms of coping with the information explosion which modern society is experiencing, is seems reasonable to state that helping learners not only to learn but also to learn about learning, should form a very important part of our philosophy for children's education.

Added-Value in Education

Several studies on ICT use indicate exciting prospects for classroom work. Apple Classrooms of Tomorrow (ACOT) in the US carried out a major research study on

technology use over a thirteen-year period. The project (1998: 1) demonstrated that the introduction of technology into classrooms could:

> significantly increase the potential for learning, especially when it is used to support collaboration, information access, and the expression and representation of students' thoughts and ideas.

In the study, teachers commonly report positive examples of increased student engagement and motivation, with students highly involved in tasks, learning faster and achieving more (Haymore Sandholtz *et al.*, 1994). Many other writers agree that motivation is a significant factor in producing learning gains for children (Provenzo *et al.*, 1999; Wheeler, 2001; Broadie, 2003).

Interestingly, however, Broadie suggests that it is actually impossible to show what learning gains are achieved through ICT. This is a point worth exploring in light of Cuban's (2001) scepticism on the value of ICT, because of what he sees as a lack of verifiable evidence on achievement! Broadie, it appears is of the view that due to fast changes in education, the curriculum and society, ICT cannot be isolated from other factors. Rather, it is the "catalyst and enabler that makes it possible to implement the changes which bring the major benefits" (Broadie, 2003: 3). He further refers to the responses to a survey (compiled by The European Education Partnership) by participants who, having had many years experience in ICT-for-learning, were asked to identify the mechanisms through which ICT increases learning. It offers eleven areas of added-value in education from ICT, which the researcher contends represent a very useful categorisation to ensure support for ICT:

1. Extending learning time

2. Increasing communication

3. Improving access to resources

4. Increasing motivation

5. Re-balancing teacher-mediation and autonomous learning

6. Increasing scale-ability and consistent replicability

7. Access for minorities

8. More information channels

9. Brain-centred learning

10. Publishing and audience

11. Management and recording

Curriculum Enhancement

There is widespread conviction that ICT should be fully integrated into the curriculum (Provenzo *et al.*, 1999; Austin, 2000; Reksten, 2000; NCCA, 2004). Some people consider that in using computers to support teaching and learning there is an ethical question to be answered - in order to justify the expenditure of time and effort given to using computers, a curricular purpose must be central to the answer (Provenzo *et al.*, 1999). Accordingly, in Ireland the Primary School Curriculum, 1999, recognises the importance of technological skills for advancement in education. The ICT Teacher Guidelines further suggests that:

> When used to support the aims, principles, and objectives of the Primary School Curriculum, these technology tools have the potential to augment and transform classroom learning and teaching.
> (NCCA, 2004: 1)

Thus, the aspiration is that children will acquire ICT learning in a meaningful and relevant context, rather than isolated from the curriculum. "Learning occurs best when

concepts and activities are integrated, as they are in life. Every task in life is an integrated task rather than a departmentalized task." (Reksten, 2000: 25). A similar belief is echoed elsewhere in research; Gardner *et al.* argue that IT in the curriculum should cultivate a greater awareness of ways it may be applied and its significance in people's work (1993: 23).

Clearly, while not all learning is easily measured, positive endeavours in cutting-edge practice and use give rise for optimism. For example, in 1997 a major Government initiative, *Schools IT 2000*, was launched to develop ICT in Irish schools. The SIP project, part of the *Schools IT 2000* initiative, was commissioned to foster whole school development in relation to ICT integration.

Overall, reactions to participation in the project were positive although an important comment referred to the need to slow down the pace of the project (Carroll, 2002: 40). Nevertheless, a primary school teacher remarked on how all learning took place through a curriculum focus and ICT skills were inserted as and when was necessary:

> ICT can definitely be used to good effect as a support to learning and teaching across the primary years. SIP has given our pupils an audience for their work and has proved a great means of motivation for our weaker pupils. It has also given us, as teachers, a valuable framework to build future practice around.
>
> (Carroll, 2002: 40-41)

Classroom Application

If schools, then, are responsible for helping their pupils to become both effective lifelong learners and citizens able to deal with information in the information society, how might ICT be used in the classroom? Mulkeen (2003) cites two examples for

consideration - extending the use of the Internet as a resource through the use of project work and encouraging students to make presentations or web-based resources of their own. Evidence from various projects undertaken by Meadows and Leask (2000) support these ideas and suggest that working with the Internet allows learners to approach material according to their own learning style. Similarly, Roberts recommends use of the web for information dissemination (1999: 19).

The challenges and skills acquired through project work are certainly worthy of consideration (Rasku-Puttonen *et al.*, 1999). Herein, lies great scope not only for the presentation of information and ideas and the structuring and recording of work, but also the provision of access to resources.

Looking at the area of Communication, recent research in the Irish context indicates that word-processing is a common use of computers in primary schools, with girls, in particular, using it more often than boys (Mulkeen, 2003). Indeed, email and the use of video conferencing also make possible greatly increased communication between learners and others who can help them. Finally, there are many advocates who feel that simulation and other software games impact on learning, allowing children to interact and play with ideas and systems (Provenzo *et al.*, 1999). Purposeful selection that is mindful of both the influence and the value assumptions being fed to the minds and culture of children by the software barons is imperative (Leask, 2001).

2.3   Concerns Surrounding ICT Use in Schools

Introducing computers into schools changes the ecology of the classroom. The sheer presence of the technology in the room can often be very daunting; on the one hand it

clutters often valuable physical space with cables and connections, while on the other hand it demands mental space in planning for both access to the equipment and familiarization with skills and techniques (Loveless, 2002). Clearly, high expectations are placed on teachers. Understanding how to manage the use of ICT as part of the school curriculum is perhaps one of the most "challenging aspects of any teacher's professional development" (BECTA, 1998: 57). The school wide environment as a conditioning variable in this technological change is highly significant.

Yesterday's Schools, Tomorrow's Future

It is quite obvious that schools do not yet recognise either the importance of information, its value or its management. Strack criticises our education systems that are both tied to centuries old instructional methods, and are "more concerned with maintaining the past and traditions rather than with the future and innovation" (1995: 181). Similarly, Papert (1980) questions whether the context within which learning will take place in the future will indeed be the school, as we now know it. He is highly critical of the conservatism that exists in the world of education, and stresses that computers are not there to serve an already out-dated system. An underlying intention here, and one which he revisits in later writings, is to deconstruct the necessity of school by showing that with computers, something very different can at least be imagined. Papert (1990) uses his concept of children programming with Logo, to stress that this learning requires a different form of control and organisation of the school system. It is necessary for children to have "freer access to the computer", with the teacher facilitating the exploration (Papert, 1990: 16). Schools need to reform into learning environments that cultivate richer and deeper

understandings and interactions. Schools are also faced with the task of serving children who have both a greater access to home computers and to a higher level of computer expertise (Papert, 1996). IT capability is seen as the new literacy that is as important as traditional literacy. The ability, therefore, to exploit the power of computers is an essential requirement for the future (Heinrich, 1995).

A Changing Role for Teachers

Firstly, Bowers argues that there is a need for a critical rethink by teachers on how computers are looked at, and how they function – how computers mediate systems of knowledge and ways of interpreting the world around us (1988: 27). In light of the social imperative, then, to balance the demands and experiences of the 'computer haves' and the 'computer have-nots' in the information age, Selwyn and Bullon remark that it is important to "develop the role of the teacher in facilitating children's use; both in terms of regulating access and providing a confident and competent role model and source of advice" (2000: 331). They examine the role of the teacher in influencing children's orientation towards ICT and reveal in their study that the mode of ICT presentation and use by teachers may be a significant part in curtailing children's perceptions and use.

Secondly, the demands on teachers are quite formidable. For example, a significant body of research postulates the need to cultivate pupil-centred learning environments when using ICT (Papert, 1980; Olsen, 2000; Smeets & Mooij, 2001; Heath and Ravitz, 2001).

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Accordingly, Leask remarks that in the information age teachers are no longer the fountains of all knowledge with the capacity to fill children with the knowledge and wisdom of their teaching (Leask, 2001). With the vast quantities of information readily available to pupils on the Internet, and the opportunities of communicating via e-mail and video-conferencing, teachers are being challenged to look beyond the narrow role of being expert in their field. Rather, guiding and enabling students to become more effective learners and encouraging them to seek new information from a range of sources become more central issues - to "enable rather than control learning activities" (Wheeler, 2001: 14). To ensure purposeful and creative exploration for children, teachers are expected to enter into discussions with probing questions and adapt learning according to children's needs, abilities and interests. The ultimate aim is to help children to understand their own learning styles and manage their own learning – a sentiment identified by Papert in an earlier section.

> The role of the teacher in classrooms equipped with new technology remains crucial: to frame and structure learning activities which allow the potential of the child and the technology to be realised.
> (Leask, 2001: 68)

Finally, in spite of the paradigm shift necessitated, however, Cox (1998) argues that teachers will still play a leading role in the classroom and their behaviour towards pupils will have a significant bearing on pupils' learning achievements. He is convinced that engaging children successfully in the learning process is not an insurmountable task for teachers. Many of the processes and skills needed for ICT lessons are similar for all lessons. Therefore, teachers need to have faith in their own knowledge and skills, harness and extend the pedagogies they already have. Selecting resources, interacting with pupils, monitoring the learning progression and promoting

discussion and reflection among pupils remain important considerations in a situation which now includes a computer in the teacher and pupil relationship (Cox, 1998).

The Importance of Teachers' Beliefs

The task, however, of curriculum differentiation, and providing opportunities for adapting the learning content and tasks to the needs and capabilities of individual pupils through the use of ICT, can often be very daunting. The recent OECD (2004) report describes how day-to-day use of computers by children in upper secondary schools remains disappointing. But why is this the case?

Positive ICT use may be influenced by what Mulkeen terms, "a product of teacher beliefs" (2003: 179). The role played by culture and beliefs is a major contributory factor to their behaviour in classrooms (Becker, 2000; Loveless *et al.*, 2001). Understanding how change such as technological change can be brought about begins by first acknowledging the challenging context in which teachers work, and recognising the forces that continue to shape it (Fullan and Hargreaves, 1992). Olsen notes that the shift to CAL (computer assisted learning) "brings 'bugs' in smooth classroom running and involves didactic and pedagogic ideas foreign and unacceptable to many teachers" (2000: 4). Teachers exert discretionary authority in their classrooms. Beliefs influence choices teachers make on where, how and what they teach (Cuban, 2001; Loveless *et al.*, 2001).

From the outset, teachers are pressurised into thinking by administrators and parents that classes should reach "a particular level of skill and knowledge in a fixed period of

time" (Sarason, 1982: 187). The understanding of intelligence is framed and constrained by the dominant ideological value of our educational culture – academic success. Reid (1999) speaks of the teaching of curriculum as institutionalised practice. Regrettably, there is a limit, a boundary on practitioner's efforts to innovate with the computer, for fear of straying from the acceptable domains of the public as to what they perceive school's work should be about. Teachers become attached to familiar pedagogical routine, remaining conservative with habitual practices (Eisner, 1998). The computer meets familiar and predictable techniques and tools – blackboard/ chalk, textbooks, copies/ pencils – that embody certain values about the work being done in the classroom. Teachers aren't fully convinced that ICT facilitates learning in the subjects in question and are seen to use computers in a very selective, individual manner. Thus, the way that a teacher uses computers gives "an indication of her underlying pedagogical philosophy" (Becker, 2000: 8).

The influence of beliefs is further revealed by data from the ACOT project (Dwyer *et al.*, 1990). The project also indicates that participating teachers carry with them a common set of beliefs about schooling that has built up from years of participating in the traditional system, beliefs that underlie the institutions resistance to change. Consequently, findings reveal that teachers proceed through five phases before adopting ICT: *Entry, Adoption, Adaptation, Appropriation and Invention.*

This calls for a revolution in belief on the part of teachers if they are to be both convinced of the value of ICT and integrate it fully into their teaching. Looking at what pupils might be doing, or examining examples of what might be achieved in an ICT rich environment becomes a necessary requirement. Indeed, developing

pedagogical content knowledge is central to these deliberations. According to Fullan pedagogical uses of new technology are what will count (1992: 30).

Clearly, the ultimate determinant of what actually happens in the schools rests with the approach adopted by the teachers (Fullan, 1992). These individuals have to develop new meanings and express these meanings in practice. As one of four insights into the process of change, Fullan (1992) emphasizes that people have to delve into something before they discover new meanings. Changes in behaviour precede rather than follows changes in beliefs. It follows then that if ICT in schools is to be worthwhile and effective, schools must ensure teachers' involvement in aspects of technological change.

Teacher Competence

Looking at the conditions under which teachers are motivated to use technology in the classroom is also necessary. Technology in education is a relatively new phenomenon and clearly most teachers did not receive technology training in teacher education. Nonetheless, to effectively broaden the range of instructional opportunities offered to pupils by computers, "teachers must reach and maintain a certain degree of technological competence (Baylor and Ritchie, 2002: 8). This raises the question of the ability and willingness of teachers to make effective use of ICT in the classroom.

Williams *et al.* (2000) highlight two facets of this issue as personal competence with ICT and competence to integrate ICT into the teaching process. In their study on the ICT skills and knowledge needs of teachers in Scotland, they reveal that the vast

majority of primary and secondary teachers say that they make use of some computer-based resources at some time in their professional lives.

Some teachers feel that they first need to build up their basic skills and confidence in applying ICT in the classroom (Williams *et al.*, 2000). In his discussion on the findings of the 'Teaching, Learning, and Computing' (TLC) survey, Becker (2000) is convinced that teachers' own limited skills and expertise in using computers themselves prevents them from using computers frequently with their students. Mooij and Smeets, (2001) add that teachers lacking in the confidence to handle computers may be hampered in their willingness to introduce technology in the classroom. Becker then goes on to say that those who have a reasonable amount of technical skill and who use computers to address professional needs, use the computer in, "broader and more sophisticated ways with students" (2000: 6). Mulkeen, however, draws attention to studies from the US which suggest that quite a high level of skill is required to encourage classroom use of ICT; teachers lack the confidence to use it in teaching despite using it in classroom preparation (2000). In contrast, Cuban (2000) is of the opinion that insufficient technical skills are *not* holding back teachers from using computers in the classroom. Rather, he points out that the potential of new technologies to alter existing social practices is a particular cause of concern for teachers, thus creating feelings of ambivalence about computers (Cuban, 2001).

Baylor and Ritchie (2002) point out that when those teachers who are more open to change are provided with the opportunity to learn new technology skills through training, competence levels increase. Consequently, increasing competence and comfort using technology is essential; there appears to be a link between teachers'

comfort or confidence with technology and their increased use of technology with students (Heath and Ravitz, 2001). Significantly, increased competence and familiarity with computers allows teachers to focus on pedagogical uses of technology (Demetriadis *et al.*, 2002: 21).

2.4   Conclusion

The literature in this chapter was chosen to better understand the possibilities and potential value for ICT use in education generally. It is noted that positive endeavours by educators are attempting to support the education of children for the information society of the 21st century. The literature offers convincing reasons for integrating ICT into schools, and that despite certain concerns, there is evidence to suggest that effectively used technology can improve the teaching and the learning process.

Chapter 3: The Evolution of ICT Change

3.1   Introduction

This chapter attempts to demonstrate that in providing a vision of the educational relevance of computers it is necessary to manage and direct ICT change as efficiently and effectively as possible. Accordingly, the complex task of dealing with change is the focus of the first part of the chapter. Next, the chapter seeks to identify the characteristics of school culture, and provides a guide to the culture that best promotes technological change – a collaborative culture. Some interesting observations are also made on the influential part played by the principal in change. Developing a quality plan will then be revealed as a critical element in establishing a strong technology programme in the school. Finally, the chapter explores some basic concepts associated with the professional development of teachers. Ultimately, the interplay between all the areas discussed will be seen as highly significant in directing the organisations thinking on ICT - seeing ICT as a means to enhance the delivery of a quality education.

3.2   Dealing with Change

Change is eternal. In fact, Fullan (1993) maintains that introducing innovations and policies has resulted in an uphill battle. Disappointment has been frequently experienced when expectations turned out to be far removed from the realities of the implementation. For example, in one of their studies Pelgrum and Plomp (1993) point to simplistic policies being partly responsible for the disappointing progress in the

integration of ICT. Similarly, findings from statistical surveys carried out in Ireland 1999/2000 indicate that despite the huge investment by Government in equipment, Internet connectivity and short basic skills courses, the expected increased use of ICT within subject areas did not materialise (Mulkeen, 2002). In many instances, then, change reveals itself as a complex process - an endless quest for understanding, requiring problems to be solved but with no ultimate answer to be found.

Few would deny, however, that the ability to deal with change is "one of the premier requisites of the present and future" (Fullan, 1993: 5). The realisation that not all change is improvement, but all improvement involves change, challenges the education system (Stoll and Fink, 1996). Therefore, we need to alter how we think about and act in relation to change. Learning to live with change more "proactively and more productively" in our daily lives is at the heart of the matter (Fullan, 1993: vii). Fullan (1993) presents a radical portrayal of turning the educational system into a learning organisation as a possible solution to dealing with change. In this instance the school needs to develop to become "capable of responding to and gaining benefit from sustained technological change" (OECD, 2001).

3.3   School Culture Supporting Change

What is culture?

Culture is the sum of all those qualities that make the organisation unique. It is built around a "configuration of interlocking beliefs, ideas, values, attitudes, meanings, symbols, rituals and behaviours", that inform the way the organisation projects itself to the world (Tuohy, 1999: 9). Every organisation has its own cultural style that

exerts a powerful influence on people's perceptions and behaviour. Basically, when culture works against you, it may be impossible to get things done (Stoll and Fink, 1996). Understanding that culture is an important tool and is a fundamental step in moving the school towards change is essential (Fullan and Hargreaves, 1992). Changes in structure, however, without changes in school culture are likely to be superficial (Stoll and Fink, 1996). This would appear to indicate that introducing ICT into the school context without teachers' belief in its benefits to teaching and learning processes is unlikely to result in lasting change.

A Collaborative Culture

Mulkeen observes that the process of ICT integration may depend on factors "related to the thinking and beliefs within each individual school" (2002: 22). Technology use is fraught with problems, therefore, policies likely to prove important may relate to the thinking of school principals, and the process of collaborative planning for ICT. Scrimshaw concurs, the need for teachers to use technology in collaborative contexts is called for so that, "They can both identify the problems and possibilities for themselves and find ways to model these activities in their own practice with learners" (1997: 112). Interestingly, the training of all staff is considered a valuable means of creating such an atmosphere of collegial support (Reksten, 2000). Learning how to use technology demands great change, and cultivating an atmosphere of support through training:

> helps to reduce anxiety and to encourage risk taking by staff. Additionally, training fosters professional interactions and a shared language among teachers about using technology. This shared technology language allows these new skills to be incorporated into each teacher's repertoire.
>
> (Reksten, 2000:111)

When referring to a study carried out in California, Cuban (2001) is also of the opinion that teachers should be engaged in deliberations regarding technology plans, to allow their voices to be heard. He criticises computer advocates who seldom take seriously the experiences, expertise or constrained choices teachers have to make in the classroom. He is convinced that when teacher engagement happens, "changes in classroom practice occur that even the teachers themselves had not contemplated" (2001: 170).

3.4   The Importance of Good Leadership

The Principal and Change

Much has been written on the principal's relationship to the problem of change (Fullan, 1991; Fullan, 1992; Fullan 1993). Fullan (1991: 152) remarks that:

> The school is the center of change. The school is an organisation, and organisations change more effectively when their heads play active roles in helping to lead improvement.

A fundamental step in addressing these challenges lies in the principal's desire to transform the organisation. Aware of the challenges and ramifications in initiating change, s/he is driven by a moral commitment to seek out and ensure improvement (Fullan, 1993). Principals in trying to implement changes face many difficulties; they have to implement changes that they have had no part in developing and have to implement changes that they may not even understand. Accordingly, to ensure successful implementation, two important leadership characteristics surface – the critical importance of rapport with teachers and the fact that principals' actions carry

the message as to whether a change is to be taken seriously and serve to support teachers (Fullan, 1991).

Reksten (2000) suggests that for technology change or any innovative change to occur, a new paradigm for leadership is needed. She refers to this type of leadership as responsive leadership. The principal does not dictate orders or make demands on teachers, but rather leads and not only "provides guidance but works alongside staff and has a vested interest in the results (2000: 11). Communication and interpersonal skills are critical as the focus is on two kinds of change for teachers – personal and interpersonal. Clearly, working with teachers is necessary as Cicchelli and Baecher (2003: 2) insist that unless the:

> real concerns of teachers are systematically considered as a critical variable in the change process, application of computers will take on the usual "hit and miss" orientation.

Consequently, guided by a positive understanding of how ICT can enable school improvement (OECD, 2001), the principal is required to reflect, observe, and discuss various issues with staff, and also begin to build up a picture of the school and teachers' concerns.

Organisational 'Know how'

Teachers decide whether the change is to be taken seriously depending on the principal's actions. The principal's actions should support the teachers not only psychologically, but also with resources. The principal, therefore, must understand the issues surrounding the adoption of ICT - have the organisational 'know how' - as

working constructively in the provision of adequate support structures is crucial. Integration of ICT may create issues related to timetabling, or classroom layout in efforts to enhance a pupil-centred learning environment (OECD, 2001). Even the management of resources and equipment is an important consideration for the principal – selection of software and procedures for organising and maintaining equipment. Stark *et al.* (2000), investigating the impact of ICT initiatives, identified a number of obstacles to the effective use of ICT by teachers. Some of these obstacles included irrelevant software and faulty or insufficient hardware. It must be stated, however, that although the availability of such hardware and software is an important consideration, it is not a sufficient condition. A body of research also recognises the effects that competing priorities with regard to teachers' time, skill deficiencies and a scarcity of motivating examples of good practice in ICT, also have on implementation (Stark *et al.*, 2000; Preston *et al.*; Selwyn and Bullon, 2000).

3.5   A Workable Plan

A Vision in Planning

Although the first two years of the three year *Schools IT 2000* initiative in Ireland resulted in substantial progress such as developments in equipment, connectivity and more organised teacher training, it would appear that educational computer use was poorly managed and badly executed during this period (Mulkeen, 2003). A study carried out at the end of 1998-99 by Mulkeen (2001) indicates that even though seventy per cent of primary teachers had used ICT in their teaching during the first year, approaches were quite opposite and varied. There was overall low levels of

Internet use. There was dispersed use of curricular software in some schools and exclusive use of computer applications in other schools.

Schools need to develop new ways of coping, and ways of succeeding in this complex technological innovation. Planning and implementing change become essential if schools are to avoid stagnation. New technology is a major part of that planning. Accordingly, Short argues that school management needs to take the lead, and indicate its intention to "place IT development on the agenda of overall school development" (1996: 118). Mulkeen agrees, managing change is, he believes, widely recognised to require, "a clear vision of the direction and a holistic view of ICT in the school plan" (2002: 13). Interestingly, schools that are successful in integrating technology into the curriculum are often guided by a comprehensive technology use plan (Baylor and Ritchie, 2002: 3). Central to this plan lies, not only a guide to the events the school hopes to achieve, but equally important an overall philosophy of technology use and exploration of how teaching and learning will improve.

The NCCA Guidelines (2004) also recognise the importance of planning for ICT to ensure its successful integration within the framework of the Primary School Curriculum. They alert us to the fact, that although planning commences with the curriculum, "what may be achieved with the curriculum at school level is also affected by organisational, personnel and training factors" (2004: 15). Accordingly, Heinrich (1995: 56) points out some relevant areas that a development plan should consider: *People, The Curriculum, Resources, and Buildings.*

A technology plan is dynamic and changes in complexity as experience and knowledge builds over time, so starting with a plan that represents the beliefs of staff is an important first step (Reksten, 2000). Next, ensuring that the plan is realistic, workable and manageable for staff is a sentiment frequently expressed (Straker and Govier, 1997; Reksten, 2001). Realistic targets with realistic timescales will foster more staff confidence, the main aim being to achieve small but successful steps forward. The philosophy guiding a technology plan mirrors a similar philosophy of Fullan's – 'Start small, think big!'

3.6   ICT and Professional Development

Progress Requires Time!

Successful ICT integration still remains in the realm of the ICT enthusiast. In examining Cuban's assertion that computers as a medium of instruction and as a tool for student learning, are largely incompatible with the requirements of teaching, Becker (2000: 14-15) highlights two important findings:

- Frequent use of most computer applications is still a minority teaching practice.
- Technology integration has been accomplished by a relatively small group of academic subject-matter teachers who are significantly different than their peers in terms of teaching philosophy.

Nias (1991) argues that feelings of loss brought about by continuous rapid change may be similar to those experienced in bereavement. Change induces uncertainty, threatens both security and classroom autonomy, and finally creates anxiety about

competence, status and adaptability. Regrettably, teachers, skilled and organised for years, suddenly find themselves in unknown roles lacking skills and unsure of the future. For this reason, Nias (1991) suggests that they need to be given time, scope and support to assimilate change and the stresses it brings, and to build collectively a new professional identity. The time element is certainly an important factor when becoming familiar with technology. Pelgrum and Plomp say that it is unfair to expect teachers who are completely new in the field of computer use in education, "to adopt this innovation and fully integrate it into their curriculum within only a few years" (1993: 127).

Teacher Development

Professional development is all about encouraging individual teacher growth and developing this as an institutional resource. Thinking about developing the school begins at the level of teacher understanding. People cannot be changed but can only change themselves (Tuohy, 1999). They must first be motivated to develop and realise personal knowledge and understanding. Personal change results in teachers developing the qualities and skills required to examine, gain insights into and make decisions about their own practice (Law and Glover, 2000). The ultimate aim is to improve that practice.

Accordingly, how successfully ICT is used in education and how it ensures meaningful change depends so much on teachers (DES, 1997; Alexander 1999). Reksten (2000) highlights the need to empower teachers through training. A combination of national and local strategies in training teachers to use ICT is evolving in many countries (Austin, 2000). In Ireland the Teaching Skills Initiative (TSI), part

of the Schools IT 2000, was set up to develop a complete ICT skills development programme to ensure teachers progressed to being expert in the field (DES, 1997). Regrettably, this did not always happen. Although training was reaching its targets by increasing skill levels, the uncertainty that teachers were feeling about what they should be doing with computers was one factor that highlighted a need to allocate resources at national levels to support curricular development (Mulkeen, 2001).

Pedagogical Considerations

In their study involving twenty-one education systems, Pelgrum and Plomp (1993) found that there was a need to include pedagogical and instructional aspects of ICT much more in teacher development programmes to improve curricular integration. Mulkeen agrees that an emphasis on "courses that build a vision for the use of ICT is more likely to bear fruit than a focus on short and purely technical courses (2002: 21). Alexander also points out that training should be about creating attitudes and learning environments for imaginative ICT use, and should provide scope for "exploring the potential of ICT in day-to-day teaching, whether by teachers or by teams of teachers" (1999: 12). Central to these deliberations lies the qualitative nature of what teachers do in classrooms and an understanding of the impact nature of their ICT usage. Involving teachers and educational researchers in this discourse is highly relevant. What are needed are:

> Considerable changes in school organisation, respect for teacher expertise, and the distribution of decision-making authority among teachers, administrators, and policymakers.
>
> (Cuban, 2001: 189)

Whole Staff Development

In order to fully realise the educational potential of ICT, teacher development is a necessary but not sufficient condition. A body of research draws attention to the likelihood of ICT being integrated into the life of the school when the whole staff is involved in training (Austin, 2000; Reksten, 2000). Indeed, Reksten (2000: 111) is convinced that weaving technology into the curriculum depends on the teacher.

What is most revealing in this argument is the capacity of whole staff training to build what Reksten terms the "collective consciousness" (2000: 111). Through training each staff member is empowered to fulfil the technology plan or policy formulated in the school. ICT does not remain in the realm of the enthusiasts, referred to earlier. Rather, all those teachers involved have the opportunity to learn from each other and build shared commitment to the plan and the development of ICT use in the school.

3.7   Conclusion

The literature reviewed in this chapter highlights that taking the significant steps towards meeting the challenge of ICT integration are formidable. Unless the established culture in schools is first confronted, building collaboration will face substantial difficulties. Clearly for teachers, the benefits of collaborative engagement relate to the fact that ICT learning is grounded in their own situation and thus becomes more meaningful and useful. The literature also presents convincing evidence that the principal can be a force for good; whose authority must not be seen as a battle for power but rather towards a facilitating one - one where the emphasis is on helping all concerned meet their needs for optimal functioning. A technology plan/

policy may also offer schools the opportunity to begin to examine ICT's place in schools in relation to curricular provision, resources, and teaching strategies, perhaps in a way and scale, they would not otherwise have done. Likewise, promoting the professional responsibility of teachers is seen as a positive influence in ICT implementation, particularly whole staff training, if teachers are willing to share their own experiences and learn from colleagues.

In this way the chapter has highlighted the positive and negative factors which the research literature suggests may contribute to the successful implementation of ICT in primary schools.

Chapter 4: Research Design and Methodology

4.1   Introduction

This chapter evaluates the suitability of action research as a method for analysing the implementation and effectiveness of ICT in teaching and learning. In so doing, it explores the rationale for selecting this method with reference to relevant literature readings. It then considers what constitutes validity in adopting this type of research. Cognisance of the limitations to the research is appropriately chronicled throughout. It concludes with an examination, in overview, of the design and methodologies of the research, as well as an outline of the criteria employed in the framework for analysis. This overview is in two parts; the first dealing with the research focused on children, and the second dealing with the research focused on teachers.

4.2   Action Research as a Method of Research

At a fundamental level, formal scientific research fails to understand the real, everyday experiences of practitioners' professional lives. Drudy (2000) argues that action research is becoming one of the more popular elements of educational change and professional development. Action research emerges as an approach that is more directly relevant to the work of practitioners (Altrichter *et al.*, 1993; Stringer, 1999; McNiff *et al.*, 2000).

For practitioners it involves:

- constructing understanding about their practice;

- gaining a more comprehensive view of their situation;

- developing action strategies to bring about improvement;

- evaluating the outcomes of their efforts.

(Altrichter *et al.*, 1993)

Accordingly, this research was adopted as a 'collaborative' method of research involving teachers and pupils within the school (Altrichter *et al.*, 1999: 6). This research is, accordingly, a means of improving the quality of teaching and learning as well as the conditions under which teachers and pupils work in schools (Altrichter *et al.*, 1993). Finally, Bell reminds us that an important feature of action research is that the task is not finished when the project ends, rather, "The participants continue to review, evaluate and improve practice" (1993: 5).

Validity: Triangulation

The planning philosophy underlying this research is both quantitative and qualitative in its approach. Altrichter *et al.* (1993) assert that action research is not distinguished by specific methods or techniques; each research project has "a character of its own" (1993: 6). Bell contends that a research instrument, "is merely the tool to enable you to gather data, and it is important to select the best tool for the job" (1993: 52). The selected method of inquiry for this study, therefore, is an eclectic approach incorporating a range of data evidence. In selecting procedures for data collection, consideration is given to the fact that any selected procedure must be examined carefully to assess the likelihood of

their reliability and validity (Bell, 1993). Denzin used the term "methodological triangulation" to describe a, "complex process of playing each method off against the other so as to maximize the validity of field efforts" (1978: 304). Accordingly, when carrying out the research for this study to validate linkages between different data, it was considered essential to use triangulation.

4.3   Design, Methods and Analysis Used in Children Research

When planning the use of ICT in the classroom, it is important to identify the role that ICT can play in adding value to learning across the curriculum. Endeavours to ascertain if particular ICT tools could enhance the effectiveness of learning, or add a dimension of learning that was not previously available, were central to the participation of children in this research. Clearly, disseminating and sharing the findings were also considered crucial. Consequently, data was collected employing a three-fold methodological approach, viz. Naturalistic inquiry, Documentary evidence and Teacher-children question/ answer session.

Naturalistic Inquiry

Programme Design for ICT Activities

A Second Class was selected to participate in the eight-week ICT programme, which was co-ordinated by the researcher with the assistance of the class teacher. This class comprised twenty-seven children - fourteen boys and thirteen girls, aged between seven

and nine years. The research was carried out in both the computer room and the classroom. The class had access, for one hour each week, to the computer room of sixteen networked computers. However, as an explicit intention of the study was to further ICT use in the classroom, steps were taken to set up four computers in the classroom for the duration of the research. The researcher was encouraged and positively facilitated by the School Principal with free time that coincided with actual times this class spent both in the computer room and in the classroom for dedicated ICT work.

The timescale for the pattern of events involved in this programme will now be discussed (*cf.* Table 1). During the month of September informal meetings with the class teacher were first held to discuss the creation of the schedule for the overall process. The decision was made to focus attention on pedagogy rather than on the technology itself, to concentrate learning on two particular subject areas – English and Mathematics.

Table 1 - Timescale for ICT Programme with Children

Target Date	ICT Activity
Week 1: October 13th-17th 2003	Exploration of Software: Maths Circus 1
Week 2: October 20th-24th 2003	Exploration of Software: Maths Circus 1
Week 3: November 3rd-7th 2003	Word Processing: Story / Picture
Week 4: November 10th-14th 2003	Word Processing: Letter
Week 5: November 17th-21st 2003	Spreadsheet: Bar Chart
Week 6: November 24th-28th 2003	Spreadsheet: Pie-Chart
Week 7: December 1st-5th 2003	Internet: Christmas Website
Week 8: December 8th-12th 2003	Internet: Christmas Website

Activity Details – Children's Research (Weeks 1-8) Appendix 1

Data Gathering and Analysis

During the eight-week research period, the data obtained was principally through observation of participants as they worked on the various ICT lessons, both in the computer room and in the classroom environments. This was especially conducive to observing the children's efforts to engage with the technology in a practical manner. Data was also recorded through the use of field note taking that pertained mainly to children's comments or queries during class, children's social interactions and learning capacities. Discussions with the class teacher about the issues or concerns involved in the integration of ICT into curricular work were also recorded.

In analysing the data, every effort was made to categorize this data in main themes representing the experiences referred to by the children and teacher in the learning events. These themes included increased communication, motivation, and enjoyment in work. Each newly identified issue was filed as a new theme and subsequent references were added to these themes. Data was correlated later with data collected from the other data recording activities.

Documentary Evidence

Aston Index test cards

Data was compiled through the use of Aston Index test cards to ascertain the potential of ICT to enhance children's learning in the area of literacy skills. In the present study particular attention was paid to Test 11 – Free writing (LEVEL 2 only). Prior to commencing computer activities with the children and immediately after the eight-week

research period, the children were required to write a story – completely free, unaided writing. As free writing is sometimes associated with failure, encouragement is an important factor in this subtest. The test was adapted so that children were instead given a sheet to write on which contained a picture.

Work Samples

Ruddock and Hopkins (1985) suggests that the more traditional 'teacher research' compiles evidence that may include documents such as journal entries, student's work, policy documents from schools, and newspaper accounts. In this instance, weekly samples of pupils work collected, reflected in particular what was accomplished through the use of word processing and spreadsheet applications.

Analysis

In analysing the data from the Aston Index tests, each child's two sample sheets were closely examined under five headings - type of spelling error, syntactic structure, fluency, originality of content and general level (as compared with peer group performance). This process was considered useful as a formative type assessment in establishing a methodology for indicating strengths and weaknesses, if any, in children's written work before and after using computers. It was also considered beneficial in comparing this analysis to interpretations gained through naturalistic inquiry. Mindful of the limited time available, and the fact that the use of ICT for children's attainment of specific learning objectives may not always be appropriate, the possibility of discovering other value functions of adding ICT was considered equally important.

Similarly, the text in the samples of children's work was examined, particularly for information relating to any syntactical patterns that contributed to the effectiveness of the text. Underpinning this study was an awareness of the age and class level of the children and the fact that children's writing develops at different rates. Thus the strands of language selected for this investigation were use of capital letters and full stops, length of sentences, and errors in spelling.

Teacher-Children Question/ Answer Session

Design

After the completion of practice work children were interviewed in the classroom about their experiences of working with computers. With children sitting on the floor in a circular position, the session was tape-recorded as this facilitated concentrating on the views of the children, rather than note-taking. Twenty-seven children and the class teacher participated in the session. It was necessary for good order to maintain direct control over the group during the interviews. Cognisant of the potential for some children to dominate proceedings, every endeavour was taken to ensure that all children had an equal opportunity to contribute to the discussion. A weakness in this method, however, may be that the interview was driven by the researcher's interest in attempting to validate and better understand data compiled through the naturalistic inquiry of working sessions. Nevertheless, it was also felt that when working with the children reliance on the researcher's focus was necessary to ensure that concentrated responses on the precise topic of interest were generated.

Analysis

Following transcription of the recorded discussion, the data was processed in depth. Interpretations were categorized under the themes listed in the 'Naturalistic Inquiry' section. Clarification was sought from children. This data was correlated under themes to previously recorded data which offered the opportunity to confirm and fine-tune the resulting conclusions.

4.4   Design, Methods and Analysis Used in Teacher Research

In this study the aim was to first identify the forces that were either driving or restraining teachers from implementing ICT in the classroom. Having explored a programme of activities to encourage teachers to integrate technology into learning experiences, the aim was to assess if teachers had discovered any new meanings or perspectives on ICT use during that research period. Accordingly, combining a wide range of methods was considered appropriate for this study. The methods employed were:- Questionnaire, Naturalistic Inquiry, and Focus Group.

Questionnaire

Following preliminary work on planning, consulting and deciding what information needed to be disclosed; a questionnaire was considered a suitable method of building teacher profiles that was likely to yield usable data for this study. Berdie *et al.* (1986) say that different studies call for variance in both purpose and type of information sought in questionnaires. Participants may be questioned on their opinions on issues or factual

knowledge. Selecting a questionnaire for its "Capability of producing large quantities of highly structured, standardised data" (Clarke, 1999) was significant, as participants were invited to give both factual and attitudinal information about ICT. Thus a questionnaire was considered a very appropriate means of addressing sensitive issues because it offered anonymity and confidentiality.

Questionnaires present certain weaknesses. Completing the questionnaire fully and accurately depends on the co-operation of the respondents and highlights the assumption that participants are sufficiently literate. Certainly, anonymity can remove or even dilute personal responsibility for comments made. There is always the danger of responses being superficial or merely descriptive information as respondents indicate what they think they ought to say or what they feel the researcher would like to hear (Munn and Drever, 1999). Finally, indiscipline on the part of the researcher may lead to the addition of questions that are superfluous to the main task (Bell, 1993). Clearly, questionnaires may be weakened if time to process them has been underestimated.

Design and Content

Bell (1993) contends that a well-designed questionnaire is one which provides the relevant information, is acceptable to respondents and which gives no problems at the analysis and interpretation stage. She cites forethought as being particularly relevant in "selecting question type, in question-writing, in the design, piloting, distribution and return of questionnaires" (1993: 58). Cohen *et al.* (2000) advocate using a common sequence, where, it is desirable that initial questions are both simple and of high interest to encourage participation, and to build both the confidence and motivation in

respondents. The more difficult questions are contained in the middle section with the concluding section again being of high interest for respondents. To achieve the desired questionnaire format for this study, these considerations were kept in mind, and the questionnaire compiled can be viewed with the covering letter in Appendix 2.

In overview, the questionnaire layout was specifically designed to look interesting and attractive, with an uncluttered layout. The aim was to be both easy to read and easy to answer. Efforts were made to ensure that the questions and the instructions were clear and unambiguous. In particular varied use was made of open and closed questions. While it is acknowledged that closed questions are more easily coded, the expressed intention was to afford teachers the opportunity to reveal information that might be important and that could be followed up at the focus group stage.

The Pilot

Moser and Kalton argue that, "The pilot study is… the researcher's last safeguard against the possibility that the main survey may be ineffective" (1985: 51). Bell also states that piloting of a questionnaire is essential to test length of time required to complete it, to check clarity of questions and instructions, and to remove unnecessary items that will not yield usable data (1993: 65). Accordingly, the questionnaire was piloted in October 2003, with two primary school teachers (female) in two different schools, both of whom use computers to varying degrees. As one teacher indicated frequent use of computers due to study commitments, and the other teacher said she used it infrequently due her role as resource teacher in the school, it was considered that the population reflected the target population.

Feedback was generally positive and the estimated time for completion of questionnaire was between twenty and thirty minutes. A number of points were highlighted for amendment.

- Increasing the font size on the questionnaire, for easier legibility - particularly the introduction.

- Placing instructions for Q3, Q5, Q13, Q14, Q19 and Q20 in the box opposite the options box was regarded as confusing - these were repositioned.

- The wording of Q11 was considered to elicit too many variables - leaving it more general with the example of the Internet was considered sufficient.

In light of the feedback, the questionnaire was amended and a refined version prepared for distribution. A covering letter was sent to each of the twenty-one teachers. The return rate was a 100%, all questionnaires being returned.

Analysis of Questionnaire

In analysing data, Bell refers to the two broad categories into which statistical methods fall, "descriptive and inferential" (1993: 103). Descriptive statistical methods are characterised by charts, tables, percentages, averages etc. For the purposes of this questionnaire, descriptive statistics were deemed suitable for analysing the information gained, and Microsoft Works Spreadsheet was used for this task. The data was, therefore, divided into the following areas:

- Obstacles Influencing ICT Use

- Incentives to Promote ICT Use

Data was analysed as follows:

- calculating codes from nominal scales;

- calculating codes from ordinal scales;

- categorising valuable information pertinent to ICT issues from open-ended questions.

Naturalistic Inquiry

Programme Design for ICT Activities

The proposed timescale for the various ICT initiatives that took place in the school as part of the research carried out with the teachers is presented on Table 2. Research was carried out mainly with the sixteen mainstream classroom teachers, while teachers from the Learning Support team participated in some sessions with classes. Involving the Learning Support team was considered equally important and two members participated in the focus group session.

Table 2 – Timescale for Staff Project

Target Date	ICT Activity
October: Monday 6th – Friday 10th 2003	Software Evaluation
October: Monday 20th – Friday 25th 2003	Software: Computer Room Work
November: Monday 10th – Friday 14th 2003	Word Processing: Computer Room Work
December: Monday 1st – Friday 5th 2003	Internet: Computer Room Work
January/ February 2004	Preparation for Presidential visit
March: Friday 5th 2004	Visit from IT Tutor

Activity Details – Teachers' Research (Oct.-Mar.) Appendix 3

Focus Group

As a form of qualitative research, Morgan describes focus groups as, "group interaction... between a researcher's questions and the research participants' responses" (1997: 2). He explains that the researcher takes the role of moderator and supplies topics, but basically the reliance is on interaction within the group which will ultimately produce data and insights only accessible within a group.

Design for Focus Group

It was decided, therefore, in the light of literature readings, to explore the supplementary use of focus groups in this study. A focus group was seen as possessing the potential to create follow-up data to assist the primary method (questionnaire). An example is that certain views and opinions were initially expressed in questionnaire responses that might be revised after some teachers had the opportunity to use ICT tools with children in the context of their engagement with the curriculum. Accordingly, the purpose in facilitating group interaction was to explore four particular areas:

- to expose the relevance of computers in their daily lives;
- to re-examine teachers views on the capacity of ICT experiences to enhance children's learning in the Primary School Curriculum, and to assess their willingness to allow ICT to afford children the opportunities to develop learning skills;
- to assess the school's endeavours to develop ICT to-date;
- to offer suggestions and share concerns for the future development of ICT in the school.

The choice to use a structured approach to the focus group was seen as especially useful since the work being carried out to develop ICT presented what Morgan terms a "strong pre-existing agenda for the research" (1997: 39). He goes on to say that both a standardized interview and a higher level of moderator involvement have the capacity to contribute to that set agenda.

There are, however, limitations to using focus groups. For example, Morgan alerts us to the fact that in comparison to observation of interaction in naturalistic settings, focus groups are not only limited to verbal behaviour and consist only of interaction in discussion groups, but are also created and managed by the researcher (1997: 8). Certainly, the fact that the researcher's interests drive the focus can be a source of weakness. Furthermore, when compared to individual interviews, focus groups again reserve greater attention to the role of moderator and less depth and detail about the opinions and experiences of any given participant may be produced (Morgan, 1997).

This proved a challenging feature for the focus group as, on one occasion the researcher in order to explore the topic of promoting ICT use in the classroom, attempted to give more control to the group. Regrettably, it was discovered that giving control over to the group resulted in less being heard about the topic of interest as the discussion was dominated by the concerns of running a busy classroom. Direct control had to be consequently reasserted.

Determining Participants

Seven teachers (32% of the staff) were selected for the focus group as six to eight people are viewed as the optimum size for a focus group (Bloor *et al.*, 2001). There was one representative from the following class levels – Junior Infants/ Senior Infants/ First Class – while two teachers were selected from both the Second Class level and from the Learning Support team.

As interaction between participants is a key feature, Bloor *et al.* (2001) recommend careful consideration to the group composition. Accordingly, the decision was taken to use "segmented samples" of participants, whereby, the group composition was controlled to match carefully chosen categories of participants (Morgan, 1997: 35). The ultimate aim was to ensure that the participants in the group had both something to say about the topic and felt comfortable saying it to each other (Morgan, 1997: 36). Observation of various teachers' attitude towards computer use had been noted during the course of the research. Participants were, therefore, selected for either their reluctance to adopt ICT use in the classroom or their willingness to do so - a 4:3 ratio.

Use of Dictaphone

Verma and Mallick suggest that the opportunity for observing during discussions provide the researcher with clues regarding the extent to which questions can be probed. Having an accurate record of discussions from which information could be assimilated was also clearly an obvious benefit. The unobtrusive use of the Dictaphone was adopted to record the discussion.

Analysis of Focus Group

The analysis of qualitative data should be "systemic and rigorous" (Bloor *et al.*, 2001). Following transcription of the entire Focus Group discussion, extracts of data pertinent to the themes outlined in the questionnaire were indexed. The goal was to assign index codes to the content of the data that were of interest to the, "researcher's analytical framework" (Bloor *et al.*, 2001: 63). These data themes were added to those already correlated from the two other modes of inquiry, and quotes from the focus groups were also gathered under the various headings.

4.5 Conclusion

In this chapter the sequence of events undertaken to promote ICT use in the school was explored. Investigations using action research were seen as a particularly effective means of enhancing learning experiences for children and bringing about teachers' professional development in information technology. The chapter outlined not only the methodology used and the design of the research instruments, but also the mode of analysis that was adopted. A three-fold methodological approach was used with children; exploratory working sessions were carried out with the children, samples of their written and typed texts were gathered for analysis and a question/ answer session was held. A three-fold approach was also used with teachers, comprising of an initial questionnaire, facilitation-type sessions and a final focus group. The aspiration was to evaluate the measures objectively, so that a full understanding of the issues and implications involved in developing ICT use could be gained.

Chapter 5: Findings on Research with Children

5.1   Introduction

This chapter presents an analysis of data which seeks to establish the potential of computer-based activities to enhance the effectiveness of children's learning or indeed add a new dimension to that learning. The analysis draws on quantitative and qualitative sources. Data was collected by observing the effects of ICT applications on pupil engagement with learning tasks. In assessing the computer as an educational tool - specifically in relation to development of literacy skills – data was also gathered through an analysis of written samples of work. Further clarification of issues was then sought through anecdotal evidence collected in a question/ answer session. The different data sources thus served to support, confirm and illustrate emerging issues. The process of analysis, however, highlighted the difficulty in determining whether the innovation or educational method of using ICT had been effective.

5.2   Constraints of the Study

Two main constraints in conducting this study emerged. The first relates to the limited timeframe of eight weeks in which to establish, run and evaluate the ICT programme of activities with another teacher's class. The possibilities for using ICT are far-reaching, but regrettably, there was insufficient time to watch ICT play itself out in children's experiences and sort through what works and what doesn't. This was further compounded by the fact that children presented with varying degrees of ICT

experience which created barriers to both the nature and process of working on tasks in the time allowed.

Secondly, the fact that children were involved meant that the research was dealing with individuals who were at various stages of development. None had or still have fully developed in relation to objectivity, rationality or logic. Participating in the qualitative research, therefore, the children may have experienced a certain novelty from participating in the programme and this could have affected the objectivity of their responses to the questions in the question/ answer session.

5.3   Children in the Information Age

The aim of this section is to detail the extent to which home computers are a reality in children's lives.

Home Learning Culture

Of the twenty-seven children in the Second Class in question, fourteen were boys (51.8%), while thirteen were girls (48.2%). The data indicates that 77.7% of the children have home computers, while 22.2% do not. The question/ answer session provides interesting data on the exposure of pupils to computers and the types of activities for which they use them. It is interesting to note that of the 77.7% of children who have computers at home, the main activities that they use computers for are games (48%), writing (43%), drawing (38%) and Internet (29%).
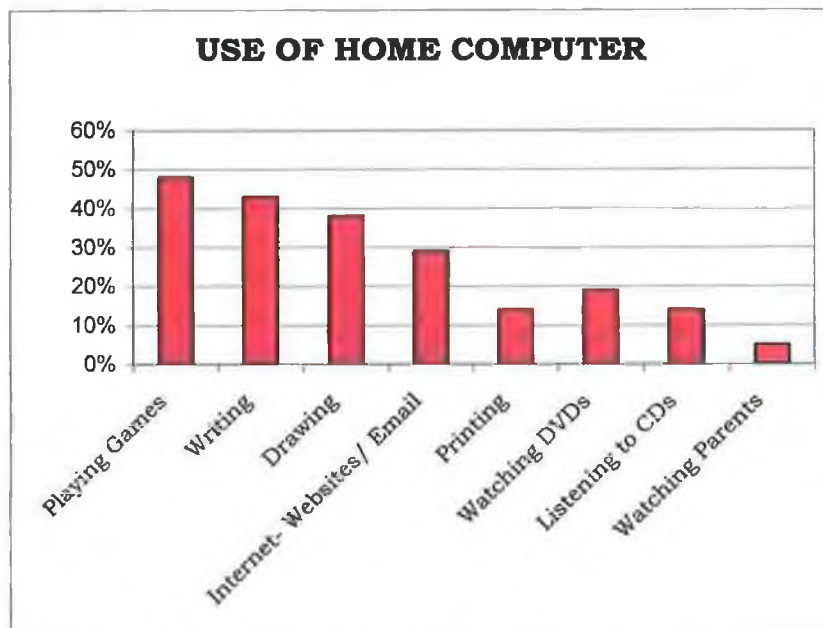
Figure 1 – Children's Exposure to Computer Activities

The data generated in this section indicates that the growing number of computers to be found in homes is widely used for leisure activities. Quite a high number of children expressed a preference for games, while an equally significant number used it for writing and for drawing purposes. Exploration of the Internet proved to be a relatively popular pursuit. It is evident from their comments that children are being afforded the opportunity of experimenting with a variety of activities:

- I write, paint and print.

- I write letters to my friends and sometimes me and my Mam, and my sister go on the Internet.

- I mostly would play games and sometimes I'd listen to music and sometimes I might go on the Inter… on the website.

5.4   Educational Benefits Arising from ICT Use

English

This section provides data on the extent to which the word processor had an impact on the quantity and quality of children's writing. Text analysis was carried out on children's writing in two free writing assignments (Aston Index Test 1 and 2) administered prior to, and subsequent to the research period. Assessment of individual strengths and weaknesses will be discussed under the following headings - type of spelling error, syntactic structure, fluency and originality of content. This is compared with a similar analysis carried out on samples of typed text produced by the children during their work on the word processing tasks. Syntactical patterns assessed here related to spelling errors, length of sentences and use of punctuation e.g. capital letters and full stops. Samples of the Aston Index Tests (1 and 2) and samples of children's typed text (stories and letters) may be seen in Appendix.

Spelling Error

Analysis of the Aston Index Test samples (Figure 2) indicate that the number of pupils who experienced academic gains in writing, particularly in the area of spelling error was relatively low. In the Aston Index Test 2 spelling errors had improved for only 15% of the children. Clearly, a high proportion of pupils (81%) were still making similar mistakes to those made in the Aston Index 1 Test. For example, spelling mistakes related mostly to:

- Phonetic spelling e.g. 'nite' for night / 'lovele' for lovely / 'thout' for thought / 'codent' for couldn't / 'Mis Clos' for Mrs. Claus.

- Omissions e.g. 'chimey', 'stuk', 'herd', 'lookd'.

On analysing spelling errors in the stories produced on the word processor, the data reveals similar patterns of results to those already mentioned above. Examples of reversals and phonetic spelling mistakes were:

- I love brian o, driscle. He is my faverite.

- The fowers were gorwing in the garden.

The particular word processor used did not have the facility for checking spelling. Making a text completely correct is an arduous job, and as children were being introduced to many new skills in word processing, emphasis was not placed on spelling correction in their texts while they were working. The children also typed a 'Thank You' letter which was a redraft of one already discussed and written in their copies in class. Consequently, there were fewer spelling errors in letter writing, spelling errors here also related to reversals:

Dear Santa,
Thank you so much for all the toys you have given me. I play with them all day. I wunder how meny toys the elves made. From Enda.

Dear Niamh,
Thank you for the doll, ti has a nice dress. I like to pay with her. I hope to see you soon. Love Kelly.
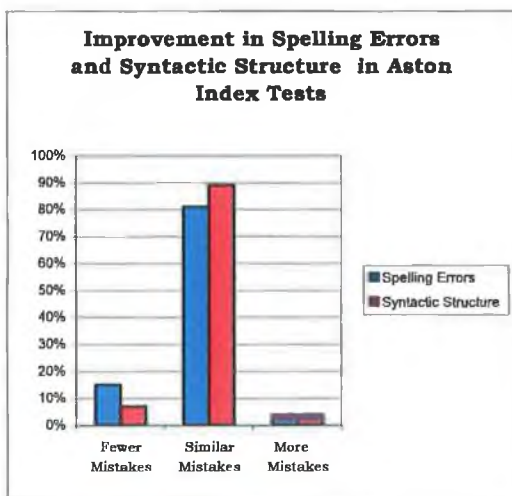

Figure 2 – Improvement in Spelling Errors and Syntactic Structure from Aston Index 1 to Aston Index 2
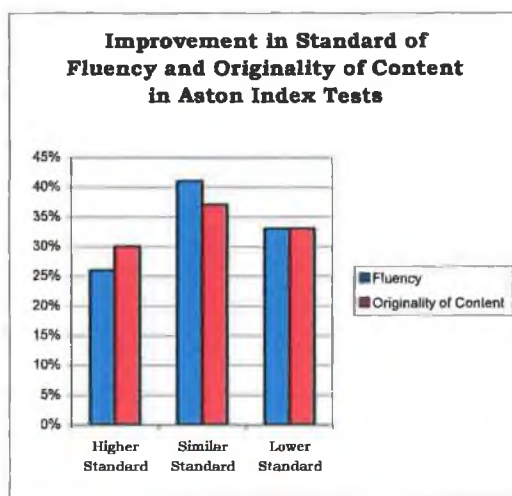

Figure 3 – Standards Achieved in Fluency and Originality of Content from Aston Index 1 to Aston Index 2

Syntactic Structure

Analysis of the Aston Index Tests 1 and 2 to assess if a higher standard of improvement was evidenced in the syntactic structure of children's writing subsequent to working on computers also revealed little in the way of substantial changes in terms of structure (Figure 2). For example, in the Aston Index Test 2 syntactic structure in writing had improved for only 7% of the children, while 89% of them recorded similar errors to the first test, their standard of work remaining unchanged. The extent of errors made in syntactic structure by that group (89%) varied. Of that group 66% recorded relatively few errors in the first test and again recorded a similar amount of errors in the second tests. The following are examples of errors made by a child in the two tests:

Test 1:   The butcher was in the backroom. A thief came into the store and robed his money. The butcher came out of the backroom to get his money to see how much he had but he couldnot see how much he had because the thief robed all his money.

Test 2:   Santa is going to get into the chimney. But he can't get in. He can't get his other foot in it would only let one foot in. The chimney is to small. so santa hat to do some magic.

On the other hand 33% of them recorded significantly more errors in both tests. Regrettably improper use of capital letters and full stops emerged as the main weaknesses in their writing. Examples of these types of errors made by a child were:

Test 1:   one day a butcher was cutting some meat and Then a thief came and tuk. The cashregester. And The butcher ran after him but he was to late so he called the garda.

Test 2:   one Christmas eve santa was on my roof I herd the sla clatter I herd him mumbleing help I went down staris opend the door. then I Looked up the chimny

When cross-referenced with samples of children's stories and letters, the opposite was noted - good use was made of capitals and full stops in their work. However, further analysis revealed that stories also showed a dependence on simple sentence structure and a lack of variation in sentence length.

- It is a very very sunny day. The grass was growing. The sun was very hot. It was a summers day.

- Im a goal keeper for hillcrest and I am good. I love football and I support man unitid.

Fluency and Originality of Content

Analysing the texts of the Aston Index Tests for fluency and originality of content indicate more interesting results (Figure 3). A higher standard of fluency was evidenced in the writing of 26% of children. More substantial changes in terms of ideas were revealed with an equally high number of children (30%) displaying good originality in the content of their stories. There was evidence of some more adventurous vocabulary being used, as well as marginally more sophisticated ideas coherently expressed. Certainly the quantity of work had substantially increased:

> One Christmas eve I was in bed. I was fast asleep and I heared something on the roof. I thout it must be Santa Clause. I got so excited that I fell out of my bed. Then I heard footsteps. I thout that it couldn't be Santa because I had carpet in my living room. I started to get scared.

> On Christmas eve the elves had finshed packing the wonderful present's for the children. Then santa took off in the night sky. When santa came out of the house his foot got cought in the chimney. Santa sighed. I will never get to the last house he said.

Worryingly, however, this was counterbalanced by a high proportion of children (33%) producing both a lower standard in fluency of writing and a lower standard in originality of content:

> I love all the Santa. But he give us lots of toys and games at home.
> We have lots of fun whit our toys and gams. Santa look at everyone.
> Santa is looking at us.

The 'Haves' and the 'Have-Nots'

However, the fact that over one-fifth of the population are not acquiring a knowledge of technology at home, raises the issue of the 'equity gap' between the 'haves' and the 'have-nots' (Caperton and Papert, 1999). The analysis of children's written work indicated, however, that in comparison with children who have computers, those six children without home computers achieved an equally good standard of work. For example, a high proportion of children maintained a similar standard in spelling errors and syntactic structure (80% and 60% respectively), but importantly, a 20% higher standard in both the fluency and originality of content was evidenced in the Aston Index Test 2.
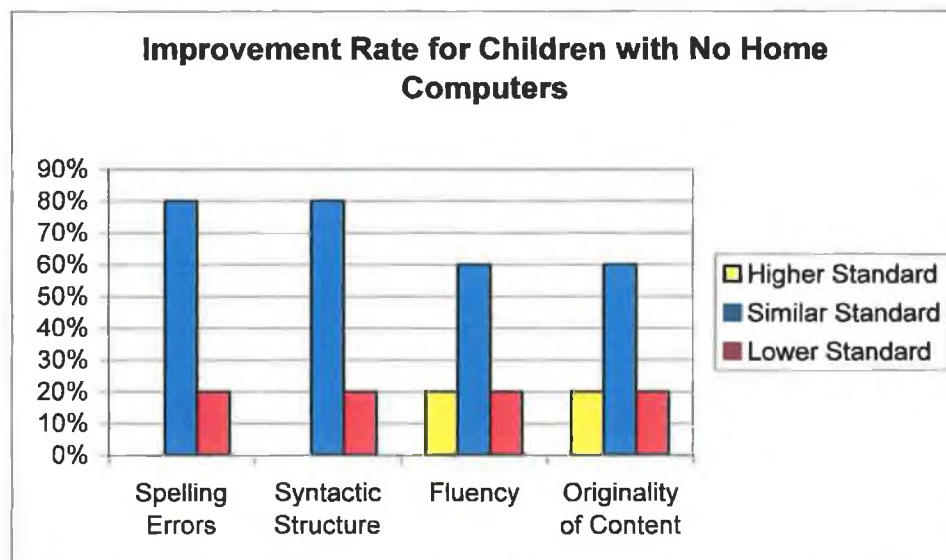
Figure 4 – Improvement in Children's Writing from Aston Index 1 to Aston Index 2

An analysis of children's typed text demonstrated that these children were equally proficient at using the word processor. Although the results for spelling errors and sentence length were overall average, four children showed a surprisingly good ability to use skills to apply punctuation to the text.

Table 3 – Analysis of Typed Text

	Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 4	Pupil 5
Spelling Errors	A	A	A	A	A	G
Sentence Length	A	A	A	A	A	A
Punctuation	G	G	A	G	A	G

W=Weak   A=Average   G=Good

Maths

This section presents an analysis of the use of a CD-ROM and spreadsheets in solving mathematical problems. Firstly, observations made during time spent exploring various ICT activities indicate the extent to which:

1. The use of the CD-ROM provided a support mechanism that adapted to the strengthening of ideas and concepts revolving around direction, estimation, positive/ negative numbers and arithmetic.

2. Children's critical inquiry was supported through the use of spreadsheets, and also the extent to which children were challenged.

CD-ROM: Maths Circus 1

When initially introducing the drill-and-practice programme, guidance was aimed at the novice user. Each programme required fixed action patterns, which the children showed they were able to learn quickly, particularly those for the 'Direction' and 'Estimation' activities. The component activities involving numbers were more

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variable and caused the weaker children more problems. Comments from the children were mixed, and ranged from, 'This is easy, let's move onto the next level', to, 'I don't like the number game, can I try a different one'. However, children of equal ability worked surprisingly well in pairs and encouraged each other to apply themselves to the task. In quite a number of cases, discussion invariably lead to a competitive edge being introduced into the games. Nevertheless, the games format was certainly exciting and motivating, and ensured certain basic maths skills were practiced. Its ease of use, and appealing graphics provided ample encouragement to stimulate the children and provided them with the opportunity to succeed at their own pace, which was an important incentive for those most in need of help.

Undoubtedly, the evaluation sessions at the end of each lesson indicated children's full support for and enjoyment of the activities:

- The games were deadly, exciting and good fun!
- I liked trying to get on to a harder level.
- When you were with a partner you had to work harder.

Spreadsheets

Bar charts and pie charts were the graphs used in the pupil's inquiry and data was elicited from children's own experiences. Analysis of observational notes indicates that production of the bar chart was an arduous task for the Second Class. Input of data was time consuming and creating the chart was quite difficult for children unfamiliar with both 'menu' options and the location of numbers on the keyboard. One child remarked during the question/ answer session:

> The difficult part was when you had to go into a file and go down to
> print and go into all that stuff, 'cos it's a bit confusing.

Nevertheless, children did appear to have gained experience of the bar charts because they could as Smith (1997) suggests describe what the chart showed and make direct statements such as 'five children like pizza' and 'eight people like hotdogs'. Their answering on completion of the assignment revealed good interpretational skills but invariably the fact that numeric data was only represented on the y-axis may have reduced the difficulty level of questioning.

Similar results surfaced when creating pie charts. Ease of production was more apparent and children expressed a preference for this particular chart:

> I liked the pie chart 'cos it was colourful and it wouldn't go up and
> down and it's my favourite shape.

Once again they were able to identify and compare sectors, and articulate what the graph showed. Numeric fields didn't cause major difficulties and quantitative interpretation was quite often correct. In overview, the use of both graphs appeared a positive learning experience for the children, but there is significant room for further and certainly more challenging development in the usage of graphs.

Internet

In this section an analysis of data reveals the extent to which the Internet can be used as a resource for making greater use of the potential of the computer to facilitate learning in new and innovative ways.

Christmas Website

Observations made indicate that on the days the Internet was accessed, a definite air of excitement and anticipation was experienced in the computer room. Children were enthused by the variety of activities they had the opportunity to explore:

- I liked playing the word search.

- I liked it because there are great games.

- Most of all I liked writing the letter to Santa.

One of the most impressive aspects in using this medium was the amount of talk it generated. In pairs, the natural focus for their talk was Christmas, and children were encouraged to listen to each other, reflect on and participate in the various interactive website activities. In particular purposeful conversation was promoted to highlight the value of the Internet in communicating with other people, and writing a letter to Santa proved a successful first step in introducing them to the 'notion' of email. The children's efforts were rewarded when they received an actual reply from Santa:

> Like, I asked for a computer for my surprise and in Santa's reply he said I see you like computer software, I like computers too.

> I asked for a bike and Santa said back that he always drives bikes around the North Pole, delivering letters.

In this regard, opportunities for developing both the reading and the writing skills of children were seen to be positively exploited through use of the Internet.

5.5   Enhanced Dimensions of Learning

Chapter two highlights a number of mechanisms through which ICT increases learning and contributes to added-value in education. For example, anecdotal evidence gathered from the ACOT project in America, illustrates significant improvements related to increased student engagement and motivation that streamed out of those classrooms involved with ICT. Consequently, presenting evidence of learning improvements from ICT in this study is now the focus of this section.

Motivation

The huge enthusiasm of pupils was clearly evident as they worked on computers – in their awe at learning the new software programme and in their delight at producing booklets for both stories and letters. Games were invariably a source of constant inspiration but even with word processing tasks the children willingly responded to the task of editing their written work. Indeed, when creating pictures, observation revealed that the pupils were entranced with the ability of the graphic file of the computer to produce colour, line, texture, colour fill etc. They subsequently derived much satisfaction out of printing and admiring these images. Admittedly, it was discovered that with some children their typing might have suffered in their bid to get to the drawing part!

Benefits also derived from working with ICT showed how children were learning faster and were genuinely anxious to learn. For example, motivation in learning became apparent when the children revealed that they had revisited the Christmas website on home computers. Two children enthusiastically described how:

> I looked into all the different houses that were on it and when my
> Dad was gone away he brought his laptop with him and he printed
> out a story for me.

> I was on my auntie's computer and I went into the reindeer barn and
> I saw Santa's sleigh and it showed you how he takes off and what he
> uses to make the reindeers like fly.

It would seem that at least for a few children their interest and motivation in ICT had extended and was being reinforced in a home learning environment, and the researchers efforts were further reinforced when one child announced:

> I couldn't go into big picture, because it wouldn't let me but then I
> went into a different one, which was *merrychristmas.com* and there
> were loads of games and you can make stories and you can learn
> recipes.

Enjoyment

Aspects of using computers in school deemed enjoyable by the children were games, the Internet and word processing. When questioned further on the reasons why they enjoyed typing the letter, the release from the tyranny of handwriting was emphasised; a child suggested, 'because it is quicker to do it than when you are writing'. Another child added, "cos… because its great fun and it is much easier to write on the computer'. Interestingly, when probed further as to why it's easier to write on the computer, she then pointed out, 'because once you learn how to do it then you get faster every time you do it'.

The term 'easy-peasy' was used quite frequently to indicate confidence in using an application. It did, however, become apparent that as time progressed pupils were able to demonstrate a good standard of ICT competence and an ability to use their skills relatively independently. Even those children who according to the class teacher would normally experience difficulty with class work had the opportunity to experience success. One particular child for whom English is a second language typed the following in her letter and was absolutely thrilled with the printed booklet:

> Dear Emma,
> Thank you very much for the doll. I miss you. Are you wel. From Mistura.

Children also derived immense support from working with a partner. One child gives an insight into this when she said, 'Yes, because if you are stuck on something you can let your partner help you'. Perhaps this was a good indication of why they were enjoying the classes so much! Significantly, the class teacher indicated that as the children both enjoyed and became more involved and competent in working on the computers, the time spent on tasks in the classroom was increased and use was extended throughout the day.

Increasing Communication

An examination of the potential of ICT as a means of enhancing learning could not be complete without reference to the communications opportunities it presents. The 'Communications' element of ICT is seen in terms of communication not only with a constantly updated information base, but also communication with other individuals.

The findings reveal that to a limited extent endeavours were made to explore the Internet's contribution to the development of communication skills with people i.e. letter to Santa and replies. Regrettably, in light of time constraints it was not possible to access data information in an effort to promote new learning in particular areas.

5.6   Conclusion

Although it was difficult to quantify achievement gains in terms of the long term impact of ICT on learning, a clear message emerging from computer-based activity work carried out is that, it presents considerable reasons for reviewing classroom practice. Evidence suggests that it has the potential to offer a more enlightened pedagogy for delivering the curriculum and merits being seen as one tool among many in teachers' instructional repertoire. Crucial to these considerations lies the need to ensure that pupils use ICT within the context of meaningful assignments within the classroom and that ICT is not just set aside as an activity to be carried out exclusively in the computer room.

Chapter 6: Findings on Research with Teachers

6.1   Introduction

In this chapter both quantitative and qualitative results demonstrate the factors that inhibit the extent to which teachers in the school are using ICT, but also highlight the change issues that are needed if teachers are to be supported in taking advantage of ICT's potential. Data was first gathered through teachers' written responses to a questionnaire. During the research period, more data was obtained from discussions with, and observations of teachers during facilitation-type sessions. To better understand and validate the data already received, teachers were asked to give further details about their experiences in a focus group session. Resulting data indicates that although teachers are considerably interested in learning how to use technology, they need constant support and training in order to feel adequately able to integrate ICT into their instructional practice.

6.2   Obstacles Influencing ICT Use

The teacher is seen as the person ultimately responsible for not only incorporating ICT into the curriculum, but also for building new instructional habits, and for integrating all that technology offers into the classroom. Hence, we will now examine more closely the factors that tend to inhibit teachers from making ICT an effective educational instrument.

Exposure to External Technologies

Of the total 21 teachers who responded to the questionnaire most teachers (95%) indicated computer ownership. The largest group of owners (33%) tended to use the computers at home weekly, while the remaining group used it daily (14%), monthly (19%), termly (24%), never (5%) and others (5%). Literature suggests that the extent to which teachers use technology outside the classroom may be an indicator of their interest and corresponding skill in using technology (Baylor and Ritchie, 2002). Accordingly, data generated in the focus group indicated that with the exception of two teachers who mentioned using the computer for teaching preparation, teachers' exposure to technologies external to the school mainly focused on leisure and domestic activities - the Internet was used for booking tickets, book reviews, emails, banking, and grocery shopping.

Not Using Acquired Skills!

Literature also supports the view that one element preventing more teachers from using computers frequently with their students is their own limited skill and expertise in using computers themselves (Becker, 2000). In this study the data indicates (Figure 5) that, clearly, some teachers lacked proficiency in certain skills. For example, a majority of teachers (76%) were unable to create databases, while others (71%) were not capable of compiling spreadsheets, preparing a PowerPoint presentation or using the digital camera.

However, a formidable percentage of respondents had indeed learned some ICT skills over the years. A high majority (90%) could print, an equally high number were able to use the word processor (86%), and many more (62%) indicated their ability to install and run software. The most interesting results relate to teachers' ability to use

the World Wide Web. Many (76%) knew how to browse the Web, and a significant proportion (67%) was able to download information from the web and send/ receive emails. These findings were further collaborated by responses to the statement, 'I am afraid of using ICT because I lack basic ICT skills'. An impressive number of teachers (47%) disagreed with the statement while some more (14%) aired even stronger disagreement. In response to another statement, 'I don't feel technically minded enough to use the computer', many teachers again reported that technical incompetence was not inhibiting them from using computers. Interestingly, teachers expressed an interest in seeing the Internet being used in the school to enhance the teaching and learning environment (Q11); herein lay an application in which a significant majority already had the 'know how' to exploit.
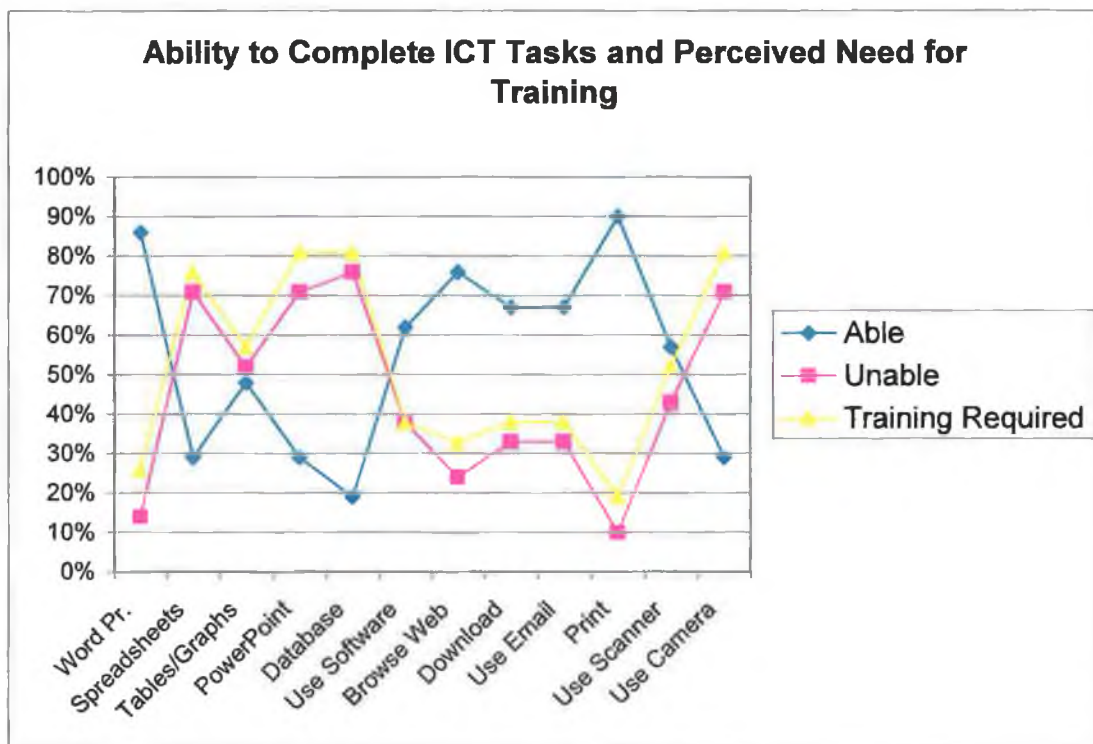

Figure 5 – Composite of Ability Range and Training Needs of Teachers

Teacher Competence

The majority of teachers (53%) indicated that they consider themselves generally confident using computers. Of the remaining group, some (14%) felt very confident, an equal number (14%) expressed slight confidence, while the final group (19%) were not confident. However, these results did not translate over to classroom practice, or even meant that teachers felt competent enough to use ICT as a major tool in instructional practice.

This definite lack of confidence when confronted with the demands of using ICT was expressed by some of the teachers interviewed; they were of the opinion that they had to reach a certain degree of technical competence to effectively broaden the range of instructional opportunities that could be offered to children. For example, a teacher for whom confidence in using ICT was a major inhibiting factor, was quite adamant that:

> It all comes back to where you are at and how you feel before you can introduce something. I wouldn't like to teach anything to a child that I am not very confident with myself because I don't think I would bring the best out in it, and as far as computers are concerned. I most certainly wouldn't agree with that for any child at the moment.

When asked if at some stage in the future they could envisage integrating ICT into curricular areas, another teacher reluctantly replied, "You'd have to be confident in your own usage to be at that stage; you would have to be very confident using a computer really".

The need to clarify the role of the computer was seen as a good starting point since over half the teaching staff felt that ICT wasn't essential in order to do a good job as a

teacher. Furthermore, a discussion on the likely changes computers bring to the teaching and learning environment of the classroom revealed a noticeable fear on the part of some teachers. This fear was manifested in a possible greater proficiency on the part of technology. The worry of being eventually replaced by the computer was clearly detected. This worry, as expressed by one teacher, was rather indicative of an actual misunderstanding of the role of the computer:

> I still think there is an awful lot to be said for teaching outside of the computer as well... I think I would hate to see a computer become a teacher, to me it is just a machine, and it is nothing like a human. There is nothing like sitting children around, telling them a story and teaching them as well.

Teacher Beliefs

A predominant view of literature cited in chapter two suggested that beliefs about how children learn, what they should know and what forms of teaching are best, influence teachers' decisions on what skills are taught and how they are presented to children (Cuban, 2001).

Extent of ICT Use by Teachers

In an effort to first assess the extent of teachers' technology use, the teaching staff were asked to indicate how frequently they used ICT in three contexts: classroom administration, teaching preparation and classroom practice (Figure 6). At best only 10% of the teachers dedicated time weekly to using the computer for administrative, teaching preparation and classroom purposes. About one third of the teachers allowed children monthly access to computers. Similarly, using computers for professional

concerns was only deemed necessary on a termly basis by one third of the teaching staff. Interestingly, a significant proportion of teachers (38%) never used the computer for any type of professional purpose.
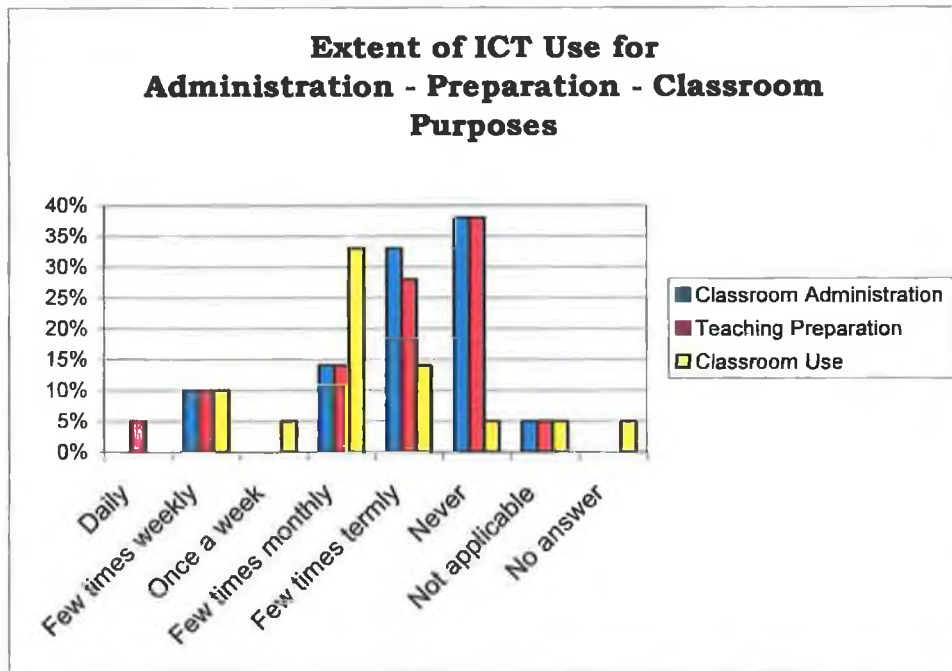
Figure 6 – Correlations between Classroom Administration – Teaching Preparation and Classroom Use of ICT

ICT Relevancy in Learning

A resounding number of teachers (86%) indicated that computers were in some way relevant in children's learning. Data generated in the focus group made particular reference to the presentational utility of ICT. With computers presentation of work was enhanced and seeing the 'finished product' such as a written story was considered most important in promoting children's self-confidence. Teachers also pointed to the advantages of using software for reinforcing work and remarked that the success experienced by children when using the games was highly motivational.

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Nevertheless, teachers' concerns about the actual value of ICT in the basic nature of the children's learning was questioned. Teachers questioned what the real gains were when investing time in ICT, this was seen in terms of improvement in academic ability:

> I think at the end of the day, maybe if you looked at two classes, one that was more familiar than the other, I wonder would there be much of a difference?

Table 4 – Views about ICT in School

	Strongly Agree	Agree	Neutral Unsure	Disagree	Strongly Disagree	No Reply
ICT will improve teachers' ability to provide quality learning experiences for children.	10%	48%	37%			5%
ICT promotes a new and exciting form of access to knowledge.	33%	62%				5%
ICT should be seen as a useful instructional aid which complements the more traditional teaching methods.	14%	71%		5%		10%
Children willl not be fully prepared for today's rapidly changing world if ICT is not integrated into classroom work.	10%	56%	24%	5%		5%

Moreover, on analysis of teachers' views on ICT in school, one notes the high number of teachers (37%) who are uncertain of the potential of ICT to provide quality learning experiences for children (Table 4). Furthermore, a third of the teachers do not feel that children will be ill-prepared for the future if denied technology integration in class work.

In their responses teachers also indicated that although they value ICT, they are equally pressurised by the expectation to transmit the established curriculum:

> I still wonder sometimes, there again is it my lack of 'know how', how do you fit all this into a timetable, it is a narrow timetable, what is missing out? But then I could say that about a lot of things, but then if I was more familiar with what was in the computer and how to get the best out of it, then I could integrate it much more with different subjects.

Literature refers to the teaching of curriculum as institutionalised practice and highlights the difficulty for teachers of introducing new innovations that may not assist them in this prescribed course of action (Reid, 1999). Indeed, the problem of curriculum overload, especially in relation to the revised Primary Curriculum was seen as one of the main inhibiting factors to using ICT (strongly agree: 24%, agree: 48%). Perhaps overload contributed to teachers feeling limited responsibility for cultivating computer literacy. In response to, 'It is not the teacher's role to ensure that children are computer literate', many respondents (38%) expressed uncertainty, while nearly a quarter of the teaching staff didn't acknowledge any responsibility. Convincing teachers otherwise is crucial if we are to expect them to exploit the potential of ICT to complement their own pedagogical practices, and to extend children's learning.

Curriculum Differentiation

Teachers were subsequently asked to indicate the level to which ICT should be integrated into the curriculum. The majority (62%) responded that some integration was sufficient, while others (14%) felt that full integration was more applicable. Only a small number (19%) expressed an interest in ICT being taught as a separate subject. One particular respondent was convinced that ICT in a junior school should be subject taught, with teaching centred exclusively on skill acquisition for forty-five minute periods weekly. Any further development was expected to occur in the homes.

The responses confirmed that actual use of ICT by teachers in teaching curricular concepts varied; 38% of staff indicated usage, but 29% did not indicate any usage. Interestingly, almost half of those surveyed disagreed with the statement, 'I just don't know how to promote the creative use of computers as a learning tool across the curriculum', even though examples of curriculum differentiation were seen to focus exclusively on skill-based software for reinforcing English and Maths skills. Consolidation of skills and language enhancement through software usage was considered important and more appropriate computer experience for children at infant level. Generally, teachers felt that there was satisfactory access to an extensive range of software in the school. One teacher commented, "Even the software, I wouldn't say I know how to use all the software yet".

Hence, the introduction of the more open-ended word processing programme during working sessions, aimed to offer an alternative to teachers' over dependence on the drill-and-practice programmes. Teachers were enthusiastic about the ease with which it could be applied to the learning situation, even for younger children. Positive use of this programme was evidenced; at Junior Infant level work concentrated more on graphic features but the Senior Infants became quite adept at writing little phrases and sentences. Increasingly, it became apparent that those teachers who had skills and who regularly used computers more for their own purposes were beginning to use computers more frequently with pupils in different ways. For example, during the group interview one teacher described how she and another staff member had begun to explore geography and the continents through the use of 'My First Amazing World Explorer'. In this instance, prepared questions were used as the focus of the children's inquiry.

Management and Equipment Issues

Time Concerns

One of the most critical factors deterring teachers from using ICT related to time concerns. To the statement, 'I feel that more time is needed to learn what ICT programmes can do and time to plan how they might be used', three quarters of the staff answered in the affirmative. Undoubtedly, teachers are genuinely interested in identifying those ways of using ICT programmes but finding the necessary time to do so was exceedingly difficult in crammed school schedules. As planning time is intrinsically linked to time *within* the timetable, teachers are sometimes reluctant to participate in planning outside that timetable. For example, during the interview a teacher made reference to the fact that infant teachers are afforded an hour's planning in the afternoon when their children have departed, unlike First/ Second Class teachers.

ICT Use in Classroom/ Computer Room

The level of equipment available in the school has already been described in chapter one. The data reveals that there was general satisfaction with the provision of hardware and software in the school, particularly since the computer room of networked computers had become available earlier in the year. With the purchase of excellent resources, uses of many of the applications (scanner, digital camera) had not yet gained a stronghold as ICT was still very much in its infancy.

High interest in utilising the computer room was evident when teachers were asked their opinions on where ICT might be more effectively developed. Only one

respondent (5%) opted for the classroom, a significant number (47%) favoured the computer room while a majority (43%) considered that the unique opportunities for learning that ICT afforded could be better exploited in both the classroom and computer room. One respondent did not comment. The ease of simultaneously directing *all* children's attention to a common learning skill, with the aid of the overhead projector was considered a most attractive feature of the computer room. Particular frustration with managing and organising large numbers round the use of one computer was seen as a considerable inconvenience when using ICT in the classroom. Distraction from lessons was all too frequently noted, as emphasised by one teacher's comment, "I feel that they are going to miss something really important by not listening to me". Moreover, infant teachers insisted that children's age and inexperience impeded progress; when problems arose, teachers were inevitably burdened with the demands of this extra activity. Access to three computers was, therefore, considered the ideal infant classroom scenario that would facilitate the inclusion of an 'ICT Activity Group' in the timetable.

6.3   Incentives to Promote ICT Use

In an effort to better understand how to increase usage of ICT in the school and foster the benefits it offers the teaching and learning process, we will now analyse more closely incentives that encourage its uptake.

Training

The role of training emerged as a critically important factor to encourage teachers to use ICT more effectively in their teaching; nineteen teachers indicated the relevance of participation in skills based training, seventeen teachers reported that training in

curriculum-based uses of technology would be necessary, while further training on peripherals (scanner etc.) was considered worthwhile by fourteen staff members. Clearly teachers did care about learning how to use the computer and were very positive about training. For example, when questioned on their interest in using computers in the future if computer knowledge was greater, overall responses were quite positive; 38% of teachers strongly agreed, 28% agreed, 19% were unsure, 10% disagreed while 5% didn't offer a response.

Subsequently, the help of Dublin West Education Centre was enlisted and during an initial exploratory discussion with an IT tutor, teachers were openly critical of the fact that previous training experiences had resulted in feelings of inadequacy. They felt that the level of progress had been directed towards facilitating intermediate-stage teachers. Accordingly, domain specific training, the philosophy characterising the Centre's new mode of training, was initiated. Teachers were not complete novices but were interested in focusing on commonly used software tools. Word processing was, therefore, identified as the area in which teachers were most interested. Introducing ICT into teachers' professional and classroom lives was central to training considerations. Indeed, a comment made subsequent to the first training session held in the school indicated general satisfaction, "For once we were all on the same level and no one was racing ahead!"

Interestingly, the necessity of training for attaining a more competent level for using ICT was further emphasised by the focus group. Teachers were of the opinion that training would empower them to use technology, thus enabling them in turn to empower the pupils. Indeed, the discussion among the participants proved both

enlightening and fruitful as it was also suggested by 'non-users' that expertise among staff should be utilised as a valuable training resource.

Collaborative Learning

The facilitation of an environment in which teachers can communicate openly and share ideas and skills on ICT related practices among colleagues was considered paramount. Most teachers (86%) recognised to some degree the necessity for meeting to discuss ICT issues so that insights could be gained and decisions could be made about practice. For example, in the focus group teachers suggested that very simply a colleague might show another colleague how to use the scanner. Interestingly, access to, and the sharing of information on web-based work was considered by teachers to be the area necessitating most attention; they remarked that making a directory of useful websites (subject or topical issues) available in a copy or on a notice board would be most beneficial.

Planning

Allocation of school planning time was identified as another worthwhile recommendation by a high proportion of teachers (62%). During the interview process it was pointed out that ICT planning had already become a feature of a class level monthly meetings. In terms of an overall ICT Plan, over three quarters of the staff supported its development. In the adoption of such a plan, a wide range of issues are seen as relevant (Table 5). The need to include an Internet Safety Policy is most relevant (66%), followed by ICT Scheme of Work (62%), an Assessment of hardware/ software (52%) and Staff training needs (52%).

Table 5 – Recommendations for ICT Plan

	Not Relevant	Slightly Relevant	Neutral Unsure	Relevant	Very Relevant	No Reply
Mission/ aims		10%	5%	66%	14%	5%
Assess Hardware/ software				43%	52%	5%
Staff training needs				43%	52%	5%
Stakeholders' Input				76%	19%	5%
ICT & Curricular areas				43%	47%	10%
ICT Scheme of work				33%	62%	5%
Special needs children				43%	47%	10%
Internet Safety Policy				29%	66%	5%
Gov. Policies/ Initiatives		5%	47%	33%	5%	10%

Surprisingly, however, a proposed ICT Plan was greeted with trepidation by teachers in the focus group. Teachers described how they were trying to get to grips with the task of utilising the new computer room and new technologies. Learning how to use these resources was considered very much in its infancy and was deemed a demanding learning process for teachers. Generally, it was felt that if the school developed an ICT Plan at such an early stage, it would heighten pressure for teachers. Moreover, they wanted time to assimilate new experiences to date, and continue with further exploration at a slower pace.

The Principal and ICT

There was unequivocal agreement (86%) on the importance of the principal for ICT implementation. Positive intervention was made and solutions were offered by the principal to problems that related to allocating appropriate time for training sessions, encouraging teachers to attend training, and for his enhancement of perceived importance to aspects of the study undertaken. He showed that he understood that teachers need time to explore curriculum ideas, learn how to handle technology, and effectively integrate technology into the curriculum. For example, he supported the

facilitation-type sessions, recognising that ICT development needed hands-on experience, and opportunities for experimentation and sharing information with colleagues. Teachers were in fact empowered to live the process of ICT development.

6.4   Conclusion

This research focused on factors that effect the uses of educational technology among teachers.   Results showed that there are many obstacles that prevent teachers from using technology. These include limited exposure to valuable technology experiences outside school, the inability to use acquired ICT skills, a low technology confidence level, the inhibiting effect of traditional teaching habits and finally management demands. Data indicated that teachers were interested in advancing ICT in learning but if they are to make the transition to becoming discernable users, then they must have lots of support, especially from each other but also from an experienced advisor. Given time the aspiration is that teachers will find new ways to integrate the old and new teaching approaches in order to enhance the delivery of a quality education that is of benefit to all pupils.

Chapter 7: Conclusion

7.1 Introduction

As a nation that is well and truly immersed in the information society, one wonders if our primary education is preparing our children adequately to meet society's technological realities. Although the Primary School Curriculum, 1999, promotes the use of ICT in the enhancement of teaching and learning across the curriculum, the overall trend emerging from this study indicates that the learning potential of technology is far from being realised. This chapter first draws together issues, which have arisen from efforts to gauge the extent to which ICT accentuates children's learning and reveals that assessment of strong and reliable evidence of learning improvements from ICT, are difficult to find. The study then highlights the many difficulties which exist for teachers in implementing ICT in schools. Hence, to ensure positive technological experiences for children and successful implementation of ICT by teachers in a junior primary school, the following issues have emerged and will be discussed in relation to research findings and those from literature:

1 learning gains;

2 the digital divide

3 catering for teachers' diversified training needs;

4 valuing software in children's learning;

5 contrived collegiality in promoting collaboration;

6 coherent future planning;

7   increased access to more computers in classrooms.

7.2   ICT and Children

There is a need to consider the outcomes of pupil's technological experiences in terms of product as well as process.

Learning Gains – The Product

In considering the outcomes of pupil's stories written prior to, and subsequent to introducing a technology supportive learning environment, results, while disappointing were not completely unexpected. Spelling and syntactic structure, in particular showed small learning gains. The work, however, of the emergent writer is slow and halting as children strive to cope with working through the technical barriers of handwriting, spelling, punctuation, and getting things down as best one can from one's plan. With appropriate time for teacher intervention, children need to develop sound-letter associations, spelling approximations, leading to competency in writing. Knowledge, however, of what the children are able to do and what is developmentally appropriate needs to be considered and planned in more than just an eight-week research period. The outcomes for fluency and originality of content were marginally higher. It is possible that for those children whose work showed a marked improvement, the seasonal picture used might have been influential. A shared experience like Christmas may have been a topic that children could write about freely. For those who struggled in this aspect of their writing, one has to be cognisant of the fact that for young children in Second Class, the normal procedure when writing a piece of text is to first discover what they already know

about the topic, and clarify their understanding of it. The teacher facilitates the organisation of that information in a coherent plan for writing. Without this supportive structure, the task may be too daunting.

On examining texts produced on the word processor the results were significantly better. The improved punctuation outcomes, however, may be interpreted as a result of teacher intervention. During the drafting process the importance of using capital letters and full stops were stressed. This may be a contributory factor to any improvement evidenced. It is possible that shorter sentence structure and rather simplistic expression of ideas were possibly overshadowed by the concentration needed to use so many word processing skills in producing that text. In any case it would appear that children were not developmentally ready to subsequently transfer learned computer skills back into hand written scripts.

With regard to the use of software, consolidation of mathematical skills was effectively strengthened in the computer room but regrettably a link was not bridged with classroom activities. Using software was seen as an activity exclusively linked to the computer room. In retrospect this may have been due to lack of foresight on the part of the researcher! Time constraints did not allow for exploration on, or assessment of the effectiveness of software on children's thinking and learning.

Moreover, the use made of the Internet in these sessions was to a certain degree limited; only one website was explored, and in addition, the focus of attention was directed to

particular sections of the site. Consequently, it was impossible to define the true potential of the Internet to provide a more engaging and enlightened curriculum. To facilitate learning about a topic under study, as well as the information technology being used in that study, it became apparent in observing the children that they required clarity of purpose in their inquiry. They also needed specific questions to be answered. The lack of a structured approach such as this could be viewed as a negative aspect in endeavours to promote the learning potential of ICT.

In overview, the difficulty in identifying verifiable evidence of learning gains in children at that young age was a major limitation to this study. This difficulty was aggravated by the ethical issue of the researcher's inability to use a parallel group, not afforded the use of ICT, with which the class under study could be compared. This would tend to confirm Broadie's assertion in the literature review of the impossibility of showing what learning gains can be achieved through ICT.

Learning Gains – The Process

Pupils responses indicate that first and foremost they both enjoyed and were positive about the idea of using ICT. On the whole they expressed a preference for using the computer across all activities. Undoubtedly, in employing ICT in the classroom, teaching became not only more enriched and more varied, but also created a more exciting learning environment for the children. The different applications provided a means of supporting collaborative learning, generating and encouraging increased verbalisation

and peer interaction. Clearly, however, measurement of this interaction is hard to gauge and verify and present as a model of good practice to others.

The Digital Divide

This study revealed that a high number of children currently have access to home computers. This is consistent with a view expressed by Papert (1996) who foresaw a possible exponential rise in the number of children with access to home computers. He felt that this rise would result in an irresistible pressure on schools to provide similar facilities. Pupils with access to home computers can often exhibit more confidence using computers than those without access. Access helps pupils to develop their competence. The findings of this study indicate that equal access and equal learning opportunities for all children is necessary if the digital divide is not to be exacerbated. Examination of results indicate the promising work produced by these children and highlights the need for all children to be afforded this learning in the future. The study proposes that eliminating the 'equity gap' is a significant reason for promoting ICT as a popular resource in the school.

7.3   Teachers and Technology

Diversified Needs

Responses to the questionnaire indicate that there are important differences in the resulting profiles of teachers. Teachers' responses in relation to ICT use confirm that two main groups predominate. One group is composed of teachers who focus minimal or no

attention on managing the computer at a professional level, and also use computers infrequently at classroom level. Clearly this group, as classroom practitioners and/ or planners/ managers, do not see the embracing of ICT as a priority. The word 'avoidance' used in literature (Baylor and Ritchie, 2002), to describe a pattern of technology use among teachers is particularly apt for such teachers; they assign computer time to pupils but do not use the technology for their own purposes. Further comments made by teachers would also tend to indicate that this profile of the average teacher is similar to the profile of a 'nonuser'; a 'nonuser' profile is associated with someone whose focus rests on personal concerns rather than concerns about implementation. It is not necessarily someone who does not use the innovation at all (Karagiorgi, 2003). Comments from some of the teachers interviewed demonstrate that generally individuals feel uneasy about the innovation, and their perceptions about their computer abilities are affecting their use of ICT. Consequently, self concerns are resulting in low implementation levels – where teachers are not focused on managing the computer in the educational process or concerned about the effects of using ICT in the classroom.

On the other hand there are those teachers who have both a high level training background and a high proficiency in using computers. This group of teachers are frequent computer users at home, and use computers for addressing professional concerns. However, these teachers adopt ICT to a limited extent in classroom work. Hence, in light of these findings, it could be argued that for some teachers Cuban (2000) is correct in his assertion that insufficient technical skills may *not* be holding back teachers from using computers in the classroom. Some teachers seemed to have a

reasonable amount of skills to use computers in more adventurous and sophisticated ways with children. Their needs, however, relate to pedagogic concerns, and the real needs in the classroom.

This study suggests, therefore, that in order to help both groups of teachers to develop, and to adequately prepare them to effectively use computers in the classroom, training is crucial. Both the diverse concerns of teachers and the nature of ICT as an innovation pose significant challenges for training. Considering the manner in which concerns develop, it is expedient that training should be diversified to meet those needs. That training should more importantly address the concerns of 'nonusers'. A first step has been initiated to provide training that identifies what computers can do to enhance the personal and professional needs of teachers. In identifying those needs the study has strengthened valuable links with the Education Centre. Sustaining such training until teachers feel comfortable using new technologies with existing instructional practices is imperative. The study recognises the limitation that the current training presents. Training is being directed at application areas only. It is crucial that pedagogical concerns are aligned with ICT activities to support specific curriculum goals. Currently, training does not cater for those teachers who have made significant progress with ICT. There is an equal need to focus attention on teachers who are implementing technology and address their concerns. Significantly, however, the study has highlighted the expertise that exists among staff and the aspiration now is that developing a strategy to utilise this resource will be an important factor in promoting future successful ICT implementation in the school.

Valuing Software

A significant proportion of teachers report that ICT is relevant in children's learning. Computers, however, are used infrequently with children. Many of the teaching staff are uncertain of ICT's potential to improve teachers' ability to provide quality learning experiences for children. Part of the problem would seem to lie in the lack of verifiable evidence on how the integration of technology actually accentuates young pupils' learning. The findings, therefore, indicate teachers' ambivalence as to the true value of ICT in the learning of children in a junior school.

Literature suggests that teachers become gatekeepers for what content and skills are taught and how they are presented to pupils (Cuban, 2001). Undoubtedly, the study reveals that the teaching of an overloaded curriculum controls the expenditure of teachers' time and energy. Sustained technological improvements are limited as software is being used for drill-and-practice type sessions in somewhat trivial contexts. Furthermore, teachers are comfortable using software and consider it a more appropriate computer application for young children.

Invariably the study suggests that the teachers' method in using software is facilitating traditional ways of teaching, it is rather an 'add-on' to routine classroom work. According to literature, the selection of software, and use by teachers, "can have a significant impact on the learning environment" (Smeets and Mooij, 2001). This study, however, was limited in that only one short evaluation session was carried out with teachers at an early stage of the research. Moreover, as teachers expressed an interest in

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spending more time exploring what programmes could do, the study highlighted a need for more structured evaluation sessions in the future to analyse and select appropriate software for junior primary school children. Significantly, the study reinforces the need to explore ways of using software in contexts that are not trivial but rather contexts that have a more curricular focus.

Contrived Collegiality

Observations made when exploring ICT with teachers provided instances of positive, interaction. Literature suggests that change is a highly personal experience (Fullan, 1991). Fullan (1991: 127) continues that,

> each and every one of the teachers who will be affected by change must
>
> have the opportunity to work through this experience in a way in which
>
> the rewards at least equal the cost.

Consequently, the study emphasised that clearly for teachers the benefits of collaborative engagement in the working sessions related to the fact that learning was grounded in their own situation making it more meaningful and useful for them. Even the 'nonuser' group of teachers showed they were interested individuals who were aware of the innovation and wanted to learn more about it from a positive proactive perspective. Significantly, it would appear that collaborating with another colleague in these sessions allayed some fears and shifted the emphasis of their concerns beyond the personal level. Nevertheless, collaboration does, however, present certain weaknesses. Difficulties are created by the nature of the task of collaborating. To a certain degree, due to the time constraints of the study, collaboration was rather a more controlled and regulated form of interaction,

otherwise known as contrived collegiality (Hargreaves, 1994). Ironically though, the study presents contrived collegiality, as a possible means of setting up a more collaborative culture in the school; one in which innovation and imaginative solutions for ICT can be cultivated.

Future Planning

According to literature, a workable plan is instrumental in promoting the successful integration of technology into the curriculum (Reksten, 2000). In this study a majority of the teaching staff considered that an ICT plan was an integral part of general school planning, and many more considered that developing a scheme of work throughout the school was very relevant to that plan. Moreover, the study suggests that in light of new developments in ICT in the school there is a greater need for teachers to build a philosophy of ICT use and explore how it could improve teaching and learning. That philosophy should incorporate a plan of teachers' perspectives on how ICT activities might be covered throughout the curriculum. A definite limitation emerges in light of negative comments made in the focus group regarding the initiation of a plan in the school whereby a significant number of teachers didn't want the opportunity to input the ICT Plan. The study, however, highlights the need to coordinate teachers' efforts and avoid the creation of piecemeal efforts by teachers as exemplified in Papert's parable of the jet engine (technology) and stagecoach (education system). In trying to improve the stagecoach, a jet engine is tied on to it, and the stagecoach shatters into pieces. These shattered pieces represent the haphazard efforts of teachers to use computers in the education system. Certainly, Mulkeen would suggest that a lack of clear curricular

guidelines was at fault in the earlier stages of IT 2000 and variation depended on "teacher interest rather than school policy" (Mulkeen, 2001: 56).

Access to Computers

Another important aspect with the potential to facilitate enhanced technology use is access to technology. With respect to hardware, a new computer room with sixteen computers in the school permitted two children to work on each computer. With regards to software, quality and quantity was considered satisfactory. Consequently, the integration of technology was made possible. However, with regards to hardware in the classroom, only one computer was available i.e. thirty children per computer. The findings suggest that three computers would be the ideal scenario for an infant classroom. An obvious limitation concerns the financial purchase of the extra computers but the study suggests that there is an increased likelihood of increased usage with more access to computers.

7.4   Recommendations

The following are suggestions that arise in this study from responses to the questionnaire, or comments made either during exploratory sessions or during the focus group:

1. Development of little educational projects with both children and teachers to facilitate the integration of ICT into the curriculum and bridge a link between using ICT in the computer room and using it in the classroom.

2. Build a framework of thinking on how ICT can enhance Special Needs requirements.

3. Establish a permanent training process, coherently structured with advanced models for teachers directed to responding to teachers needs.

4. Establish software evaluation sessions periodically with teachers. Seek a small group of volunteers from Senior Management to explore the various ways in which ICT might enhance their subject areas and build a directory of resources.

5. Set up opportunities for using valuable in-school expertise as a means of enhancing staff self-esteem and building collaborative engagement through both observations of examples of professional practice and professional disputation.

6. Initiate a slow step-by-step process in the formulation a School ICT Plan. Involve interested parents or other stakeholders to support, develop and expand the richness of the experience which ICT has to offer.

7. Concentrate financial resources on building up more hardware in classrooms to further the uptake of ICT use.

7.5   Conclusion

The ever-increasing social pressure driving the integration of ICT into schools is now, one would feel impossible to ignore, yet to a certain extent ICT is still a novelty in many classrooms around the country. It is only within the last seven years, with the advent of *Schools IT 2000*, however, that a majority of schools have begun to address the role that ICT can play in the other curricular areas.

In this study the experience of the integration of technologies into the school and perceived impact on learning gains for children are presented. The analysis of the study's work developed to date allows certain aspects to be highlighted. Firstly, there is a need to develop ICT progressively; the introduction of new developments needs time to be assimilated by all concerned. Offering children the opportunity of using different computer tools was seen to provide a richness of experience. While quantifying the learning gains achieved there was no doubt that the importance of the activity carried out will provide greater motivation for pupils.

Secondly, the introduction of ICT into the school was complicated due to the fact that there was neither flow of ICT experiences nor any integration model with the necessary pedagogic guarantees available. Consequently, good care must be taken in the training of teachers in the framework of a common ICT philosophy. That is the only way to take advantage of the real potential of ICT; ultimately we want this concept to allow the development of a sustainable effort to truly enhance learning. Undoubtedly, ICT is here to stay and we should endeavour to build a society in which nobody is digitally excluded!

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Appendices

Appendix 1

- **Activity Details – Children's Research (Weeks 1-8)**

Appendix 1: Activity Details – Children's Research (Weeks 1-8)

- Use of software

As the new computer room was not operational until the beginning of October 2003, cognisance was taken of the fact that until the academic year 2003-2004 computer experience for the children had been limited to sporadic drill-and-practice exercises on a single or possibly two computer(s) in every class attended. This influenced the decision to initiate research proceedings by allocating the first two sessions with the children to the exploration of the content-rich software. Selecting appropriate software to support the curriculum is seen by the principal as "an integral part of the overall school plan for curricular areas" (NCCA, 2004). The class teacher had previously collaborated with other Second Class teachers in the evaluation of software. Maths Circus 1 was perceived as suitable, in that it consisted of twelve puzzles which could both provide familiarity for children with ICT as well as enhance a wide range of mathematical skills e.g. arithmetic, positive and negative numbers, direction, angles, estimation. Vaughan suggests that, "Given its myriad forms, it seems very likely that information technology has the power to transform mathematics education as we know it" (1997:48). In utilising Maths Circus 1 and the areas targeted were:

- Week 1 – Direction (Levels 1-3), Estimation (Levels 1-3)

- Week 2 – Positive and Negative Numbers (Levels 1-2), Arithmetic (Levels 1-2)

These sessions were carried out in the computer room. To avoid the possibility of any one child dominating the activity, children were paired with a partner of equal ability (as recommended by the teacher) and the necessity of taking turns was discussed. The children were given initial instructions and subsequently allowed to work in pairs on

each puzzle. Intermittently, where problems arose, these were noted and then both teachers guided new discovery through appropriate questioning. Finally, an evaluative session was held at the end of the class, whereby, the children were questioned on the merits of the lesson and the learning skill central to each particular lesson was revised.

- Word Processing

Although there is a lack of evidence regarding the benefits of word processing for children's writing (Jessel, 1997), efforts to expand children's reading, writing and creativity skills were made through the use of a multimedia creativity kit that combined a word processor and print programme – Kid Works Deluxe. This software, specifically aimed at children aged between four and nine was packed with loads of inventive tools, and animated stamps, and children had the opportunity to express themselves through pictures and words. In the third session the children were allowed to write a story of their own choosing accompanied by a picture, while the fourth session focused attention on redrafting a letter already discussed and written in their class copies, including a picture. The copies were not, however, used whilst children were working on the computers.

Lessons in the computer room took the format of a skills development session, followed by a discussion and then work on the task in question. Function keys related to lines and paint effects were explored, and word processing skills introduced to children were those linked to keys for making:

- Week 3 – Capital letters/ full stop/ space/ delete.
- Week 4 – Revision of week 3/ tab/ backspace for deleting/ directional arrows when a word or letter is omitted.

Significantly, these sessions were followed by further consolidation of skills back in the classroom, as time was very limited in the computer room. Initially forty minutes each day was allocated to ICT work but interestingly by the fourth week, the teacher's classroom management facilitated time for children to use the computer at other times of the day. Furthermore, a classroom assistant, when not required elsewhere supervised computer activities – a process which proved most beneficial.

- Spreadsheets

Phillips (1982) observes that, "Computer graphs save time and effort, thus shifting emphasis from creation to interpretation". The aim in introducing spreadsheets, therefore, was to further children's inquiry by not only exploring new possibilities for reinforcing children's representational models of data but also to focus on data interpretation. The use of graphs was carried out on a 'Star Office' application as follows:

- Week 5 – Bar chart: Food We Like.
- Week 6 – Pie chart: Games We Play.

A similar approach was adopted for these lessons; skills were first taught during lessons in the computer room, followed by some practice. The steps involved in 'Inserting charts' proved both challenging and time consuming. Hence, it was necessary to dedicate more time in the classroom to both the interpretation and the reporting of findings.

- Internet

Crane (2000) lists many compelling reasons for using online technology. For example, he refers to the way the Web encourages some of the latest trends in learning and supports the view that, "Engaging students using a variety of media and

allowing them to feel as if they are a part of the subject matter" (2000: 5). Due to the vast quantities of information available on the Internet, and the inexperience of the users, it was agreed to limit the search to just one website as this would be more manageable and would adequately serve as the main interactive site for the two lessons. The chosen site was one that was both pitched at children's levels and it was also appealing to all children as it was seasonally appropriate – http://www.northpole.com. The homepage contained a wide-ranging site index from reading stories, writing to Santa, and a games section. Indeed, so great was its appeal that it was necessary to limit search to particular sections of the site. Hence, the Internet lessons adopted the following format:

- Week 7 – Care when using Internet! / Searching for site / Santa's Workshop: Listen to hear a story / Game Chest: Wordsearch and Crossword Puzzle.
- Week 8 – Santa's Mailroom: Write a letter to Santa/ Game Chest: Concentration.

As accessing the site was quite time consuming and as classroom computers were not connected to the Internet, a free period in the computer room was also utilised each week.

Appendix 2

- Rationale for Questionnaire
- Covering Letter
- Questionnaire

Appendix 2: Rationale for Questionnaire – Covering Letter – Questionnaire

"Early questions may set the tone of, or the mindset of the respondent to, the later questions" (Cohen *et al.*, 2000; 257). The initial questions gathered personal information from respondents - straightforward questions that focused on access to, and teachers' use of computers - questions of 'yes/no' variety that enabled responses to be not only coded quickly but which were also mindful of the fact that more subtle and complex questions were to be asked later. An example is Q3 which was designed to explore the computer skills level of teachers, and respondents are asked to indicate ICT areas, if any, that they felt training was required. Including this question was judged relevant to discovering teachers' openness to possibly improving practice at a future date.

In the second section, both open-ended and closed type questions were employed. For example, the design of Q5-Q7 sought to measure teachers' use of computers for administration and work preparation purposes, against their consequential use of ICT in the classroom. The aspiration here was to explore any possible link between teachers' ICT skills level and their professional use of ICT viz. teachers' confidence in using computers in the classroom. Similarly, in Q8-Q11, integrating ICT into the curriculum was the focus of attention. The open style questions were considered not just an effective means of encouraging teachers to reveal why they did or didn't include computers in their teaching, but also a means of encouraging them to consider the potential of technology to improve the delivery of a curriculum they were already committed to teach. Cohen *et al* (2000) advocate the use of open-ended questions,

which, despite being difficult to code and aggregate, are referred to as the 'hallmarks' of qualitative data - open ended questions elicit information that might not have been otherwise revealed. Open ended questions ensure that the "move is from objective facts to subjective attitudes and opinions through justifications and to sensitive, personalised data" (Cohen *et al.*, 2000: 257).

In the second and third sections of the questionnaire substantial use was also made of rating scales. They are considered very useful in generating degrees of response, which build not only a degree of sensitivity, but also ascertain attitudes and opinions, whilst still generating numbers. The Likert-scale was employed, providing a range of responses to a given statement. An example is Q13 where respondents were asked to rate on a scale ranging from 'Strongly agree' to 'Strongly disagree' their opinion on statements which deter them from using ICT as a teaching tool in the learning environment. Every effort was made here to exhaust a range of possible responses "to allow a greater subtlety of response (Cohen *et al.*, 2000: 253).

Finally, in Q14 the importance of various recommendations that encourage use of ICT were rated on a semantic-differential, a variation of a rating-scale. The importance of each item was evaluated on a scale ranging from 'Not important' to 'Very important'. A mid-point scale of 'Neutral/Unsure' was included as an alternative response. This facilitated more flexibility and honesty in responses, and whilst processing, the ability to determine frequencies, correlations and other forms of quantitative analysis, so as to "afford the researcher the freedom to fuse measurement with opinion, quantity and quality" (Cohen *et al.*, 2000: 253)

ICT Survey,
October, 2003.

Dear Colleagues,

As part of my research for the M.Ed. dissertation, I am endeavouring to investigate new ways of promoting the use of ICT in teaching and learning activities in our school.

I would, therefore, appreciate if you would complete the questionnaire attached. All information will be treated in the strictest confidence and with complete anonymity in the final report of the study. Indeed, I hope to use the outcome of this questionnaire for the successful implementation of ICT in the school.

I would ask if could return the questionnaire within the next ten days.

Many thanks for your time and co-operation.

Yours sincerely,

_____

Catriona

Information and Communication Technology (ICT) Questionnaire

♦   *Questionnaire – Teachers*   ♦

A. YOU AND YOUR COMPUTER

In answering the following questions, please circle the appropriate word(s) or numbers which express your views and give details of ICT usage in school. Some questions also invite you to add a comment.

1) Do you have a computer at home?		Yes		No	
2) How often do you use the computer for personal use?	Never	A few times a term	A few times a month	A few times a week	Daily/ most days

3) Are you able to complete the following ICT tasks:

	Yes	No	Training Required? *(Please tick)*
Word processing applications (eg worksheets, schemes of work)?	1	2	
Compile spreadsheets?	1	2	
Create and work with tables/graphs?	1	2	
PowerPoint presentations?	1	2	
Compile a database?	1	2	
Install and run software?	1	2	
Browse the web?	1	2	
Download information from the Internet?	1	2	
Send/receive e-mails?	1	2	
Print documents?	1	2	
Create images from scanner?	1	2	
Create images from digital camera?	1	2	

4) If you have attended any ICT courses, please describe them here.	

B. COMPUTER USE AT SCHOOL

5) If you use computers, how often do you use the computer in the following areas:

	Never	A few times a term	A few times a month	A few times a week	Daily/ most days
Classroom administration e.g. timetables, pupil lists, test scores?	0	1	2	3	4
Teaching preparation e.g. worksheets, monthly schemes?	0	1	2	3	4

6) If you use ICT in the classroom, how often do pupils have access to the computer?	Never	A few times a term	A few times a month	A few times a week	Daily/ most days
7) Please indicate in what ways, if any, you use computers in your work.					

8) To what extent do you feel ICT should be integrated into the curriculum?	No Integration	A little integration	Unsure	Some integration	Full integration

9) Do you use ICT to help you teach any areas of the curriculum?	Yes	No	Sometimes
(If the answer is 'yes' or 'sometimes' please explain how you do this.)			

10) Some areas of the curriculum will lend themselves more to the use of ICT. In your opinion, what curricular areas could benefit from ICT usage?	
11) From a curriculum perspective and particularly in relation to those curriculum areas identified in the previous question, how would you like to see available technologies enhancing the teaching and learning environment e.g. use of internet?	

12) Do you feel confident enough to use ICT as a teaching resource in your daily practices?	Not Confident	Slightly Confident	Confident	Very Confident

13) What do you think most deters you from using ICT as a teaching tool in the learning environment?

	Strongly Agree	Agree	Neutral Unsure	Disagree	Strongly Disagree
I am afraid of using ICT because I lack basic ICT skills.	1	2	3	4	5
I don't feel technically minded enough to use the computer.	1	2	3	4	5
I doubt the relevance of computers on children's learning.	1	2	3	4	5
The school lacks sufficient hardware and software resources.	1	2	3	4	5
I just don't know how to promote the creative use of computers as a learning tool across the curriculum.	1	2	3	4	5
I feel that more time is needed to learn what ICT programmes can do and time to plan how they might be used.	1	2	3	4	5
The changes in timetabling and classroom arrangements required to integrate ICT are too demanding.	1	2	3	4	5
The school lacks a clear policy vision on ICT.	1	2	3	4	5
I don't see ICT as essential in order to do a good job as a teacher	1	2	3	4	5
It is not the teacher's role to ensure that children are computer literate.	1	2	3	4	5
The curriculum is already overloaded.	1	2	3	4	5
Other?					
Other?					

14) In order to encourage and enable you to use ICT more effectively in your teaching, how important are the following recommendations?

	Not important	Slightly important	Neutral Unsure	Important	Very important
Teacher participation in basic skills training?	1	2	3	4	5
Training for teachers in curriculum-based uses of technology?	1	2	3	4	5
More training on the utilisation of the hardware system e.g. scanner, digital camera.	1	2	3	4	5
Sharing current ideas and skills on ICT related practices among colleagues within the school?	1	2	3	4	5
Exploring the potential for ICT development in subject areas by the school's curriculum support personnel?	1	2	3	4	5
Development of School ICT Plan?	1	2	3	4	5
Support of a full-time technician?	1	2	3	4	5
Allocation of school planning time for ICT use?	1	2	3	4	5
Encouragement and support of principal in providing access to resources, training and assistance from others?	1	2	3	4	5
Provision of additional hardware and software in classrooms?	1	2	3	4	5
Greater access to the computer room?	1	2	3	4	5
Exemplars of good curriculum-based practice in other schools?	1	2	3	4	5
Seek advice on ICT matters from ICT advisor in an Education Centre?	1	2	3	4	5
Support of a full-time ICT co-ordinator in school?	1	2	3	4	5
Other?					

15) Should ICT be taught as a separate subject in primary school?	Yes	No	Unsure
(Please explain your answer.)			

16) Where do you see ICT being developed more effectively?	Classroom	Computer Room	Both
(Please explain your answer.)			

17) Do you consider that an ICT plan is an integral part of general school planning?	Yes	No	Unsure
18) Would you like the opportunity to input into the ICT Plan?	Yes	No	Unsure

19) In developing an ICT plan, please indicate how relevant you feel the following aspects are for that plan.

	Not relevant	Slightly relevant	Neutral Unsure	Relevant	Very relevant
mission and aims of the school?	1	2	3	4	5
assessment of hardware and software available in school?	1	2	3	4	5
staff training needs?	1	2	3	4	5
input from those with an interest in ICT e.g. teachers, B.O.M, Education Centre?	1	2	3	4	5
identification of curricular areas which could benefit from the use of ICT?	1	2	3	4	5
the development of an ICT scheme of work which ensures continuity and progress from Junior Infants - 2nd Class?	1	2	3	4	5
concerns for children with special needs?	1	2	3	4	5
Internet Safety Policy?	1	2	3	4	5
government policies and initiatives?	1	2	3	4	5
other?					
other?					

C. YOUR VIEWS ABOUT ICT IN SCHOOL

20) Please read the following statements and indicate the extent to which you agree or disagree with them.

	Strongly Agree	Agree	Neutral Unsure	Disagree	Strongly Disagree
ICT will improve teachers' ability to provide quality learning experiences for children.	1	2	3	4	5
ICT promotes a new and exciting form of access to knowledge.	1	2	3	4	5
ICT should be seen as a useful instructional aid which complements the more traditional teaching methods.	1	2	3	4	5
Children will not be fully prepared for today's rapidly changing world if ICT is not integrated into classroom work.	1	2	3	4	5
I would love to use computers further in my teaching if I knew more about them.	1	2	3	4	5

♦   *Thank you very much for completing this questionnaire*   ♦

Appendix 3

- **Activity Details – Teachers' Research (October-March)**

Appendix 3: Activity Details – Teachers' Research (October-March)

- Software Evaluation

The quality of software material and the way it is used will determine its effectiveness in supporting teaching and learning (NCCA, 2004). Consequently, before acquiring software "it is important that the teacher familiarises him/herself with what that software package offers, and explores the ways in which it can support teaching and learning" (NCCA, 2004: 38). Evaluation of software was the first step in encouraging teachers to use ICT. Teachers from various class levels were each assigned an hour on a particular day to review software in the computer room. The appropriateness of software for the age and ability levels of children were considered, but its appropriateness as regards the curriculum learning objectives were not given due consideration. Nevertheless, it was felt that the successful implementation of any innovation requires a shared sense of ownership by the participants and this may often feature a blend of top-down and bottom-up strategies in implementation (Fullan, 1993). Hence, collaborating with staff members at all stages of planning and implementation of programmes was crucial.

- Computer Based Work: Software/ Word Processing/ Internet

In a designated week each month work was carried out with teachers. The plan adopted for this part of the research was for the researcher to attend the allotted times for each class in the computer room. The aim was to support the work on technology, but also to assess the needs of individual teachers. In introducing software, word processing and the Internet, a typical schedule emerged in which the researcher taught the lesson with the teacher observing. The experience was then evaluated with the teacher when both planning and concerns about the next session were discussed.

Subsequently, teachers took classes to the computer room on their own. Throughout this process data was obtained through informal discussions and conversations with teachers. These talks were key element in making progress but the difficulty in quantifying and evaluating this data was a definite limiting factor as concerns had to be listened to and appropriate advice given. Nevertheless, at all times relevant comments and observations that emerged from these experiences were recorded and processed.

- Preparation for Presidential Visit

Throughout this study, the role of the school principal was critical - he understood the issues surrounding the adoption of ICT and was most supportive at all times. He showed that adapting to the technology will require a whole school approach and a shared vision of ICT's challenges and implications (OECD, 2001). Accordingly, he had the foresight to suggest the possibility of inviting President McAleese to the school to officially open the computer room. There was unanimous agreement and the school's invitation was ultimately accepted and was set for Thursday 26th of February 2004.

One of the main aims of the study was to present an on-line school website displaying samples of work from each classroom as examples of teachers' efforts to introduce technology into learning. However, the focus changed somewhat - a school website was indeed set up – http://www.ncte.ie/course6 - but rather than concentrating on website pages, it was felt that displaying work in the computer room and around the school would be much more effective and appealing for both children and teachers. This measure proved quite successful. ICT tools such as word processing,

spreadsheets, graphics, and the Internet were used to produce stories, poetry, mathematical graphs, computer pictures, digital photos and samples created through using the scanner. Indeed, many classes went online to explore the Aras' website http://www.araskids.ie. A criticism might be seen in fact that not all classes contributed work for presentation, but nevertheless they were involved to some extent in the day's activities.

- Visit from IT Tutor

This study also acknowledged the desirability of all teachers being able to use ICT but at the same time recognised the wide variation in ICT skills levels among them. In pursuit of such an aim, the OECD (2001) recognises that *"in-service* professional development is crucial" (OECD, 2001: 78). The OECD further suggests that few incentives for teachers to develop expertise in ICT exist. Developing ICT use comes the motivation arising from their sense of its importance for schools and children due to societal needs. Mindful of the likelihood of ICT being integrated into the life of the school when the whole staff is involved in training (Reksten, 2000), Dublin West Education Centre was approached on the possibility of providing the appropriate support. An IT tutor was appointed and agreed to visit for an afternoon to meet the teachers, assess their needs and concerns, and outline a possible format that training would take. Much data was obtained in this discussion with staff referring to their feelings on the upcoming training event. Furthermore, the IT tutor highlighted that:

- the intention would be to serve the needs of the school rather than to work methodically through a set programme;
- the aim would be to develop teachers' capacity to use ICT in both their professional and classroom endeavours;

- in light of the varying skills needs, teachers wouldn't be required to attend all training sessions, but rather were invited to participate in those particular sessions that most interested them.

Eight particular ICT areas were explained as being initially the focus of attention - these areas were tabulated, and circulated to all teachers so that definite numbers could be organised.
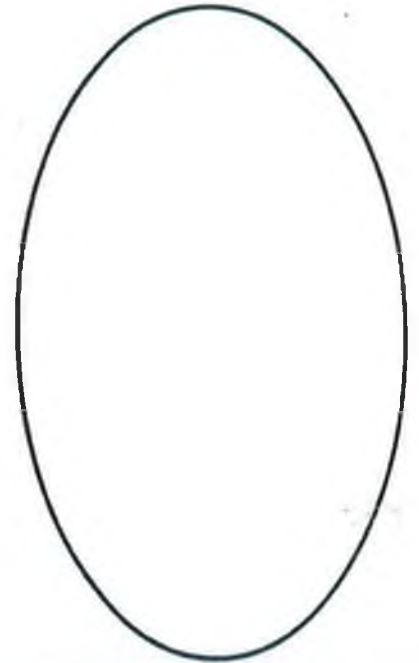
Appendix 4

- **Samples of Aston Index Tests**
- **Samples of Children's Stories**
- **Samples of Children's Letters**
- **Samples of Children's Graphs**

Stop thief!

Help Words

One day a butcher.
Was siting in his shop.
and a old man came in and
he asked for some soageses
and wen he seid that is
ten erwo. And the man had
obey five eruo. he hit the
butcher on the head

Difficult delivery
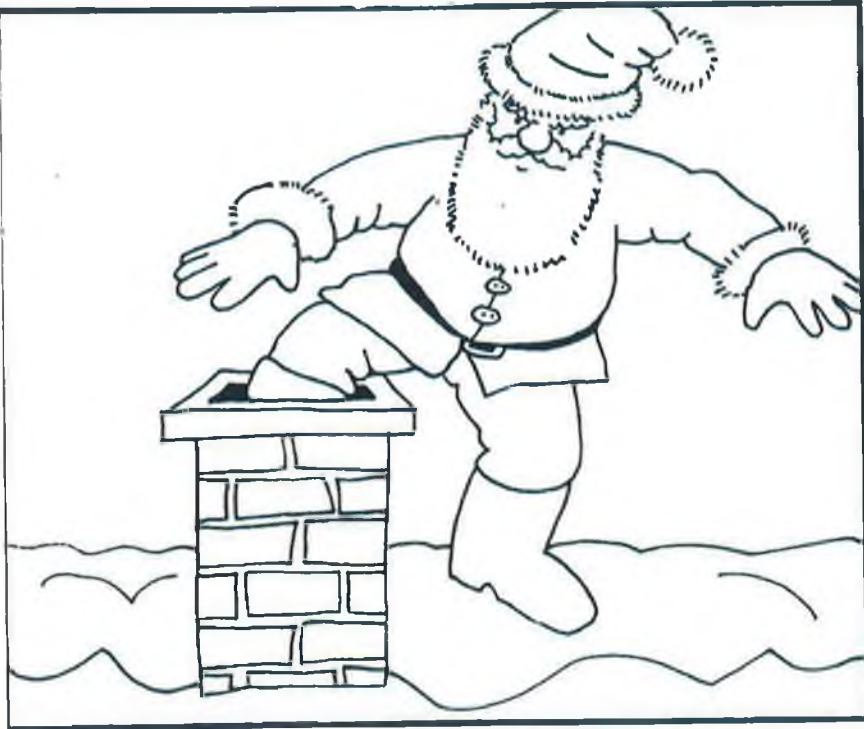
Help Words
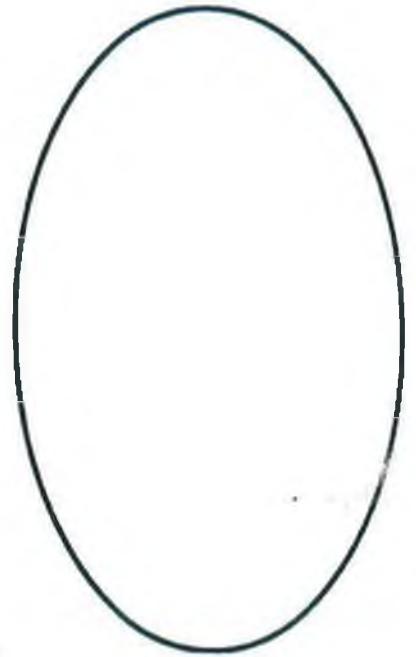
One Christmas Eve santa.
cepeted geting stuck down
the chmLiy. He dicided to
talk to God. God dicided to
give santa all his power
for next Christmas eve.
As the months past it
was Christmas eve agin.
When Santa came to the
firt chmLey. He side chmLey
go biger and then santa
had no problume. the End.

Stop thief!
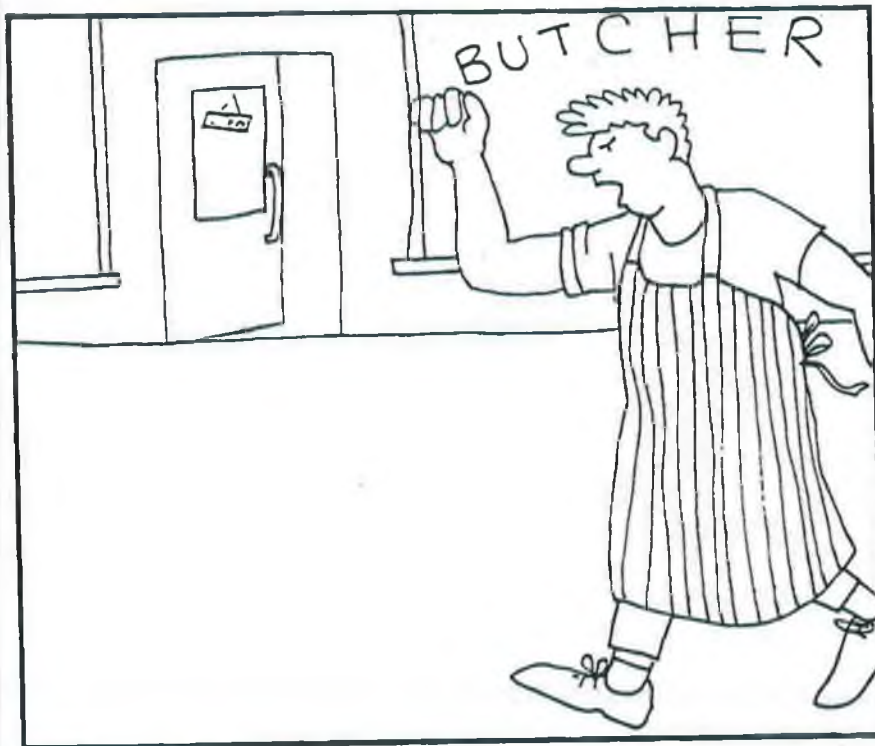
Help Words

Once apon a time there was a butcher
One day he was working away to himself
and a thief came in to the shop.
Oh no said the butcher. The thief
ran away. I no what i will do i will
call the police. They will sort him out.
So he called the police and they
looked all over toun for him.

Difficult delivery
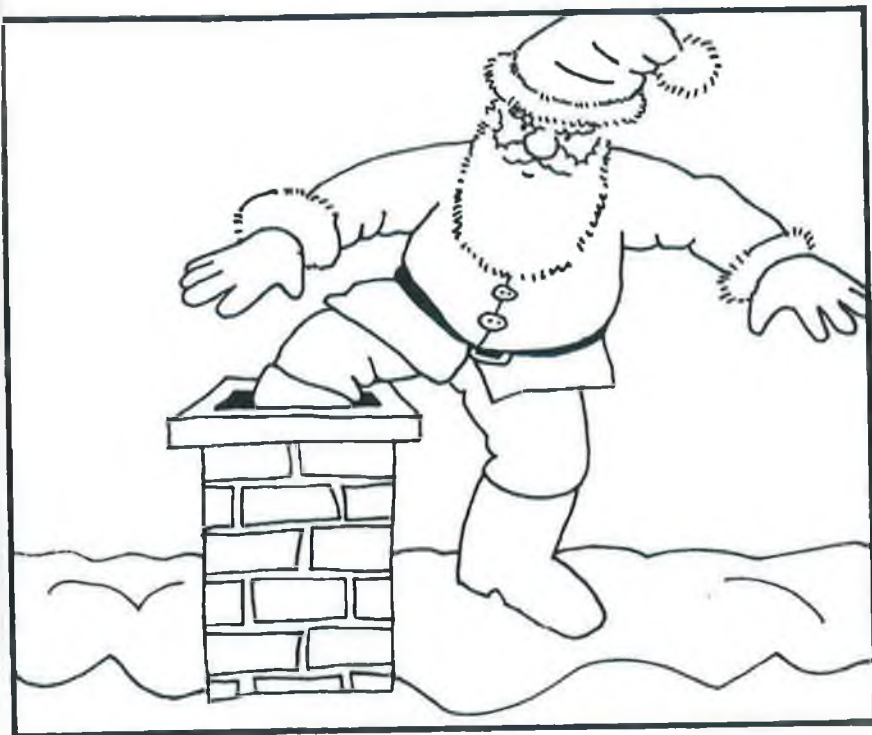
Help Words
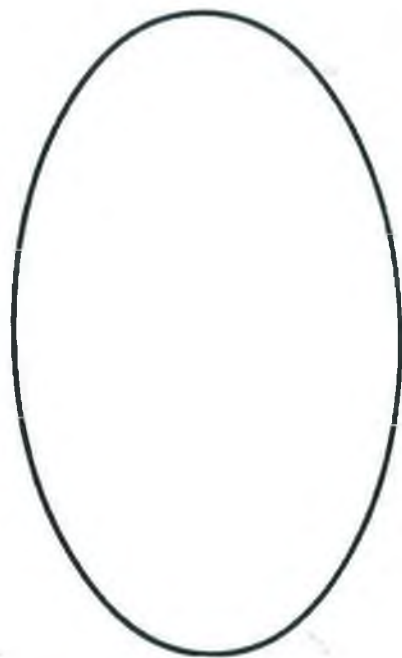
Help said Santa I'm stuck.
I cant get my sack. I cant get
down the chiminy it is to narow. What
am I going to do I'm freesing out here.
And I want my cooksies aswell.
brrrr I still need to go to alot
more house's aswell I need to
think I know Rudolf wake up Rudolf
ok there gose that plan out the
window. This is very difficult. Help help
help somone I know I'll call my
elf He will come and help me There
you are. Help me get out. There
you go santa Thank you. Santa
yes buddy look at the time ok by
buddy And merry christmas

Sample Story: Pupil C
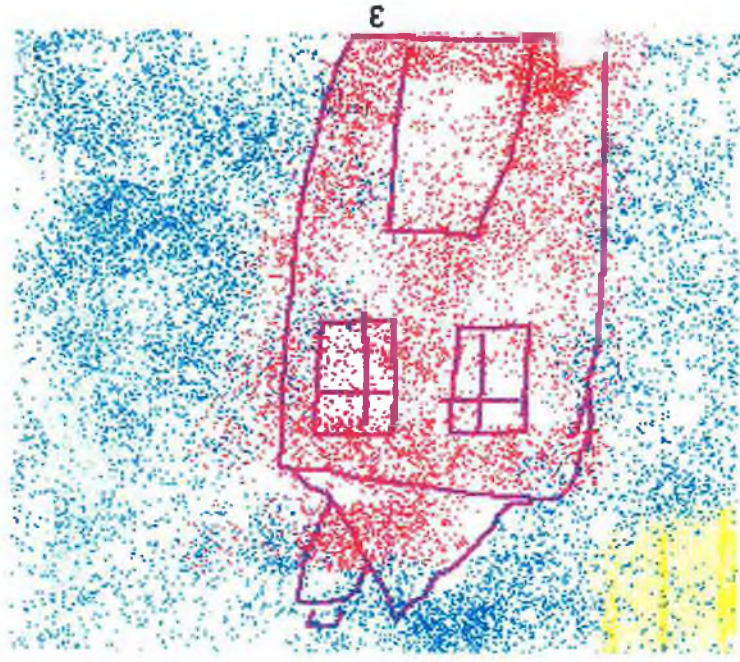
This is my house. It is
sunny out. I have a big
garden. There is a green
beside my house.

My Story

By

My Story

By

It was a sunny day and there was a buterfly outsid. An I thot it was prity. I was looking outside and I saw a flower and it looked like the sun and I thot it was byutyful.
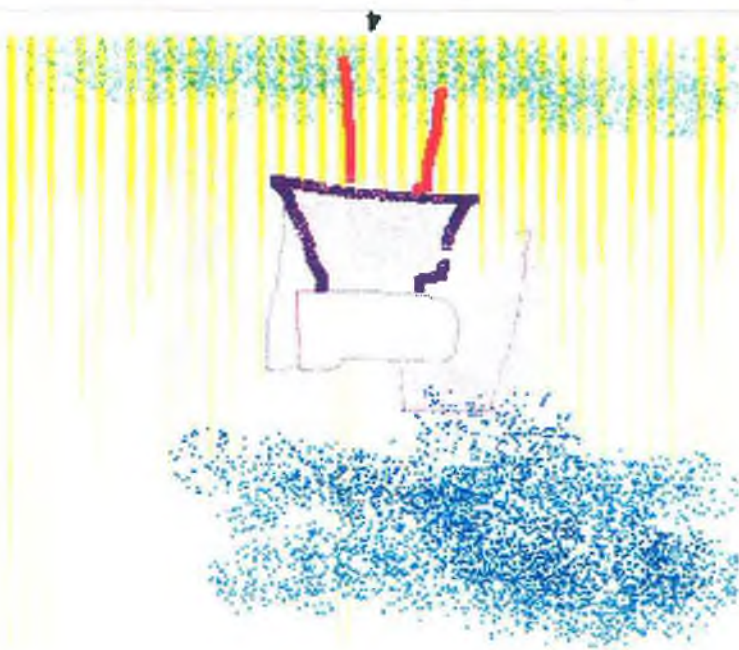
Sample Story: Pupil D

3

Letter to Megan

By
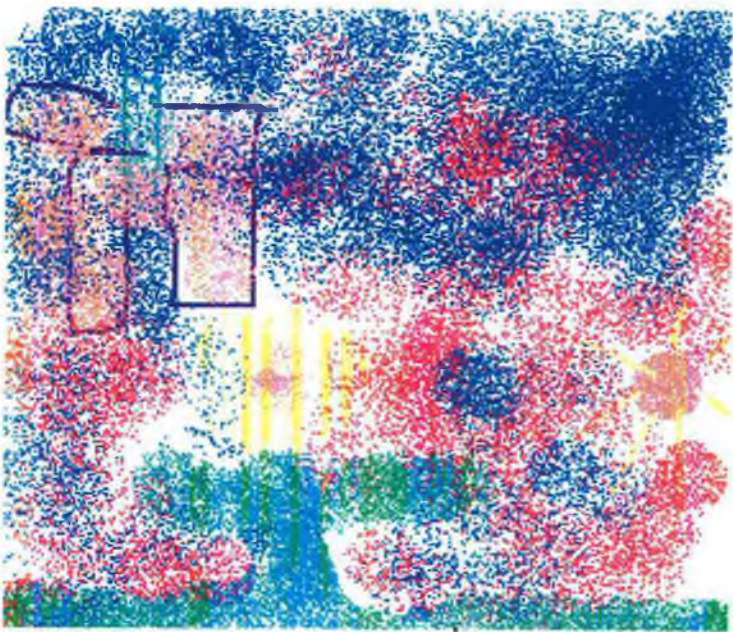
The Old Forge,
Lucan,
Co. Dublin.
20th November.
Dear Megan,
Thank you very much for
the Gameboy. I play with it
all day long. I relly relly

love it. See you soon. Hope you are well.

Love Olivia.

Letter to Sean

By

Hillcrest Road,
Lucan,
Co. Dublin
20th November.
Dear Sean,
Thank you Sean for the
Abtree vouchers last year
for my birthday. I got two
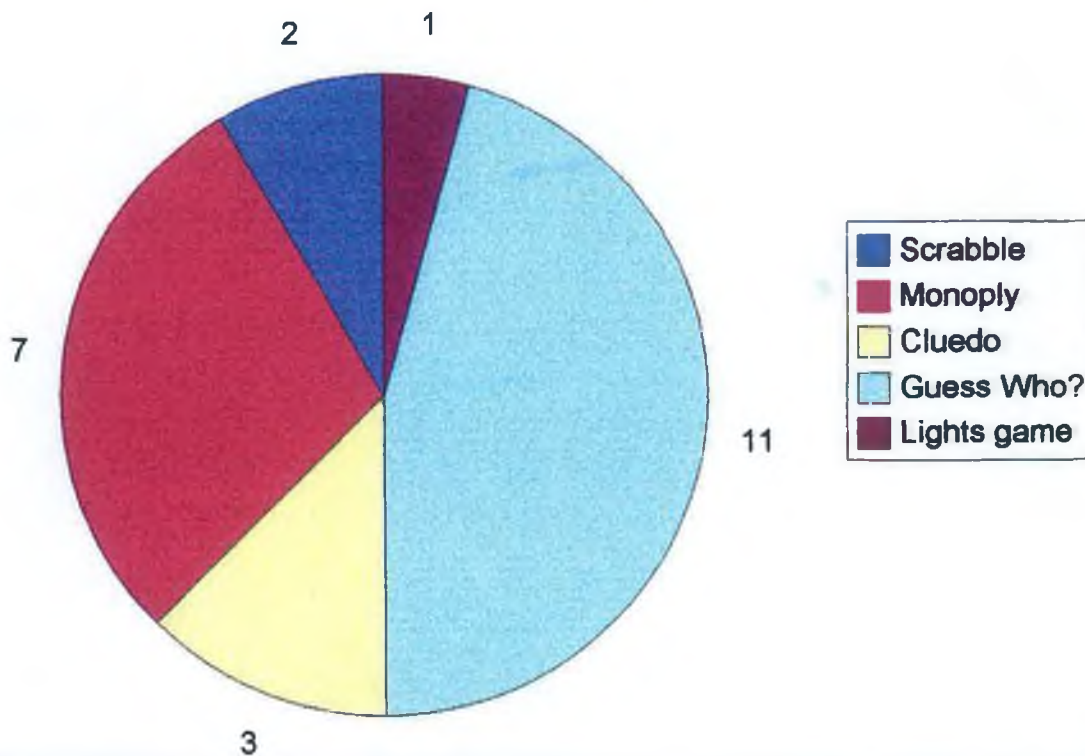
2

books. I read them all day.
I hope I see you soon.
Your friend,
Brian.

Sheet1

Games we play.

2   1

7

11

3
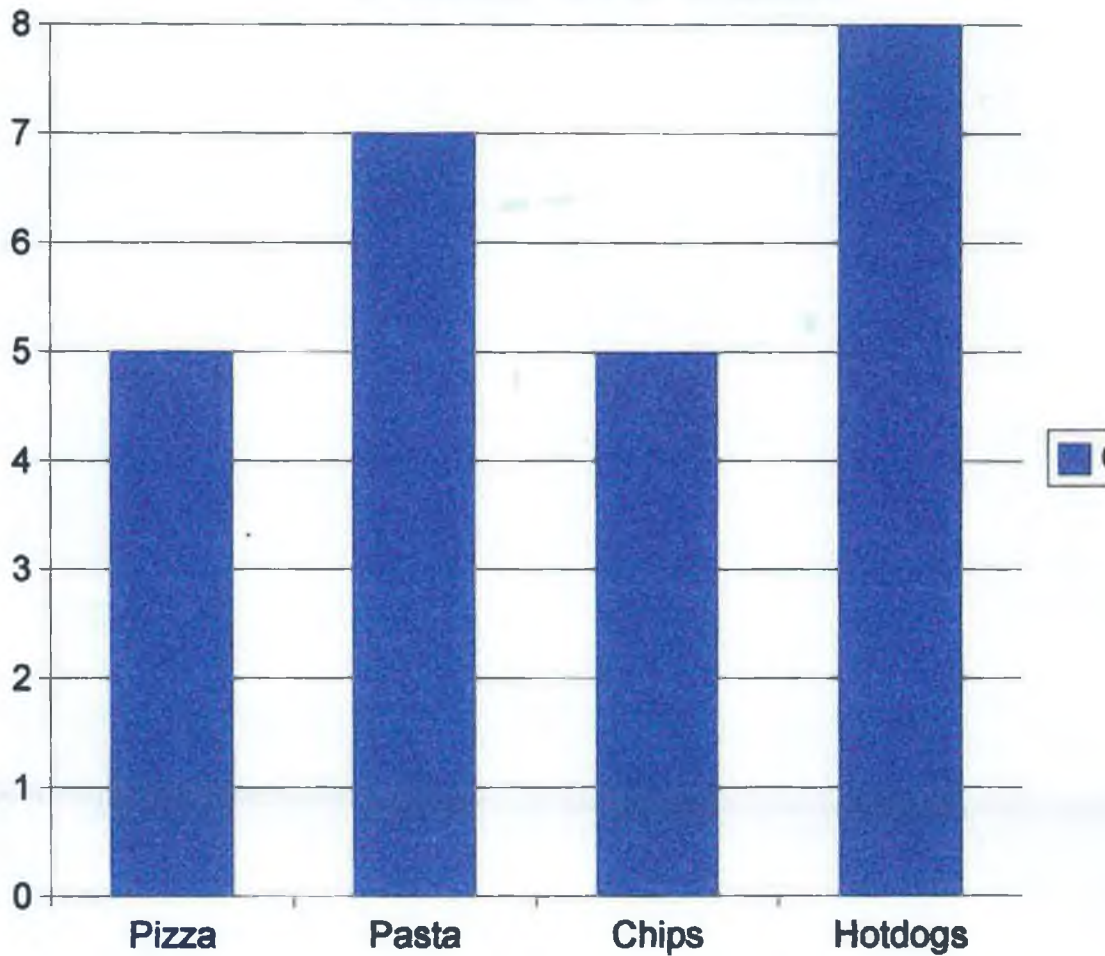
- Scrabble
- Monoply
- Cluedo
- Guess Who?
- Lights game

Two children like Scrabble.
Seven children like Monoply.
Three children like Cluedo.
Eleven children like Guess Who?
One child likes Light game.

Sheet1

Food We Like.

Five children like pizza.
Seven children like pasta.
Five children like chips.
Eight children like hotdogs.

Appendix 5

- **Evidence of Work Display**

Second Classes

First Classes

P.E. time is fu

Lunchti

Senior Infants

Look at what we did
with the scanner