ICT and New Entrant Children

How do Teachers
discover, use, and value the knowledge
that children starting school have about ICT?

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2006

TE TĀHUHU O TE MĀTAURANGA
Ministry of Education

core
technology | innovation
learning | research

eFellows

ABSTRACT

Children are starting school with an increasingly wide range of experiences with ICTs. If we as teachers are not finding out what these experiences and skills are, we are missing a golden opportunity to acknowledge and empower our students, and may be planning programmes which do not best meet their needs. This two-part study follows seven children as they move into new entrant classes in four schools in Auckland, observing changes in their knowledge and use of ICTs and exploring their teacher's practices and beliefs with ICTs and new entrant children. The second part of the study is a survey of new entrant teachers exploring their personal and professional practices.

ACKNOWLEDGEMENTS

INTRODUCTION

The E-Learning Teacher Fellowship

This programme was established in 2003. It reflects the New Zealand Ministry of Education's commitment to quality teaching, improving the professional capability of teachers, and increasing the use of effective e-learning strategies in schools and early childhood centres.

It recognises and rewards teachers who have demonstrated an innovative and creative approach to improving learning through information communication technology (ICT).

Successful teachers are provided with up to a year's release from their classroom duties in order to carry out a research project and explore the use of emerging technologies. This gives time to focus on researching how to best meet students' learning needs in new and exciting ways.

During the year e-fellows are provided with academic support and mentoring through Core Education including professional learning workshops and participation in an online learning community.

Who am I and how I came to my question?

I have been teaching since 1996, mainly in new entrant classes at Westmere School in Auckland.

I came to teaching via the computer industry, having been involved in operating large mainframe computers in the 1970s and in managing the 'new' minicomputers of the 1980s that many companies in New Zealand were using. It was during this period that I became involved in staff training and writing user documentation for the minicomputers that the organisation I worked for had bought.

In the 80s I had a break from paid work. My oldest child had a severe hearing impairment and some learning problems, so I became involved in her pre-school and primary school in order to help her.

When she started school I took on a teacher-aide role in a special school satellite class and noted that the aging BBC computers were not being used at all. No one knew how to use them! So I set about writing systems and manuals for the teachers to use. It was clear to me that there was a role in education for computers, even in those days, as they held the rapt attention of children who had extreme difficulty attending to many other classroom tasks.

When I graduated from Auckland College of Education in 1996 and began teaching, my school had an Acorn computer in each class with word processing software and various 'educational' games. My children and I were using a PC at home, and I struggled to find ways to use the Acorn effectively in the classroom. In the next couple of years the school and community grappled with the 'What shall we do about ICT?' question, eventually opting for a PC based network.

By the end of 1999, 1 networked PC (intranet and dial-up internet) was installed in all the year 3-6 classrooms and in any year 1-2 classes where it was felt that the teacher would use it.

At this point in my new entrant class, I had parents publishing on the computer for the children. We were using Kidpix ^{TM} for drawing and making slideshows and I was making templates for maths and reading activities. I was doing all my planning on the computer. The six Year 1 & Year 2 classes had a digital camera that we shared. Photo slideshows became part of our classroom repertoire. However, I felt that I was not using the computer or camera particularly effectively in my teaching programme – ICT felt like an 'add-on' activity or a 'reward' rather than something which was integrated into the life of our classroom. I

found it enormously frustrating, not to mention time consuming, and felt that the (educational) returns were questionable. – The children enjoyed using the computer and camera, but I was struggling to justify the time it took to 'do' ICT. In the evenings I was using the Internet at home, attempting to find examples of good classroom practice both in New Zealand and overseas.

By this time I was a senior teacher and was encouraging other teachers to try using ICTs in their teaching programmes. Some refused, claiming that it distracted from time spent teaching Maths and Literacy, some paid lip-service and continued to do what they always did, others did attempt to use ICTs but gave up when it 'didn't work'. I was frustrated and becoming overloaded with calls to 'come and fix this' when gear failed or teachers couldn't get things to work.

In 2003, the school joined an ICTPD cluster, and I became our junior school representative. At the same time our computer system was upgraded so that most classrooms had 2 networked PCs. Through the ICTPD cluster I became aware of some things that were happening in junior classes in other schools, and eagerly began to try them in my room. In 2004 I won a scholarship from the cluster that allowed me a week long period of release from the classroom to visit a number of schools in Auckland and the Waikato. I came back delighted to have found that there were schools integrating ICTs into the fabric of classroom life even though they didn't have the latest or flashest equipment. Children were making decisions and choices about whether a particular ICT was the most appropriate tool to use. I saw ICT being used for much more than just publishing and 'games'.

I returned to my class and began to play. I changed the layout of the room, set up systems which meant that children were teaching each other and looking first to class experts when they had problems before coming to me. In my room ICT began to feel more like a tool than an 'added extra'. The children and I debated about the 'how to' of using ICT and the 'is this the best way to . . .' I began to explore new (to me) ways of using video and digital cameras. However I was still struggling with getting some of the other teachers to see ICT as more than an added stress in their already busy day.

I was also becoming more aware of the ICT knowledge that children were starting school with. Some already knew a considerable amount about the Internet. Cell phones have games and cameras: some children have taken photos with digital cameras and cell phones. Some could download photographs. There were children who could turn the computer on and off, logon, and negotiate their way to their favourite Internet sites. Our local kindergarten has digital cameras available for the children to use and the children's kindergarten portfolios had lots of evidence of children using photocopiers, cameras and laptops. Clearly I needed to include questions about ICT in the initial assessment I was doing with children when they start school. Given that I already had children taking the roles of ICT teacher and learner, and that they were responsible for logging on and off each day, it was sensible to find out what children knew about ICTs and use the expertise they already have.

I began asking other teachers of new entrant children how they find out what children know about ICT use. With few exceptions teachers had no expectation that children would know very much that was relevant at all. Nobody that I spoke to systematically enquired of children about the ICT knowledge they had acquired before coming to school.

It had been clear to me from discussions with teachers and school managers that ICT in new entrant and lower primary classes was considered an optional extra in many schools. In many ways this idea was reinforced by the way some ICT initiatives have been implemented – the rollout of the TELA laptop scheme happened from the 'top' down with junior classes last and the ECE (early childhood education) sector yet to receive them. In many schools, new equipment goes to the senior part of the school, with older gear 'filtering down' to junior teachers and classrooms. In some schools a teacher must 'put a case' to justify expenditure on equipment or software. This of course presupposes that individual teachers know what hardware and software is available and can imagine how to use it in their programmes, without actually having it available. I heard many clichés in my discussions: "ICT distracts from the most important job of teaching literacy and numeracy"; "I use the computer as a reward or for early finishers" being the most common.

I was experiencing mixed results in my efforts to encourage my colleagues to 'play' with ICT in their teaching and learning programmes, and to begin exploring possibilities. Some teachers could see the possibilities and were prepared to persevere or adapt to their own particular scenario, many felt the overwhelming pressure of running their programmes left no energy to try something more.

I wanted to know whether the response to ICT at our school was different from that in other schools. In talking to teachers as I began to formulate my research question it became clear that simply enquiring of teachers might not give me a big enough picture I wanted to find out what teachers were actually doing with ICTs, how they were planning, what decisions were being made with and by the children, and how children's prior knowledge was being taken into account. I began to focus in my discussions with new entrant teachers on what new entrant children knew about ICT when they started school. I found no teachers who were systematically asking children what their experiences with ICT were, and very few who said they placed any priority on ICT use with their new entrant children.

I felt that I had found my window into the heart of new entrant teachers' beliefs and practices around ICT.

Purpose of research

The purpose of my research was to explore through questioning and observation, teacher practices and beliefs in regard to ICTs with new entrant children and in new entrant classroom programmes. I hope in doing this to identify some barriers to teachers' ICT use in New Entrant programmes and explore possible remedies.

My research question is:
> In what ways do new entrant teachers recognise, value and use what children starting school know about the use of ICTs?

I explored this question through four sub-questions:

> What level of competence do new entrant children have with ICTs?

> What level of use of ICTs are there in new entrant classes?

> How is children's ICT knowledge assessed by teachers?

> What are new entrant teachers beliefs about ICT use with new entrants?

LITERATURE REVIEW

Introduction

Children and adults alike are living in a world where ICT is embedded in their lives in ways that are increasingly difficult to see. Although there had been a number of school focussed ICT initiatives as described by Ham(2005), it was not until the New Zealand Government developed its 'Navigating the way' video and accompanying booklet (NZ Ministry of Education, 2005), that ICT use in ECE settings was dependent on more than the interests and confidence of individual teachers and centre management.

Governments, education agencies and researchers around the world are recognising that access to ICTs is an issue which is going to have long-term effects on the ability of people to participate fully in their societies. Siraj-Blatchford and Whitebread (2004) suggest that the provision of ICT education is a citizenship issue:

> *For citizens (of any age) to make informed technological choices they must gain some understanding of the technologies that are available. To participate actively in the future development of their culture and economy they must be equipped to predict the impact and consequences of introducing new technologies on their social, biological and physical environment.* (p.2)

In their study in Swedish Early Childhood Centres the authors Kankaanranta & Kangassalo (2003) also alluded to citizenship issues:

> *New technologies also create tremendous challenges for citizens in the information society. Active participation in the information society presumes novel skills for the acquisition, management and communication of information as well as versatile work approaches from children and teachers alike.* (p.2)

The New Zealand Ministry of Education (2006b) also links ICT use with issues of full participation in the social and economic life of our society:

> *Just like the ability to read and write, ICT literacy will be an essential life skill – an economic and social necessity.* (p.8)

Information and Communications Technology and Early Childhood Education

Mark Brown in the Editorial for Computers in NZ Schools, Early Years Edition, (Brown, 2006) points out that effective ICT use in Education requires strong partnership between teachers, children and parents. Parents need to understand how ICTs (especially computers) are used in educational settings.   He further comments:

> *We soon learned that when used appropriately as a tool for open-ended purposes young children could explore, experiment and create in ways entirely consistent with a holistic approach. Teachers could use computers to foster social interactions and to develop an attitude of exploration and discovery where children learnt that the most creative results come when they often make mistakes.*(p2)

The attitude of exploration which Mark Brown talks about is described in Te Whaariki, the curriculum for early childhood education, (NZ Ministry of Education, 1996) which requires that children are encouraged to feel comfortable about (among others) risking failure, to initiate purposeful problem-solving activities (p58), and use trial and error (p89).

In looking particularly at ICT in the Early Childhood Education setting, issues of the appropriateness of various ICTs for very young children become significant. One of the reasons put forward by groups who are against children using ICTs in the early years is that they are developmentally inappropriate. Many of the objections to young children using ICTs are based on the premise that they may damage children's brain development. Healy (1998) belongs in this camp. However, according to Blakemore and Frith (2000) and Cuban (2001) this is not proven either way, they contend that researchers in neuroscience are unable to prove or disprove the truth of the matter.

Cook (2003) in looking at the potential to do new things in new ways with ICTs suggests that we need to rethink the way we use technologies with young children. She says:

> when we think of ways to harness these as yet only partially understood powerful new technologies to support their learning we need to think about 'new forms'. These 'new forms' seem to me to be more in line with traditional views of early childhood learning which adopt a constructivist or socio-historic view of learning (p1)

The European DATEC (Developmentally Appropriate Technology in Early Childhood) Project worked across a number of european countries, linking five initiatives to determine what constitutes developmentally appropriate ICTs in early years education. What DATEC did through meetings of the partners in the project was to develop consensus regarding the most appropriate form that ICT education should take in early childhood. DATEC describes a separate ICT curriculum. While we do not in New Zealand have a separate curriculum for ICT, nevertheless the findings of the project fit our experience in several ways: the project has found integration to be central to ICT use in education, and that consideration should be given to ICT in education being developed in two ways – developing technological literacy - children's understanding of the uses of ICT and also developing children's practical capability. (DATEC, 2000). Similarly Swedish researchers Sheridan and Samuelsson (2003) proposed that ICT should be part of a rich and diverse early childhood programme and that it should be integrated into everyday activities. They too consider that the introduction of ICT early in life is a question of democracy, rights and equality.

Researchers at Stirling University studying the ICT knowledge children have when starting at early childhood education centres and in transitioning to school found that the knowledge and experience that children bring to either an early childhood education setting or to their new entrant class at school vary enormously depending on a range of factors including socio-economic, cultural and the child's own interests, as well as access they have had to ICTs in the home setting.

Their study has also identified a general lack of inquiry by teachers into children's prior knowledge. Teachers in both early childhood and early primary settings exhibited a tendency to rely on anecdotal evidence and their own assumptions about a child's background rather than systematically enquiring of parents or early childhood education records of learning. This means that existing knowledge is not being built on and enriched ((McPake, Stephen, Plowman, Sime, & Downey, 2006).

The authors suggest that children with less ICT experience at home or in an early childhood education setting are unlikely to be disadvantaged as the school focus is primarily on teaching computer skills. It would seem likely from this finding that children with superior ICT knowledge and experience are not being acknowledged with programmes which take their prior experiences into account either.

This study also found that although children in the study had varying access to ICTs in their home setting, socio-economic factors were not a predictor of how much access a child would have to ICTs. Factors such as parent's interests and belief system around whether ICTs are appropriate for young children, and the interest (or lack of) in ICT by the child were important. (McPake et al., 2006)

Transition from Early Childhood Education setting to school

The Ministry of Education in its Statement of Intent 2003 – 2008 says:

Achievement at one particular stage hinges on what a learner has done before - and affects their future ability to learn. Each part of the system needs to see itself as belonging to a larger whole. The focus of the early years must be on building strong foundations. As a learner progresses, the system should offer more pathways while still instilling the core skills that ensure later success. Transitions need to be managed between the different levels of the system. This includes the transition from early childhood to school, and on to tertiary education. When providers work together, smoother transitions occur. (Ministry of Education, 2003)

Clearly if this is to happen then educators must understand what teaching and learning is happening in other sectors, the curriculum being used, assessment processes and what assessment material is available to the sector receiving the student. McPake et al (2006) found that Scottish teachers in Early Childhood Education settings did not inquire about children's prior ICT experiences in the home setting. Similarly teachers in the Primary School setting did not use the assessment information that was available for children, nor in general enquired of parents what the child's ICT experiences had been. Research currently being undertaken by Mangere Bridge Kindergarten, as part of the Ministry of Education Centres of Innovation intiative, is showing preliminary results that indicate strengthening links between Kindergarten, School and families leads to much better transition outcomes for children. Teachers at Mangere Bridge school understand the aims of Te Whaariki, the early childhood curriculum and the role that assessment plays at Mangere Bridge Kindergarten. The children's assessment portfolios have become a vital record of the child's learning, strengths and interests and are used extensively by teachers when a child transitions to school. (Gibbs, Hatherly, Hartley, Ritzema-Bain, 2006)

A New Zealand Ministry of Education Pamphlet titled 'Lets Talk about Personalising Learning' aimed at teachers in both schools and early childhood education settings suggests that parents should be sharing their children's early childhood portfolios with school teachers so that all the child's interests and experiences are understood by the teacher. (NZ Ministry of Education, 2006c) If this is happening and quality teaching is the practice in schools as described by Adrienne Alton-Lee in the Best Evidence Synthesis: "*Quality Teaching recognises and builds on students' prior experiences and knowledge.*" (Alton-Lee, 2003, pvii), then finding out what children know about ICTs and planning classroom programmes which take all the child's prior knowledge into account would be the normal practice.

A study by Mawson (2003), looking particularly at Technology Education that followed a group of children at Kindergarten and through primary school, found that teachers in the primary school setting lacked understanding of the aims of Te Whaariki, the Early Childhood Education Curriculum. He also noted the heavy emphasis on academic subjects at primary school as being problematic (particularly for boys) as it has led to a much more structured programme in primary school with less opportunity for exploration and free play than in the past. This lack of time to explore is a problem if we think in terms of Mark Brown's comments (already discussed) about the importance with ICTs of exploration and learning from mistakes.

Information and Communications Technology and School
In spite of the notion that access to ICTs might be a citizenship issue and the vast sums of money being spent on ICT in the school sector in New Zealand, Lai (2005) found little evidence of widespread integration of technologies into the school curriculum. He suggests in fact that teachers are being blamed for not using technology when there are much larger issues at play. He quotes a number of studies, including New Zealand studies, which suggest a range of reasons for the patchy uptake of ICT use in schools including access to technology, teachers' pedagogical beliefs, school culture, vision and leadership, and lack of time for teachers to become confident using ICTs and develop programmes.(Lai, 2005).

Ertmer & Albion (2002) in their work at Purdue University have identified self-efficacy as a major influence in the uptake and use of ICT by teachers. In his study of the effect self-efficacy has on technology use in teacher education in Taiwan, Wanyu Chao explains self-efficacy as the mechanism by which a person will predict a likely outcome for themselves based on both their powers of visualisation and their estimate of their knowledge: they will stretch themselves or limit the amount of effort they put in based on this estimate. Thus self-efficacy will determine the goals individuals set for themselves, how much effort

and how long they will perservere, and what their response will be if they face problems, setback or failure. Chao (2003)
Judith Lloyd Yero(2002) describes the effect of self-efficacy thus:

> *A teacher's sense of self-efficacy is one of the most important factors in determining that teacher's behaviour. It is a critical factor in determining how easily a teacher will change.*(p.202)

Sue Vartuli (2005) suggests that self-efficacy will determine how long a teacher will persevere in the face of difficulty and how much effort they will put into overcoming obstacles. Teachers with high self-efficacy believe they can learn new concepts and that they can help children learn new concepts, so they tend to put more time and effort into achieving a desired outcome. Teachers' attitude towards ICT and self belief is also identified in a Swedish article by Sheridan and Samuelsson (2003), who further suggest that teachers must develop both an interest in technology and see the possibilities in ICT use in order to encourage technology-literate children.

An emphasis on the acquisition of technical skills by teacher training institutions rather than the pedagogical focus which is necessary to ensure integration of ICT, is a barrier to integrated use of ICTs that has been identified by Lai (2005) and Lai & Pratt, (2005). Furthermore, a tendency to return to 'tried and true' (habitual) ways of teaching even after participating in professional development by teachers is described as problematic by Ertmer & O'Connor (2003) in their study which found that profound changes in pedagogical belief are a necessary precursor to permanent change in practice after teachers undergo professional development.

Teacher belief was an issue which recurred in much of the literature. Teachers' belief about what is quality education based on their own experiences at school was identified by both Sue Vartuli (2005) and Sheridan & Samuelsson (2003) as a major inhibitor to changing practice. Similarly Ertmer and Albion (2002) describe beliefs about teaching as being:

> *Formed through personal experience over many years, first as a student, and later as a teacher…Moreover, the working conditions of many teachers restrict their opportunities for observing alternative classroom practices. Thus, teachers' beliefs about teaching are resistant to change.(*p.36)

The importance of building teacher's confidence rather than just increasing competence is one of the major findings from the evaluation of the first 2 cohorts of ICTPD (ICT Professional Development) clusters, the first 1999-2001 & the second 2001-2003. (Ham, 2005). He further found that personal skill level was not as much a predictor of classroom ICT use as were levels of teacher confidence coupled with length of time in an ICTPD cluster. Higher personal ICT skill levels on entry to the programme did not equate to greater classroom use.

Some researchers are finding evidence that integrated ICT use in education lends itself to particular pedagogical approaches to teaching and learning. Bai and Ertmer (2004) found in their study that teacher educators' modelling of learner-centered teaching practices using ICTs with pre-service teacher training programmes had a strong effect on the teacher's belief in their ability to integrate ICTs.
Sprague and Dede ((1999) say that if teachers are following a constructivist paradigm then activities are likely to be authentic that is, of relevance or emerging relevance to students, and often problem-based rather than skill and drill. In short they will be working in a student (or learner) centered way.
 Teachers who are already integrating ICT are generally found to be working from a learner-centered teaching approach. (Ertmer & Albion, 2002) Interestingly, teachers who begin to integrate ICTs also tend to move towards learner-centered pedagogies. There are some studies however that find a less clear link between particular pedagogical approaches and integrated ICT use. Ertmer (2005) cites several studies in which teachers described their beliefs about learning as constructivist in nature, but describe their ICT use as sometimes integrated and sometimes "skill and drill". She suggests that pressures such as curriculum requirements, time, parental and peer/colleague pressure all affect how a teacher feels they can run their programmes.

Lai (2005) identified the importance of having a school culture that supports classroom use of ICTs. Lack of vision or direction by schools is identified by Otago primary teachers as a barrier to them using ICT. Lai (2005) and Ham (2005) both identified structural and systemic factors as important in changing teachers' practice, as did Ertmer and Albion (2002).

To summarise, despite a stated belief by governments, educators and researchers that access to and knowledge of ICT is a citizenship issue and will become more so over time, the research tells us that uptake of ICT use in schools has at best been patchy. However access to and implementation of ICT use in educational settings is a complex issue. Large amounts of money are being spent on infrastructure and training for teachers with mixed results. Often teachers have been blamed for the lack of ICT use, however as Lai (2005) pointed out there are much larger issues at play, including those of access, leadership and lack of time. Other researchers including Ertmer and Albion (2002) and Chou (2003) have identified self-efficacy as a determining factor in teachers' success in integrating ICT use. Ertmer & O'Connor (2003) also found that unless teachers have undergone profound changes in their pedagogical approach, they are likely to return to 'tried and true' or habitual methods of instruction, rather than integrating the new.
ICT use in Early Childhood settings has been a topic of ongoing debate, with parents and educators making often emotional claims about how beneficial or harmful it is for young children to be using ICT. The study by McPake (2006), in Scotland suggested that it is parental interest and attitude that affects young children's knowledge and understanding about ICT. Also that teachers in both early childhood education settings and school settings have been shown to place little value on the child's prior knowledge and experience. In New Zealand the Ministry of Education has introduced initiatives aimed at increasing ICT use (Navigating the Way) and rigorous planning and assessment processes (Kei Tua o Te Pae) in the Early Childhood Education sector. In its Statement of Intent 2003-2008, the New Zealand Ministry of Education states quite clearly that educators need to be taking account of what a child has done before, and that transitions need to be managed in ways that serve the learner. Research currently underway at Mangere Bridge is reinforcing the idea that ECE institutions, families and schools need to understand each others curriculum and assessment processes and value the information that is available about the learner.
Te Whaariki, the Early Childhood Curriculum is founded on the following aspirations for children:

> *To grow up as competent and confident learners and communicators, healthy in mind, body, and spirit, secure in their sense of belonging and in the knowledge that they make a valued contribution to society.* (NZ Ministry of Education,1996)

In order to fulfil that aspiration we need, as teachers, to develop an understanding of the mechanisms such as self-efficacy described by Chou and Ertmer, and to model ourselves as competent and confident learners. We must also understand the importance of knowing about all the child's strengths and interests when they transition to school.

METHODOLOGY

Introduction

This research is made up of two parts:

a) The first comprises an in-depth investigation of students' knowledge about ICTs and teachers' attitudes to, and level of use of, ICTs in new entrant classrooms.

These are presented in this report as a series of case studies of seven children and four teachers in three schools. Participants were observed over a period of two terms. The schools were all located in urban Auckland. The schools are different in size, and are located in different economic and demographic zones within the urban area:

- School A: decile 1, roll approx 750 students,
- School B: decile 5, roll approx 400 students,
- School C: decile 9, roll approx 420 students.

b) For the second part of the study the purpose was to gain a wider understanding of new entrant teachers' attitudes to ICT gathered from around the country.

A survey was sent to 32 new entrant teachers, around the country and 24 survey forms were returned.

Case study data collection and sources
Participants

Children who were pre-enrolled at the three schools were selected on a 'first come first serve' basis – that is, the school contacted the parents of the next two or three children who were due to start school and asked if I could approach them about the child being part of my study. I spent some time at two contributing Kindergartens that five of the children attended before starting school, observing and interviewing the children about their ICT knowledge, experiences and level of expertise.

 I experienced some difficulty with children who moved school after the start of data collection, and with classes that filled up sooner than expected:

In School C the first new entrant class filled up faster than anticipated (before I had ethics approval for my study). This meant that I had only 1 class in School C and had to find a class in another school. Also after the initial (pre-school) observations and interviews were completed, one child moved to another city. Another child whose parents had given verbal consent on several occasions for observations and interviews (I had observed but not interviewed him) never gave written consent. I was unable to interview this child. In both these cases I had to find other children to include.

School B (which was included after the first class in School C was full) had a much lower rate of new entrant enrolments, so the children participating in the research had a wider spread of age and were expected to be starting school over a longer period of time but still have the same class placement. However the class filled more quickly than was anticipated so that by the time the second child started school, this class had also filled (several children who were not pre-enrolled filled the first class) and the second child was placed in another class that was not part of this study. At this point it was too late to include another teacher or child because of the 6-week period between school entry and the second observations/interviews. This meant that my study had only seven children, not the eight that had been intended.

In School A one child who was part of the study had started school and then left unexpectedly after initial interviews and observations were completed. The decision was made to include another child.

Data collection period
Data collection took place over the period from the middle of the second term to the end of the third term of 2006. I spent up to 2 weeks visiting the classrooms before the children started school, then again in the period after they had been at school 6-8 weeks. In addition, I visited the two kindergartens that 5 of the children attended over a three-week period.

Instruments
A checklist was used to ensure that the children all had the same opportunity to comment on or demonstrate their expertise across the same range of ICTs (Appendix A)

Interviews with children and teachers were recorded and subsequently transcribed, and notes were taken when children demonstrated what they could do. Notes were also taken during classroom observations. Some teachers provided detailed daily and long-term plans. Others allowed me to look at their planning but preferred me not to take copies. I took notes where I was unable to keep copies of planning.

The survey of new entrant teachers was distributed to teachers I knew personally, or to schools with whom I had a contact who could explain the purpose of the survey and follow up for collection. (Appendix B)

Analysing the data
To analyse what the children knew about ICTs before starting school a list (Appendix A) was used when interviewing the children to make sure that data across the same range of ICTs was collected for each child. The children's answers were then logged according to their response: Don't know; Can describe; Can use with help; Can use independently. The second interview that occurred after the child had been at school for 6 weeks covered the same list and I noted shifts in the children's self-reported or demonstrated competence as well observing the children in their classrooms. (Appendix C and Figures 2,3,5-7,9-14)

The teacher's interviews were analysed by looking at their reported practices from interviews and surveys, my observations of their practice, interview with the ICT Suite teacher where applicable and considering what effect, if any, that the ICT suite has had on the child's knowledge and competence.

The teacher's responses to the survey were recorded using an excel spreadsheet and the data was analysed using tables and graphs. (Figures 15-22 and Table 1)

Ethical Considerations

My research has been approved by CORE Education.

Consent has been gained from children, parents/whanau and from the head teachers at the ECE centres, as well as Principals and teachers in the three schools in the study.

The teachers who provided copies of their planning particularly asked for confidentiality, as there are notes about particular children in the planning.

THE STORY OF FOUR CLASSROOMS

This section presents the findings from teacher and children interviews and observations in two kindergartens, and in four new entrant classrooms across three different schools in the Auckland region. Each classroom and teacher is presented as a separate case.

Case One

The first case comprises an experienced teacher who holds the position of senior teacher in her school and two children, one male and one female from her class. The class is located in a decile 1 school.

School

School A in my study is situated in south Auckland. It is a very large multicultural school with a roll of 746 students and in 2006 had 7 new entrant/year 1 classes. This school does not have a reception class. Children start directly into the new entrant/y1 class. As a class fills up with new entrants, the next one starts. There are a large number of children for whom English is not their first language. It is part of an ICTPD cluster and has a PC based network.

Children

Mike

Mike is the New Zealand born only-child of Tongan parents. His mother reported concern at his lack of language development in both English and Tongan.

Mike was observed and interviewed at kindergarten over several sessions in one week. He enjoyed being involved with an energetic group of boys who frequently engaged in very physical and at times overly rough play. He is large for his age and seemed to initiate some of this play. He was happy to come and sit with me, and to attempt to answer my questions or try to 'show' me for short periods, but would soon return to his group of 'marauders'. He was particularly proud of being able to use the digital camera once I had shown him how, and took numerous photos of his friends, and brought them back to me to review and then show them to his friends.

Mike told me that his dad had a cellphone that he used for talking, and kept up high. He did not know whether his father used the cellphone for texting (or did not understand what I meant by texting). I wanted to check that he was not confusing the cellphone and landline, but he said that they take the cellphone when they go away from home.

He told me that his family had a computer at home that he played games on. I was concerned that he was confusing the TV and the Computer, but he told me that "*TV and computer different one*". He did not appear to know what X-Box, Playstation and Gameboys were. He also said that he did not use the computer at kindergarten. His kindergarten teacher reported that he showed little interest in the computer.

Clearly Mike's lack of language was a potential limitation to the accuracy of the data, however I cross checked his answers with his Kindergarten teacher who confirmed the details that I have and my impressions of his love for physical play.

Misa

Misa lives with her mother, father and older sister. Her parents are from Samoa. Both girls were born in NZ.

She was initially a little shy, but soon warmed to the task and realised that she had a captive audience that was interested in her and what she knew. She delighted in telling and showing me that she could spell her name, count to 100 and read some words.

She described a cellphone by the tasks that she knew it could perform – it "*takes some pictures, for ringing up – they write the number inside – inside is the phone number, I can play a game*". She was the only child to describe the memory function of cellphones. She did not know what a text message was.

Misa uses a computer at home, although she was unable to describe how to perform a startup on it. She said that it is a new computer with new games on it. All the family used the computer. She did not know what the Internet was. She said you can get mail on the computer but did not know what it is called. She does drawing on the computer at home and writes her name (she tapped out her name on an imaginary keyboard as she told me the letters. Similarly with counting she appeared to be visualising the keyboard and tapping out the numbers.) She also described card games that she plays on the computer at home. She said that she used the kindergarten computer for playing games.

Misa said (very proudly) that her family had a new video camera, and that they watched the videos from the camera on the TV.

Although she did not say the family had a digital camera when questioned, she used mine without being shown the shutter button, and knew to ask how to review existing pictures in the camera. She also asked if I would put the photos on my computer for her, which I did. She then dictated a story to go with the pictures. She clearly indicated familiarity with digital cameras and the fact that photos can be downloaded and used on the computer.

She said that her sister uses an X-Box to play games.

Teacher

Jane's reponse in the teacher survey indicated that she was in the 40-49 age bracket and had been teaching for 6 years, 3 in new entrant classes. In her senior teacher position in the school her role was to lead one of the New Entrant /Year 1 syndicates. This was her first year as a senior teacher. Jane was interviewed prior to Mike and Misa starting school. Observation in Jane's class occurred after Mike and Misa had started school

Beliefs

Jane commented, "I like using the computer." She believes that we can sometimes 'dumb-down' things for children to the point that it is boring – that a little complexity keeps them engaged better. She also believes that ICTs are *"just another form of pencil and paper"*.

Jane believes that children start school with a range of skills that she can build on. However she said that just asking a child whether they have a computer at home could be misleading. Computers are very expensive, and in this low decile area, sometimes parents buy computers and then keep them locked in a cupboard because they are so valuable.

She used a questionnaire combined with working with the child one-to-one as she observed their skills to give her an accurate idea of what children knew when they started school. She said that she is trying to use ICTs in every area of her programme – she was working on ways to make the timetable more accessible to

the children by linking her planning to a visual timetable. She was feeling frustrated at times because of the limits that are put on the network at school. For example she cannot download games (e.g. BBC Maths) from the Internet because of restrictions on what can be accessed via the school Internet setup.

She said that she was constantly looking for ways to use ICTs that will enhance children's learning. She used extra laptops from the school's loan pool in her classroom as much as possible to give more children access to computers and for direct skills teaching. She has been building up a CD resource of children's work (e.g. slideshows and photographs) that the children can access and use as part of the reading and writing programme. She used the digital camera herself and taught the children to use it independently. As the school cameras were shared and needed to be booked, she used her own camera in the classroom otherwise "the moment is lost" waiting for the camera.

In the teacher survey she rated herself as 'somewhat' confident and the metaphor she related to was 'learning is a race to acquire knowledge'. Her responses in the survey about ICT use in the classroom showed that she and the children use her personal digital camera and laptop in the classroom, and she frequently used ICT equipment which was available for teachers to loan. She believed that there are adequate ICT software and hardware resources available, and that the school supports her in using ICT in her programme, and that she is well supported by the school in using ICTs in her classroom.

Practice

Jane's classroom of 20 students was a busy vibrant one. Every inch of wall in the room and cloakbay were covered. There was a wall display titled *"Who works in our School"* the photographs in the display had clearly been taken by the children. Timetables, subject task boards and class rules were displayed pictorially. Thinking skills information modified to be appropriate to the children's level were displayed: Costa's habits of mind, De Bono's tools, 6 Hats, Questioning toolkit, WALT, Multiple intelligences. On the back of each child's chair was a laminated personal goal *"I want to get better at . . ."* with the actual goal attached with velcro (some examples were; drawing a racing car, keeping my hands to myself, writing neatly, reading, playing with my friends).

In the cloakbay were photographic reminders *"This is the way we hang our bags up", "This is the way we put our shoes away"*.

In the classroom were 2 PCs, one networked (Internet and Intranet) one not. The school had an ICT suite with a dedicated ICT teacher. Children used the suite at lunchtimes on scheduled days. Digital and video cameras were available on a booking system.

This teacher also used her own laptop both for planning and with the children because as a long-term reliever she did not have a Tela laptop. In addition when I visited the class there was a music keyboard linked to a laptop. There were also 2 other laptops temporarily in the room. Jane regularly borrowed laptops to increase the number of computers available to the children.

The teacher's own digital camera was beside her when she was working with the children. A CD player was located close to where the teacher sat on the mat.

Classroom Layout

Figure 1: The layout in Jane's class when observation took place.
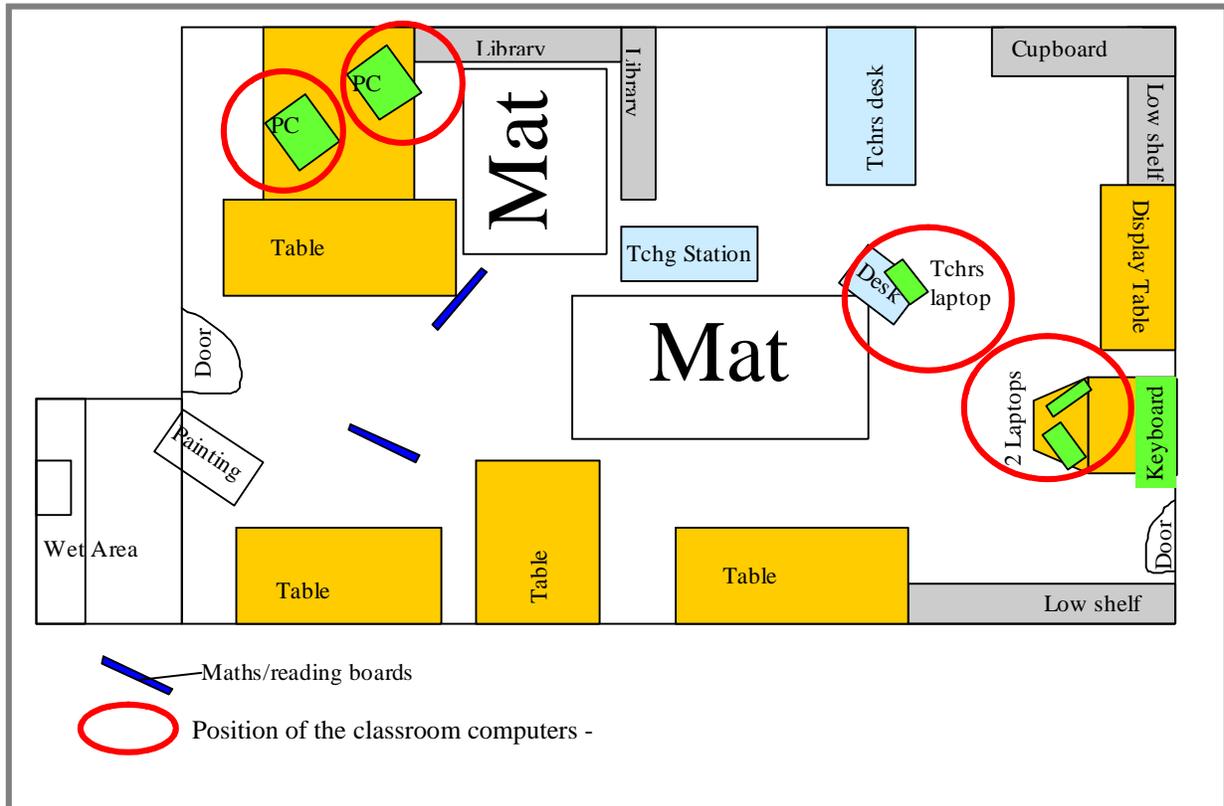
Jane's classroom layout was such that she was able to see what was happening on the computers by turning her head when she was working with children on the mat. She moved around the room during class time, and was able to see the children who were using the computers from many parts of the room while working with others.

Jane was one of the teachers actively involved in disseminating ICT information from the ICTPD cluster to other teachers in the junior school. She had some release time to find ways to support other people in implementing ICT in their programmes, and to support learning. Jane was exploring ways of using the camera to make digital stories, and was still developing the classroom photographic timetable, which I described earlier. She saw the photographic timetable as an ongoing project.

Her own planning was done using Excel ™. She had her laptop beside her as she worked, and added comment and changes as she worked with the children. She used Excel™. to link to planning pages with Achievement Objectives and Learning Intentions. She was working on ways to make the timetable accessible to the children, and to link to the photographic timetables on the walls in the room.

The programme in Jane's class was run on a regular and highly predictable pattern: first block consisted of Administration tasks (Roll, ordering lunches, notices) then fitness, oral language, Maths and phonics.

After play were writing, reading and handwriting. Then after lunch, depending on the day, the arts, PE, topic and a combined developmental session with the rest of the junior school, and assembly were covered.

Jane's programme was strongly focussed on developing good social skills and children's independence as well as literacy and numeracy. ICTs were integrated into the programme as a matter of course. To focus children as they move from one activity to another she used the CD player and music or song. Access to cameras, laptops and computers in Jane's class was largely controlled by the class timetable and systems that were in place, although in the case of cameras children could also use them if they felt they needed to photograph something of note. The task board system in place for reading, writing and maths always had an ICT component.

As well as the direct instruction that children have had in the ICT suite with the ICT teacher Jane used a teacher/learner cycle in the classroom when a child needed to learn a new computer skill (the child with the skill/knowledge instructed the learner who had control of the mouse or equipment - for example the digital camera). Each day two children had the responsibility of being the class photographer, one took the photographs, the child with more knowledge was the 'expert' or 'teacher'. I observed children critically appraising their photographs as they took them and making decisions about composition without any reference to the teacher. A photographic class diary was being built up, with the class choosing the best photograph from each day to go into an archive that was being used to construct a record of the year. Selected photographs were printed off and used in a variety of activities for maths, reading and activities to take home (sequencing, cutting up and re-assembling, labelling), and for making CDs to support reading and writing activities.

 The children used both the computers and the cameras confidently and if they encountered problems they referred to other children who knew how to help before asking the teacher.

In a Maths session, after the groups had completed their 'warm-up' activity, the class photographer took pictures of the resulting displays while each group shared their results with the class. Then while the teacher worked with a group on the mat, the other groups worked independently. As each group had their turn using the computer, I observed how democratic each group were in ensuring that all members had their turn. I also saw children who encountered problems trying firstly to solve the problem themselves, then referring to one of the 'expert' children in the class who could help them. Children who were tempted to be off task on the computer were reminded by others in the group of what they were meant to be doing. Jane sometimes booked the ICT suite for direct instruction, but preferred to use the loan laptops in her classroom, where she worked with groups of children on the laptops while the rest of the class were engaged in other learning activities.

Teachers were expected to plan using the computer. As discussed previously, Jane used Excel ^{TM}. for her daily planning. Unit plans were done collectively and posted on the server. Any problems with hardware or software were referred to the teacher in the ICT suite.

In her role as the Junior School ICT representative Jane was working with the teacher from the ICT suite to find ways to encourage other teachers to use ICTs in their teaching programmes. She was constantly looking for ways to support children's learning in her own classroom programme using ICTs. She is a confident user of ICTs herself and actively searches out ICTs that she believes will be useful in her classroom programme. During the period I was observing in her class, Jane had requested that the school buy a Digital Blue video camera so she could evaluate its potential use in the classroom.

Changes in children's knowledge

Mike
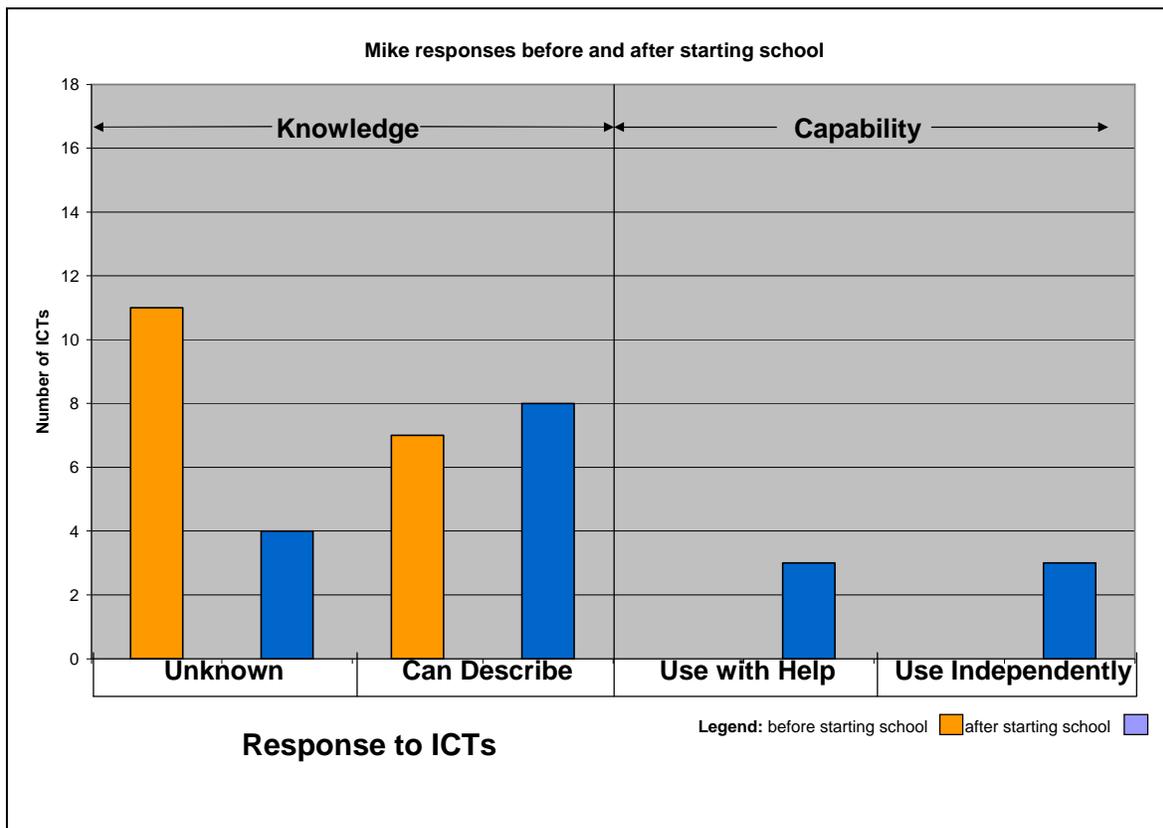
In the six-week period between the pre and post interview Mike had settled into school. His teacher was very aware of his problem understanding English and took extra care to check that he understood what he was to do. She often buddied him up with another child when the task was complex. I observed him over several days and different teaching periods and followed up with an interview.

In the pre-school observations and interviews Mike showed very little interest in using ICT equipment. At school I observed a major shift. He was using the computer independently as part of a Maths task board, remaining on task and solving problems or seeking help from other children when he encountered difficulties. He enjoyed taking photos and reviewing them with his friends, and remained engaged while I downloaded photographs. He dictated a short story for one of the photos and then lost interest as the other children dictated theirs. He didn't show any interest in sharing his Powerpoint™ story with the class.

The changes in Mike's ICT knowledge as shown in Figure 2 relate directly to the kind of tasks he was encountering in the classroom. He made the greatest changes in terms of independence using the computer and problem solving, which the teacher encourages with classroom systems.

Figure 2: The extent of Mike's knowledge of and capability with ICT prior to and after starting school.

Misa

In the six-week period between the pre and post interview, Misa had settled well into school, although her teacher found her unusually quiet in group and class work. I observed over several days and teaching periods and followed up with an interview.

Misa had made some considerable gains in her ICT knowledge and independence, particularly in relation to computer use (figure 3). After starting school Misa was able to startup the computer and logon. She could also navigate her way to drawing software, Maths and reading games and use them independently. She recalled using my camera at Kindergarten and took photographs independently, checking with me that the buttons she intended to use would perform the function she required. She had at Kindergarten needed to be shown how to use the camera. I did not observe her having to ask for help when using the computer or

camera, but expect that she would use the systems in place in the class should this happen.

Figure 3: The extent of Misa's knowledge of and capability with ICT prior to and after starting school.
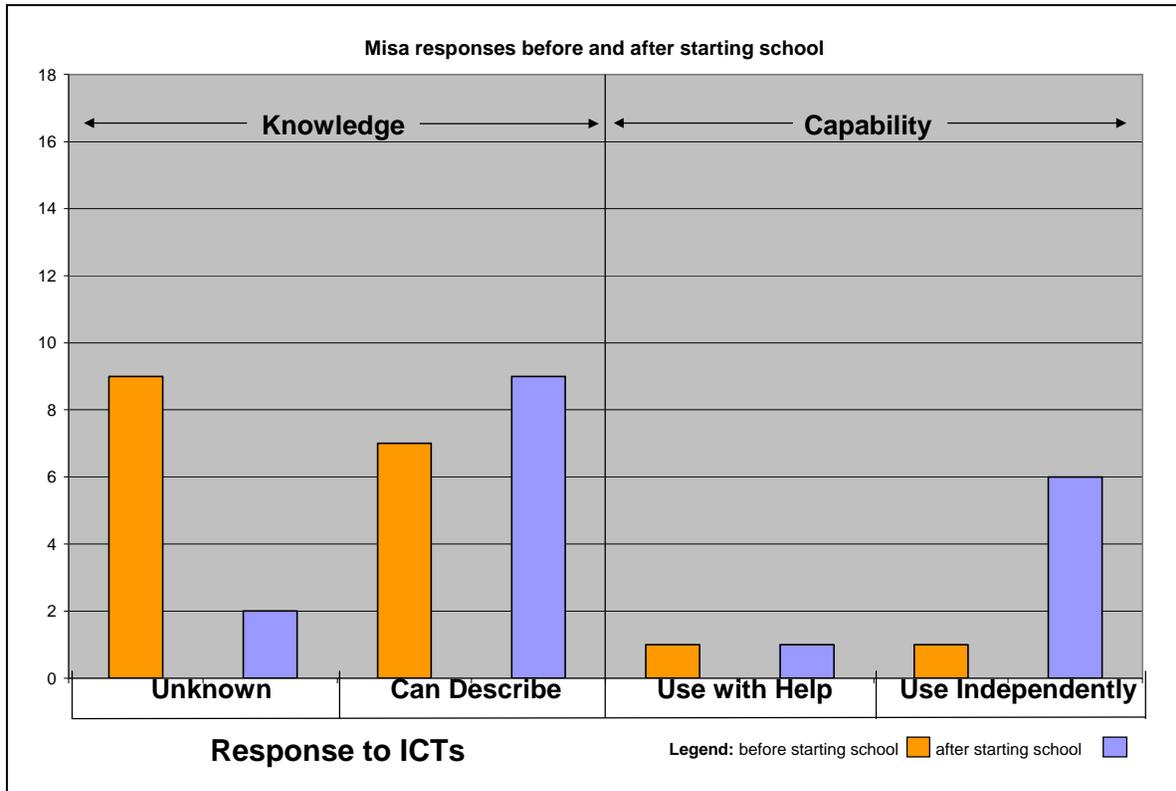
Janet described herself as an enthusiastic user of ICT. She appears to take every opportunity possible to integrate ICT into the life of her classroom. She takes new equipment home (if possible) to become familiar with it before considering ways to use it in her classroom. She also allows children a chance to 'play' with new equipment before it is used in the classroom programme. She is actively involved in planning and implementing professional development for other staff and provides models of planning that staff can use or adapt if they wish. Janet's planning bears out her claim that she makes notes about students or lessons directly into her laptop while teaching. As she said herself *"ICT is like another form of pencil and paper in my classroom"*.

Summary

Overall this was a classroom where a wide range of ICTs were used in exploratory ways but with clear purposes in mind. In my observations of Jane I found she used ICT in the way that she described in the interview and is innovative and creative in both incorporating new ICTs and in inducting children into using ICTs. The children were using systems which were in place in the classroom for teaching and learning, and resolving problems they had with ICTs. Both case children in the class had in quite a short space of time increased both their knowledge of and capability in use of ICTs. In the case of Mike this was a particularly marked shift, as his english was very limited, and his kindergarten teacher had reported that he had little interest in using either the computer or camera.

Case Two

The second case is also at School A and comprises an experienced teacher who is in the syndicate led by the senior teacher in case 1 and two children, both male, from her class.

School

School A is situated in south Auckland. It is a very large multicultural school (746 students) with 7 new entrant/year 1 classes. This school does not have a reception class. Children start directly into the new entrant/y1 class. As a class fills up with new entrants, the next one starts. There are a large number of children for whom English is not their first language at this school. The school is part of an ICTPD cluster and has a PC based network.

Children

William

William lives at home with his Mum, Dad and 2 older siblings. He was born in New Zealand, his parents are Fijian and Tongan.

William had not been to pre-school and was observed and interviewed on his first day at school. He was rather shy and spoke very quietly, but was willing to talk to me. His English was somewhat hesitant, although he appeared to understand the questions I was asking him.

William told me that Mum and Dad both have cellphones and they are for ringing. He said that is all they are for, although he did say that his Auntie takes photos with her cellphone. When questioned further he said that his brother and sister play games on his Mum's cellphone. He does not have a computer at home and has not used one at anybody else's house. His cousin has an X-Box that he has played "Gun Games" on.

When questioned more about computer use, he said that his brother and sister used to use the computer at home, but now it is gone because it is broken.

I gave William my camera, and he had to be shown how to hold it, where to look and what to push to take photos. Once I had shown him how to review photographs a couple of times he really enjoyed taking photos of other children and then showing them the photos.

William's knowledge was affected by the fact that he did not have a great deal of access to ICT equipment at home. Never having been to pre-school meant that he had missed out on opportunities for ICT exposure in the kindergarten context.

Nigel

Nigel lives at home with his Mum, Dad, younger sister and 2 brothers. He and his siblings are NZ born. His parents are from Nuie and the Cook Islands.

Nigel is an articulate and friendly boy. He was very happy to talk to me and explained at length that his Dad is an electrician. Nigel noticed that the battery indicator on my voice recorder was indicating low, and explained to me in detail how electricity got from the dams to us, and that it is the same as the electricity in the battery. He was constantly busy at Kindergarten and always with the same small group of boys. I noticed him including a lone boy in the group on several occasions.

Nigel told me that at home there were cellphones, a computer, a playstation, a telephone that is joined up to the electricity wires (landline).

Nigel told me that the computer at home is used for going on the Internet. He described the Internet as something that lets you see some things, like toys and dogs. He said that he also played games on the computer. He said that he could turn the computer on, but when I asked him what happens when you turn the computer on? He said that he was tricking, that he could turn it off, but that he got mummy to turn it on.

Nigel has a cellphone that he uses as a toy because was his older brothers and it is now broken. His parents have a cellphone each, which they use for ringing up and texting. Later in the interview he told me that his brother's cellphone takes photos too, but that it is different to the camera that Mum and Dad use. Nigel sometimes plays games on either of his parent's cellphones. He assured me that cellphones need electricity to work, too.

Nigel showed little interest in answering questions about digital cameras until I got mine out. When I asked him what it was called, he couldn't tell me, but he did tell me that when pictures are taken with it, "*they disappears [sic] then someone comes and says, "Can I have a look? . . . then you just go online and get the Internet and look at the photos*". It seems that although he could not name the digital camera, he has been involved in taking photos and has seen them being downloaded. When I gave him the camera, he knew how to use it, and found the shutter button himself. He took some care when taking photos, and asked me to review or show them after he had taken several.

Teacher

Bella is in the 30-39 age bracket and has been teaching for seven years. This is her first new entrant class. Bella's most recent teaching experience has been overseas, where she used interactive whiteboards and software in her programme with middle and senior classes. She has not previously taught new entrant children.

Beliefs
In the teacher survey Bella described herself as 'very' confident using ICTs in the classroom. She does not use any of her own ICT equipment in the classroom, and does not believe that she has enough ICT equipment available in her room. She responded 'neither agree or disagree' to the statements 'Appropriate software and games are not available in my school' and 'I have not been given the training I need to use ICTs in the classroom', suggesting that for new entrant children she may be uncertain about what software is required, and what professional development she may require in order to use ICTs in her classroom. The metaphor that Bella identified with was 'I am like a gardener tending plants, I nurture and provide what the plant needs in order to grow'.

At the time of the initial interview, Bella's class had not started, and she was feeling a little uncertain about how she would be using ICT with new entrant children. Teaching this age group was new to her and she felt that initially she would not be doing a lot with ICT, but that getting routines up and running would be her first concern. She felt that as she became more used to this level that she would start to use the digital camera and reading software. She did not envisage using her own camera, but would borrow the school one if and when she needed it.

Bella believed that ICTs were a vital part of a classroom programme and used a range of ICTs successfully with older children, but was rather perplexed as how best to use ICT with new entrants without the classroom descending into chaos.

She expected that children's prior knowledge about ICTs would vary a great deal from one child to the next.

Some will know digital cameras, they'll know all sorts of different things, mobile phones etc, and some will have computers in their homes, others won't have been near them, so I'm expecting a huge range.

She said that she would be relying on the teacher in the ICT suite to teach the children to log on and off and for skills teaching, and that she would try and go to the suite with the children to learn from the teacher there.

She did not intend to formally find out what prior knowledge the children had about ICTs when they started school, but would

put them on the computer, see how they go, what they can do. Find out whether they have a computer at home, that kind of thing.

In instances where Bella finds a child who has very limited knowledge she intends to buddy them up with a child who knows more. Bella envisaged using ICT for Maths and Reading, and then developing digital camera use once children are settled in school.

Practice
This class had been running for six weeks when I undertook observations and was almost full. There were 16 children on my first visit. Some of the children had been moved from another new entrant/year 1 class that was over-full into Bella's class and some had just started school.

There were timetables for maths and reading displayed. There was very little children's work on display, possibly because the class was so new. The classroom was sparse with minimal furniture and equipment. The teacher tightly controlled the programme and activities. Bella commented that she was a little unsure of herself and did not want things to get out of control.

Each of the new entrant classes has 1 networked and 1 stand-alone PC. The school has an ICT suite with a dedicated ICT teacher. The teacher in the ICT suite teaches the children to logon and off, open and close files, use particular pieces of software such as Galaxy Reading or Daisy Maths, or ICT equipment which is to be used in the term's topic study. Children can use the suite at lunchtimes on scheduled days. Digital and video cameras are available to teachers on a booking system. There is a CD player in the classroom. Individual teachers can book the ICT suite if they want to use it for direct instruction or in a situation where all the children need to be using computers at once. Bella has not yet felt the need to book the suite.

Bella commented that "*children often quit programmes by mistake and can't get back into them*". This affects ICT use in her classroom.

I observed children using reading games and Kidpix™. in Bella's class as part of a highly regulated reading and maths 'task board' system where, as each group worked with the teacher, the others were engaged in various follow-up and reading/writing/phonics related activities. Some children seemed able to navigate their way into and out of Kidpix™. and the Galaxy™. Software, but others were unable to do so. The ones who experienced difficulty did not always seem to know who to ask for help and children waited for Bella to notice that they needed help. I did not see evidence of the children using digital cameras.

Bella's class was a lively one. Several children had challenging behaviours that could disrupt others. The children in Bella's class operated within a highly structured programme that Bella explained in detail. The teacher mandated and regulated all the activities in the classroom. Children knew what to expect and routines were adhered to.

The morning was taken up with oral language, fitness, phonics and writing activities, then reading and maths between playtime and lunchtime. Reading games and Kidpix were being used as part of a reading activities 'task board', however if the children encountered problems with the computers or software which they were unable to solve they must wait for the teacher to come and resolve it. There appeared to be no other strategies in place for children to solve ICT problems.

The afternoons were varied, depending on the day of the week. Sport, assembly, the arts, and topic were all done in the afternoons, and two afternoons a week the whole junior school participated in a combined outdoors 'developmental play' session, which gave the children opportunities to join with children from other classes in structured and adult supervised 'play'. This was also an opportunity to invite parents to come and participate in school activities. The session included such activities as sandpit play, cardboard construction, playdough, various kinds of plastic (Lego-type) construction, painting, water play, reading, dress-ups, and family corner. These are just a few of the activities available.

Teachers were expected to plan using the computer, Bella has made her own template using Microsoft Word™ and tables. Unit plans were done collectively and posted on the server. Any problems with hardware or software were referred to the teacher in the ICT suite. Children's assessment data particularly reading and maths levels were entered into a school-wide Student Management System (SMS).

Bella has been receiving professional development from a member of the Team Solutions ICT team. This opportunity became available after another teacher left, and Bella had expressed some diffidence about ICT use at the new entrant level.

Classroom Layout

Figure 4: The layout in Bella's class when observation took place.

Bella's classroom layout meant that from many parts of the room her view of the computers is obscured by the teaching station. When working with groups at the tables she had difficulty seeing what the children were doing at the computer. If she was working on the mat, the teaching station was between her and the computers.

Changes in children's knowledge

William

Figure 5: The extent of William's knowledge of and capability with ICT prior to and after starting school.
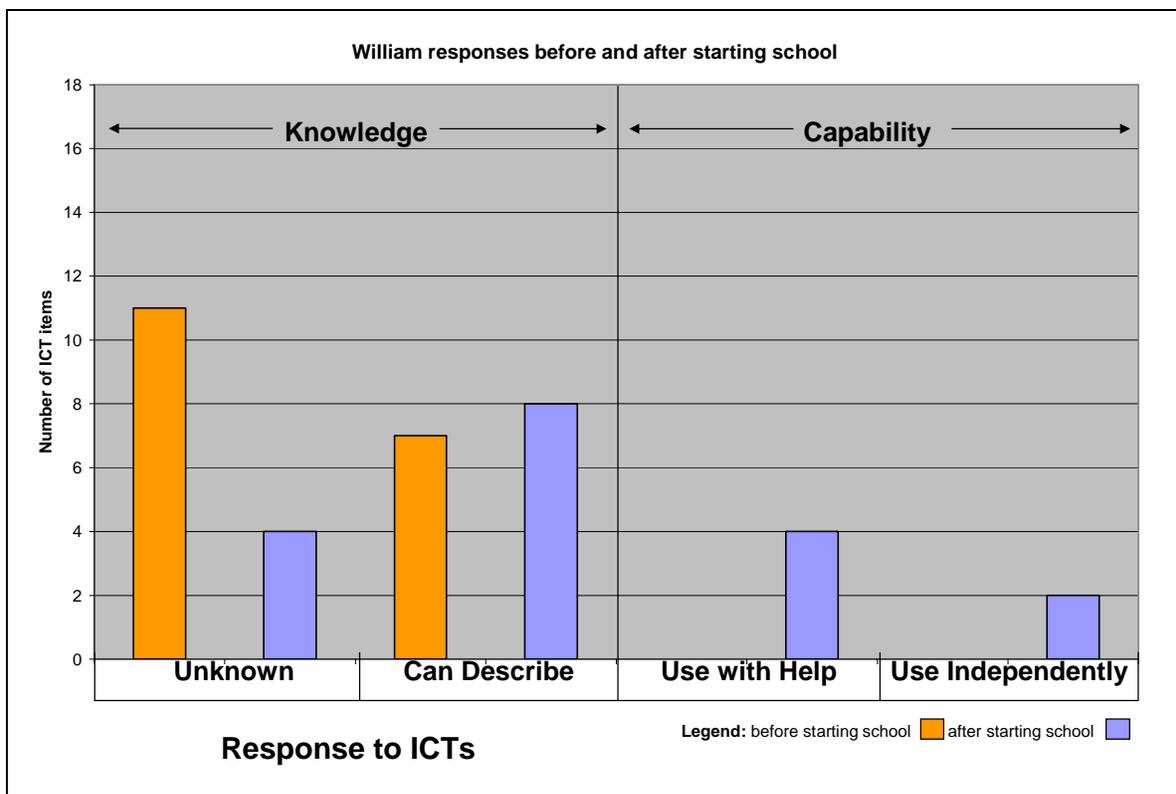
The shifts that William showed in his ICT knowledge and independence in figure 5 all relate directly to the instruction that he has received at school. His family do not have a computer at home and he has only had access to computers at school. After six weeks at school he is able logon independently and use Kidpix ™. The reading and maths software which he had been introduced to he could use independently once someone else had located them and started them up for him. The items that he could not describe after six weeks at school were things which were not used in his classroom. (Email, photocopier, internet and cellphone texting).

Nigel

Figure 6: The extent of Nigel's knowledge of and capability with ICT prior to and after starting school.
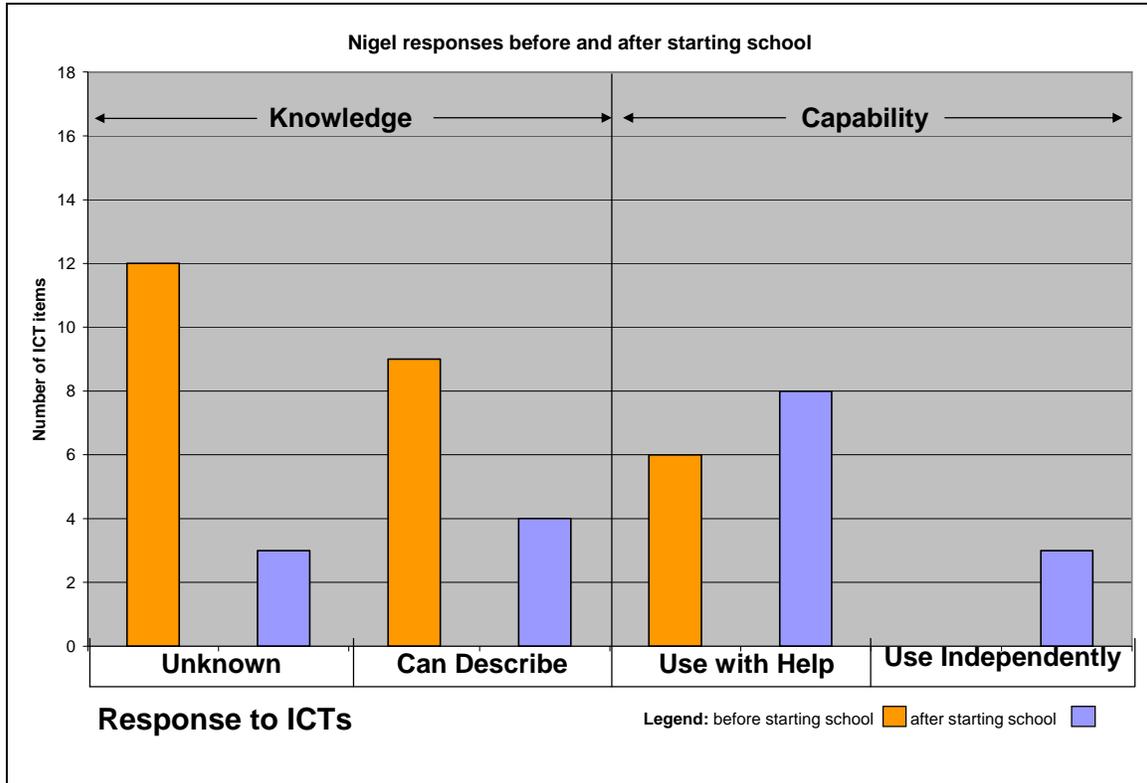
The changes that Nigel demonstrated after six weeks at school (figure 6) were primarily in being able to use with help the digital camera and make a PowerPoint ™ story with help. He was also able to logon, find and use drawing software, and find reading and games software independently. Without being asked he helped other children in his group when they experienced difficulty, and when he became bored with the reading games, switched over to Kidpix™ and spent the rest of the time playing with that. He appeared rather disinterested in the reading games, perhaps because he was used to more visually 'active' games at home.

Summary

When Bella first described ICT use in her new entrant classroom, she talked about the way she would like to see it happening. However, as the class had not started and this was a new teaching level for her she was uncertain exactly how she would manage the programme. Despite the fact that she described herself as a very confident user of ICT in the survey, when the class did start she felt that she lacked some of the skills and knowledge needed and took the opportunity for further professional development. When I observed in her classroom the computer was being used as an activity in maths and reading task board rotations. The digital camera had not been used at that point and there were no systems for children teaching or helping each other. Bella did not know which children had computers at home or what experiences they had at pre-school, and felt at that point the information would be superfluous as ICT was not a focus six weeks after the class had been established. She was in fact using ICT as she expected she would at this point.

Nigel and William were using ICTs in ways that showed their different experiences before starting school. William had learned to log on (at school) and could use the reading games when someone located them for him. He had no strategies for solving problems he encountered other than waiting for the teacher, Nigel on the other hand could log on, locate the software he was instructed to use, change from one programme to another and solve problems for himself and (voluntarily) for other children.

Case Three

The third case comprises an experienced teacher and one female child from her class. The class is at School B.

School

School B in this study is situated in West Auckland. This class comprises children from a number of different ethnicities including Maori, Pacific Island, Japanese, and Pakeha. This school does not have a reception class. Children start directly into the new entrant/y1 class. As a class fills up with new entrants, the next one starts.

The school has a PC based network. They have not yet been part of an ICTPD cluster. In 2006 a classroom was set up with 20 PCs, an interactive whiteboard and specialist teacher so that children could have access to instruction in ICT skills and thinking skills during teacher's release time (CRT). According to the teacher in the ICT room, this has led to an abdication of responsibility by some teachers in the school to incorporate ICT into classroom programmes.

Child

Arianna

Arianna is the New Zealand-born, only-child of Japanese parents.
She has been attending a community kindergarten, although her mother asked me to visit and interview her at home, not at kindergarten.

Arianna was very excited at the prospect of her upcoming birthday, and was very focused on her favourite 'My Little Pony' toy, video and computer game. She was very chatty when talking about topics of her choosing such as her favourite TV shows and computer games, 'Miffy', and 'My Little Pony.' However she tended to be less chatty when answering my questions.

Arianna told me that she could play games on the computer, and that she could get mail or what she called letters on the computer. She did not call it email. Her mother told me that she could turn the computer on and navigate around the desktop and find various icons for her favourite games.

She did not know what an X-Box or Playstation was and Arianna's mother confirmed that she had probably never seen one before.

She told me about her father's mobile phone, describing how he presses buttons and talks to someone. Arianna has talked to her grandma on the mobile phone.

Arianna used my digital camera, and was clearly familiar with cameras. She asked which button to push to take photos, then after taking a lot of photos asked which button to push to review the photos she had taken. She was displeased with some of the photos and asked how to 'rubbish' them. However she said that you couldn't see photos that were in that camera in the computer, only in the camera.

She did not know (or understand my question) about photocopiers, and her mother was uncertain as to whether she would know what one was.

This interview with Arianna was rather limited by the setting. Interviewing children in a pre-school setting where I have been able to familiarise myself with them and the surroundings gives me more opportunity to observe them with the equipment than I had on this occasion. Although Arianna's parents speak Japanese with her at home, and her English was very good, it is possible that she had some difficulty understanding all my questions. Her mother preferred to 'fill in the gaps' rather than to have Arianna show me except in the case of my digital camera. I suspect that in a different setting, Arianna would have shown me that she knew more than I was able to elicit in this interview.

Teacher

Ann has been teaching for more than thirty years, with the last 3 years in the new entrant area. She is a very experienced teacher whose classroom is purposeful and busy. She is in the 50-59 age group.

Beliefs

In the teachers survey Ann described herself as 'somewhat' confident using ICTs in the classroom. She agreed with the statement 'there is not enough time in the day to use ICTs', and responded neutrally (neither agree nor disagree) to the statement 'My main job is literacy and numeracy, ICT distracts me from this'. Although she believes that she has adequate equipment and software available, she says the fact that only one PC is connected to the school intranet is a barrier to ICT use in her classroom. Ann identified with five metaphors:

'Learning is a journey of discovery'
'Teaching and learning are journeys'
'I am like a gardener tending plants-I nurture and provide what the plant needs in order to grow'
'I am guiding them through the forest like a tour guide pointing out items of importance along the way',
'Teaching is like weaving together all the strands to make a cloth'

Ann believes that her school is very supportive of her beliefs about teaching new entrant children.

When interviewed Ann described herself as being not particularly confident in using ICTs in her classroom programme. She relies on the teacher in the ICT room to teach the children how to log on and off, open and close files and to navigate their way around, and commented,

> *As far as the kids in the classroom [goes] it is sort of more or less free range – I let them use the computer – we've got a little timetable we work by. But two at a time because we have only got the one computer that is linked up to the Internet and we have a freestanding one so they have turns. With my reading I often use [the networked PC] because we have Galaxy™. Software. Apart from that I leave it up to the teacher [in the ICT suite].*

Ann commented that although the children learn about the Smartboard™. with the ICT teacher she doesn't have one in the classroom but can book time in the ICT room if she wants to use it, *"but I haven't done the training [for the Smartboard]".*

She likes to use the digital camera in her classroom but because the school has only three cameras, she brings her own from home. *" [The children] love taking photos of each other".*

The school does not require that Ann use the computer for her planning. She currently prints the blank planning templates out, fills them in by hand and then types the plan into the computer.

> *It takes me an age, a lot longer than it used to when I did it the old way. I want to learn how to do it that way. I know I will get faster.*

Practice

The timetable for the day was displayed on a large wall mounted whiteboard beside a list of duties with children's names against them. A wall display titled "What is Learning" covered a large part of the wall with digital photos and text showing children engaged in learning: reading, writing, maths, playing in the

sandpit, playing with blocks and dressing up. There were timetables for group work in maths and reading prominently displayed. In the cloakbay outside the classroom there was a social studies display of children's work and photographs about diversity.

There were 2 PCs in the classroom, one networked the other not. The school has an ICT room with a full time teacher. Children go there during Ann's classroom release time.

Ann's classroom layout meant that when she was working on the mat with children she had her back to the group working at the computer who were completely obscured from her view, however when she was moving around the room she had a clear view.

Classroom Layout

Figure 7: The layout in Ann's class when observation took place.
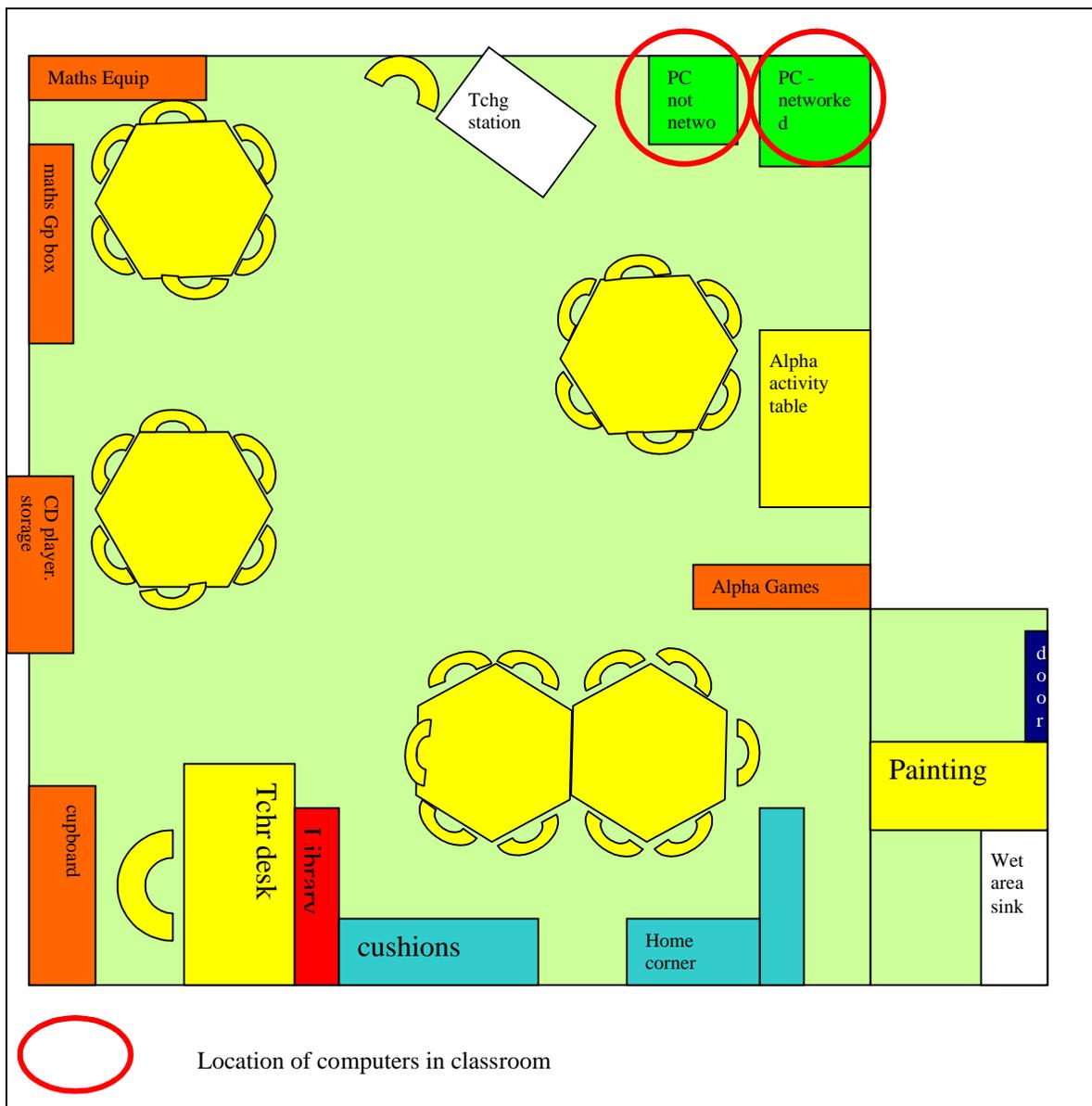
During the previous term Ann and the children had focussed on a unit on diversity. Ann explained how the digital camera was used in that unit,

> *the kids took photos of each other and put them all over maps of the world, and put their little caption up.*

and for the unit assessment;

> *the kids brought little displays along to discuss their cultures. We took photos (with the digital camera) of whatever they brought then with their display, which has gone on their assessment.*

Ann believes that some children start school with a great deal of ICT knowledge. There are children who teach her new things about the computer, and children who can navigate their way in and out of programmes and do some problem solving when things go wrong. Ann finds out what ICT knowledge the children have by observing them, although she recognises that this can lead to some misunderstanding,

> *one little girl, she has a lot of computers at home, she came in and said she wanted to use the computer and I just took it for granted that she knew what to do, because everyone else [in her family] can. When she sat down she looked at me and I realised that she didn't really know what to do.*

Ann's programme is strongly focused on teaching and reinforcing appropriate social skills, literacy and numeracy. Children in her class clearly have a warm and loving relationship with her. Ann both demonstrated and expected respectful behaviour. If a child were behaving inappropriately Ann would quietly give him/her choices about what action they could take. Although I heard her discuss with a child possible consequences of continued poor behaviour, I did not observe her having to take any further action.

Children in Ann's class know what is expected of them. Children are questioned about purpose rather than told what they should be doing when they are off-task. One child with limited English who clearly loved music and continually turned the volume on the computer up so that it was impacting on the group reading on the mat was asked, *"How are you going to turn that down?"* He complied, but continued to turn the volume up very high.

Ann uses the networked computer in the classroom as an activity during reading. The reading session is run on a 'task board' system where, as each group works with the teacher, the others are engaged in various follow-up and reading or writing or phonics related activities. The children are certainly familiar and comfortable with this way of working, and are generally purposeful. During reading time Ann's attention is almost exclusively focussed on the group she is reading with on the mat. The other groups are expected to quietly do the activity timetabled for them, and attempt to resolve difficulties by asking another child or parent helper (if present) before interrupting the teacher. Ann explains at the start of the session what each group is expected to do and checks for understanding. At this point she appoints a 'leader' for the group when they are using the computer. The 'leader' is a child in the group who is able to navigate in and out of the software that the children are using, and to remind the group about taking turns.

I observed several groups using the Galaxy Kids™. reading software as part of the reading task board.

There are up to 6 children in each group.

- First group: Each child had a copy of the book, with one child sitting in front of the computer controlling the mouse. Apart from the child with the mouse, the software was used rather like a listening post with children following the story in their books. The child sitting at the computer was reading the text off the screen. During this session, 4 of the children lost interest in the story before it was half way through. One child moved away to the non-networked computer and began switching it on and off. He played on the keyboard with the computer switched off. A parent helper moved in and redirected children back to task as they became unruly.

- Second group: One child took control of the computer and bypassed the prescribed book activity and went directly to the 'game' follow-up. All the children in the group were reading from the screen as they played the game. This group operated very democratically, taking turns and helping each other when they got stuck. One child accidentally closed the programme down and was unable to get back into the software. The group 'leader' (Arianna) fixed her problem and handed control back. Two boys from another group had moved onto the non-networked computer and were fighting over it – the teacher redirected them, but they remained on the computer and quietly played maths games.

- The next group included a child who had been promised a turn on the computer if he finished his other reading tasks. He had his time on the non-networked PC. This group took turns on the networked PC, although they worked individually. One child appeared to be unable to find the reading software and ended up attempting to play a maths game without success.

In the computer suite the children learn how to log on and open, close and save files. Ann explained,

> *every child has their own sign-on name. Because half of them can't write their own names, and their sign-on and the keyboard are in capitals, we've got to go through that little drama to get them to sign-on.*

They have also been working in the suite with older children who have been helping them to publish stories using word-processing software.

If a teacher experiences problems with ICT they refer to the teacher in the ICT room to fix it.

Ann believes that she needs more professional development in order to use ICT regularly and effectively in her programme, but by taking steps herself with her planning, she is learning more about how to use the computer. She says that when the school buys more digital cameras access will be easier and she may not need to bring her own camera to school so much.

Professional development in ICT is available if a teacher has identified ICT or e-learning as a goal in their appraisal cycle. The teacher in the ICT suite also gives teachers instruction in using ICTs if requested.

Changes in child's knowledge

Arianna

I observed Arianna in her classroom six weeks after she started school. While she is a quiet student, she is clearly considered to be competent with the computer by both her teacher who made her the group 'leader' on the computer at reading time and other students who looked to her to solve problems they were experiencing while using the computer. Although the items she could use independently remained the same, (figure 8) she was able to describe how to use photos from the digital camera and that the computer can be used for writing stories, which she does in the computer room with an older child to help her.

Figure 8: The extent of Arianna's knowledge of and capability with ICT prior to and after starting school.

Arianna responses before and after starting school
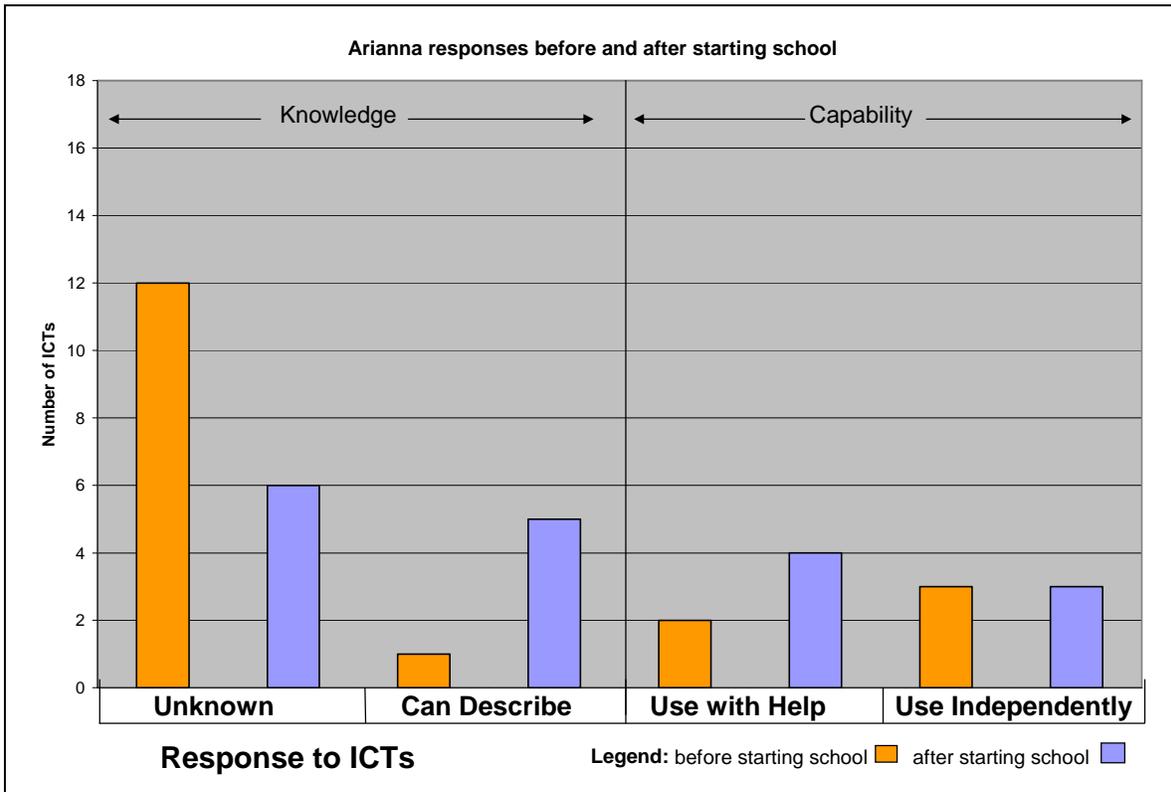
Summary

Ann was using ICT in the way she described when interviewed, although there was less evidence of children actually using the digital camera than was suggested in the interview with her. Children could use the computers and games on request if it did not interfere with the class programme. Although the children were told which software to use in the reading session, Ann was either unaware or unconcerned when they were using other software, as long as they were working quietly. She knew which children had the skills to solve problems and appointed particular children to be 'leaders' when groups were working independently on the computer. The reading software was being used in a very similar way to an audio 'listening post' in that all the children in a group sat with their books and read along with the computer, with the group leader having control of the mouse. Time on the computer was also used as a motivator and reward for children who struggled to complete other work.

Arianna was one of the children that Ann identified as a 'leader' at reading time. She was able to navigate her way in and out of software programmes and had the skills to redirect some children when they were off task. Children from another group also sought her help when they had a problem. Shifts in her responses after 6 weeks at school were mainly in being able to describe more ICTs and she could use 2 more items with help than prior to starting. She was already using the computer at home independently before starting school and I noticed no change in her level of indepedence,

Case Four

The fourth case comprises an Australian trained beginning teacher in her first teaching job and two children, one male and one female from her class. The class is located in School C.

School

This Auckland inner city school has at least one networked PC in each junior classroom. The number of computers in the classroom is determined by teacher preference. All teachers have Tela laptops. The school does not have a computer suite but does have a set of laptops that can be booked by teachers for use in their classrooms. All teachers share digital cameras between two classes. There are two video cameras and four data projectors available for teachers to use in the classrooms. The school is in the process of evaluating and buying an interactive whiteboard, although how this is to be used is yet to be determined. This school does not have a reception class. Children start directly into the new entrant/y1 class. As a class fills up with new entrants, the next one starts.

Children

Mary

Mary lives with her mother and older brother and visits her father regularly. She is of Maori and Pakeha descent. Her whanau are keen for her to transition to the school's Maori Bi-lingual unit at the end of the year.

Mary has a couple of particular friends at Kindergarten and plays mostly with them. She prefers active 'outdoor' play, or constructing with blocks, although on one occasion I did see her drawing with Kidpix™ on the kindergarten laptop. She was not particularly interested in talking to me, and the interview took place over three kindergarten sessions after spending time over a two week period at kindergarten sessions familiarising myself with how the Kindergarten operates and getting to know her a little. She typically answered a couple of questions and then 'dismissed' me.

Mary said that her family had a computer at home that belonged to her brother. She said that she could "*look at ABCs*" on that computer. The computer at her father's is "*just for looking at the internet",* and was not for playing games. She told me the Internet is for *"looking up stuff"*, but was unable to tell me more than that.

She told me that some cellphones have cameras on them, and that you can ring people on them. She did not think they could be used for anything else. She distinguished between the cellphone and the telephone (landline), and said that she rang her father on the telephone 'lots'. *"Because I love him."* She teased me about knowing her father's telephone number, but when she was pressed she did not know it, and confessed to 'kidding' me.

Mary described how people at home took photos of her with the camera, and then pushed the button so that you could see the photos in the camera.

Mary did not know what downloading meant or how to get the photos out of the digital camera. She did not seem to be able to describe how photos could be seen on the computer, although I did see her watching the kindergarten teacher download photos.

Mary took several photographs with my camera, she asked which buttons to push, and then after she had taken the photos asked which buttons to see the photos. She soon became bored with this and gave the camera back.

Mary was a little difficult to engage in the interviews. The promised 'bribe' of being able to take photos with my camera had a small effect on her attention, but in general she preferred doing her own thing with her friends. She appeared to be generally disinterested in using computers, the photocopier or camera.

Stuart

Stuart is the younger of 2 boys in a family of Indian descent; both parents are New Zealand born, as are Stuart and his brother.

I interviewed Stuart twice at Kindergarten, after spending time over a 2 week period at kindergarten sessions familiarising myself with how the Kindergarten operates and getting to know him a little. He played mostly with a small group of friends who shared his interests. Stuart has a lively interest in the world around him and engaged with me in conversation about a wide range of topics, but mostly about cricket, which is his passion. For every interview he had with me, I had to 'pay him back' by playing a couple of overs of cricket. He soon decided that I was a particularly bad cricket player, and lost interest in playing with me. He has a lively sense of humour and loved 'tricking'. Refusing to play cricket with me because I was 'useless' was part of his 'tricking'.

He is a particularly able boy socially and appeared at times to be impatient with the more immature children in the session, although generally he tended to avoid them. He was particularly happy if he could talk another child into playing cricket.

Stuart was very eager to tell me about his computer at home. He described how he could turn it on and off independently,

> *Ummm this thing goes (sings Windows™ startup sounds) and then it comes onto the names. One's snotty – that's me. The other one is woofy which is my brother; George is Dad and Diana's, Mum. But Mum's name should be Gidget and Dad's should be Doofus.*

The computer at home is set up with individual logons for each family member, allowing varying degrees of access. Stuart told me whose logon he had to use to access particular games and the Internet. His was the most restrictive Logon, which he tended not to use. He described for me how the Internet could be used to find out 'stuff' about computer games, characters, "*or anything you want to know*". He went to some detail to explain how to get the Internet,

> *You have to plug this long thing into the back of the computer and then the other end in the wall – by Dad's bed, you know!*

He also described emails and could differentiate between email and the ordinary mail that the postman delivers. He said that he could send emails if someone helped him with the words. He sends and receives emails from his grandparents.

Stuart told me that he used his mother's cellphone for playing games, ringing up if mum told him the numbers to push, and that he could send texts when mum told him which letters to push, because, "*I can't spell much yet – but I can spell my name and I can spell cold*". He said that cellphones and telephones are different – although he did not say what the difference was.

Although Stuart said that the camera at home was broken, and that their cellphones didn't take photos, he could describe that digital cameras could be joined to the computer to download photos. I observed he and the kindergarten teacher downloading some photos that he had taken and put into a learning story, then together making a slideshow. Stuart told the teacher which photos he wanted to use, and dictated the text.

Stuart knows that Playstations and X-Boxes are for playing games on, although he does not have either at home. He has used them at his cousin's house.

He has access to a photocopier at home and could describe what a photocopier does.

He knows that Kidpix™ is for drawing on the computer, although he seemed to have little interest in using it.

Teacher

Fay is an enthusiastic Australian trained beginning teacher in the 20-29 age group. This is her first teaching position.

Beliefs

Fay's responses in the teachers survey indicate that she feels 'somewhat' confident about using ICTs in the classroom. She does not use her own ICT resources in the classroom. She agreed with the statements: 'appropriate software and games are not available in my school' and 'I have not been given the training I need to use ICTs in the classroom'. She added the comment that time affects her use of ICT in the classroom. She believes that systems in her school, and her colleagues, both support her in using ICTs in her classroom. The metaphor which she identified with was 'I provide the tools, they (the students) make the learning happen'.

Fay had been offered 2 PCs for her classroom but had opted to have one because,

> *I think with the new entrants, I find there is a bit of fear on my part . . . that they (the children) are going to be pushy and not know what they are doing.*

She feels very unprepared by her training to use ICTs in her classroom programme,

> *they basically ask you to read a chapter in a book, and I guess that it is difficult for them to make assumptions about what resources will be available to you until you are actually out there, they don't give you this really concrete way to utilise them.*

She said she had not thought about ICTs in her own programme, and did not think that she would be finding out what children know about ICTs, although she knows that many of the children will have access to ICTs at home and may know quite a lot about them.

Fay felt a little unsure about how to begin using ICT in her classroom. She envisaged that the digital camera would be useful in her programme for recording events and capturing a "child's view" of events and items.

She believed that limited literacy skills would dictate how the children can access ICTs. The listening post would be part of her reading programme. Fay saw information literacy for researching and library skills as very important. She believed that the children need to understand that information can be accessed from the Internet. She also felt that "*you don't credit kids with the fact that they are so much more technologically minded than kids were 10 years ago.*"

Fay believes that she needs professional development in the area of ICT and e-learning, but started teaching at this school after the initial Appraisal Interviews so does not have an appraisal or professional development goal.

Practice

Fay's new entrant class, which had started 6 weeks before I observed, was not yet full, when I visited there were 16 children in the class. It is located in a small classroom adjacent to the hall and covered assembly area, consequently it can be a very noisy environment.

The programme is very much focussed on literacy, numeracy and establishing routines. She was taking the lead from her tutor teacher, using reading and maths software as part of an activity rotation.

The walls of the classroom have displays of children's work, including photographs the children took around the school for the recent School Art Festival. Despite the fact that Fay had indicated that she would not be using her own ICT resources in the classroom, she had brought her own (very sophisticated) digital camera for children to use for these special photographs. The children chose their subject: either nature or structures around the school. They could take their photographs using the zoom function on the camera if they wished. There was also a wall display with individual photographs captioned, "I am . . ."

There is one networked PC in Fay's class. On my first visit to the class it was turned off, on the second visit it was turned on, with the children's photographs running as a screensaver. In addition there is a CD player and listening post.

The children in Fay's class are learning school routines and Fay is coming to terms with the varying learning needs of her students, who demonstrate a keen desire to please their teacher.

Maths and reading task board timetables were displayed and Fay explained to all the groups what was required of them while she worked with the group on the mat. I observed several children using reading software on the computer as part of the reading task board. Unfortunately the volume was down so low that they had difficulty hearing. They did not ask Fay to turn it up, but attempted to play the game with no volume.

Teachers are required to do their planning on their laptops, using either their own or school supplied planning templates. Planning must be saved to the server on Monday for the current week. When teachers encounter problems with software or equipment, they are expected to first attempt to solve the problem themselves. Generally they then ask somebody in their syndicate who knows more about the equipment.

The Assistant Principal has overall responsibility for ICT in the school and is given some release time for this responsibility. However he can be difficult to access due to the pressures involved in administering the system and maintaining his classroom teaching. Serious problems are referred to a contractor who comes into the school on a regular basis.

The school has been part of an ICTPD cluster, which ended in 2005. The Assistant Principal was primarily responsible for disseminating information from cluster meetings to the middle and senior part of the school and a teacher from the new entrant/year 1&2 area sharing information with other teachers of junior children.

In 2004/5 there was a concerted effort to begin incorporating thinking skills across the school. This has resulted in most teachers using various thinking skills in parts of their programmes. Fay is not yet using any thinking skills in her programme.

Classroom Layout

Fay had full view of the computer when she was working on the mat with the children, however it is sited very close to where she was working with other children. This may be a problem when she is working with a group at maths or reading time when the sound effects from computer activities may interfere with what is happening on the mat.

Figure 9: The layout in Fay's class when observation took place.

Teachers Desk · Tchg Station · Library · CD Player · Puzzles · Computer · Maths · Mat · Listening post · Storage Cupboard · Big books · Sink · Art Table · Shelves · Writing centre & kneeler · Sliding doors · Shows position of computer in classroom
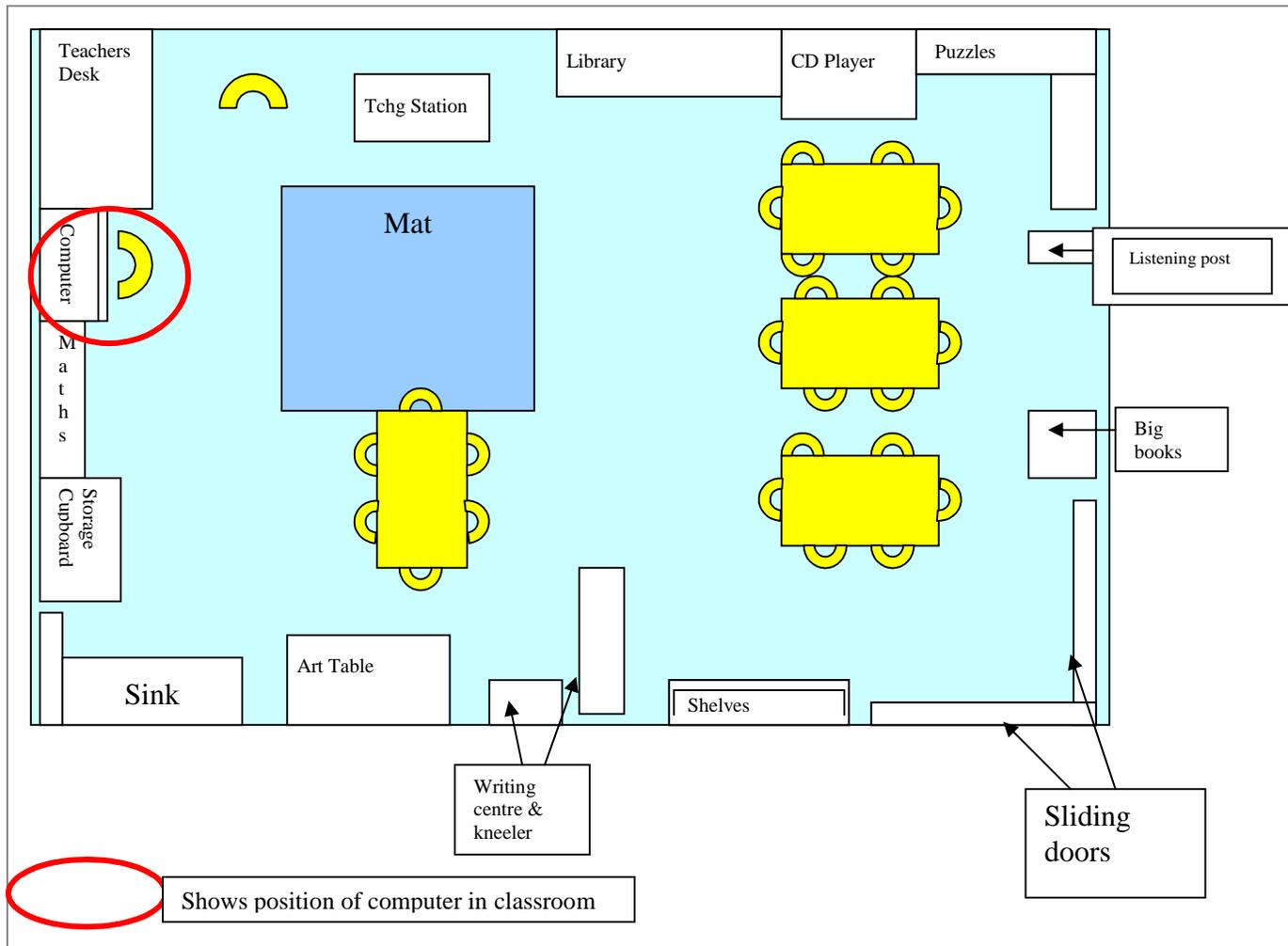
Changes in children's knowledge

Mary

Mary was not particularly interested in ICT when interviewed at Kindergarten and entered a class in which ICT was not a focus. The only change I noted in Mary's ICT competence or knowledge was that she could use the Galaxy™ reading software, although she was unable to locate or start it up (figure 10). She had also used the digital camera as part of an art unit and was able to talk about the process involved in taking photographs, although she was unaware of how the photographs could be used other than printing them out or looking at them on the computer.

Figure 10: The extent of Mary's knowledge of and capability with ICT prior to and after starting school.
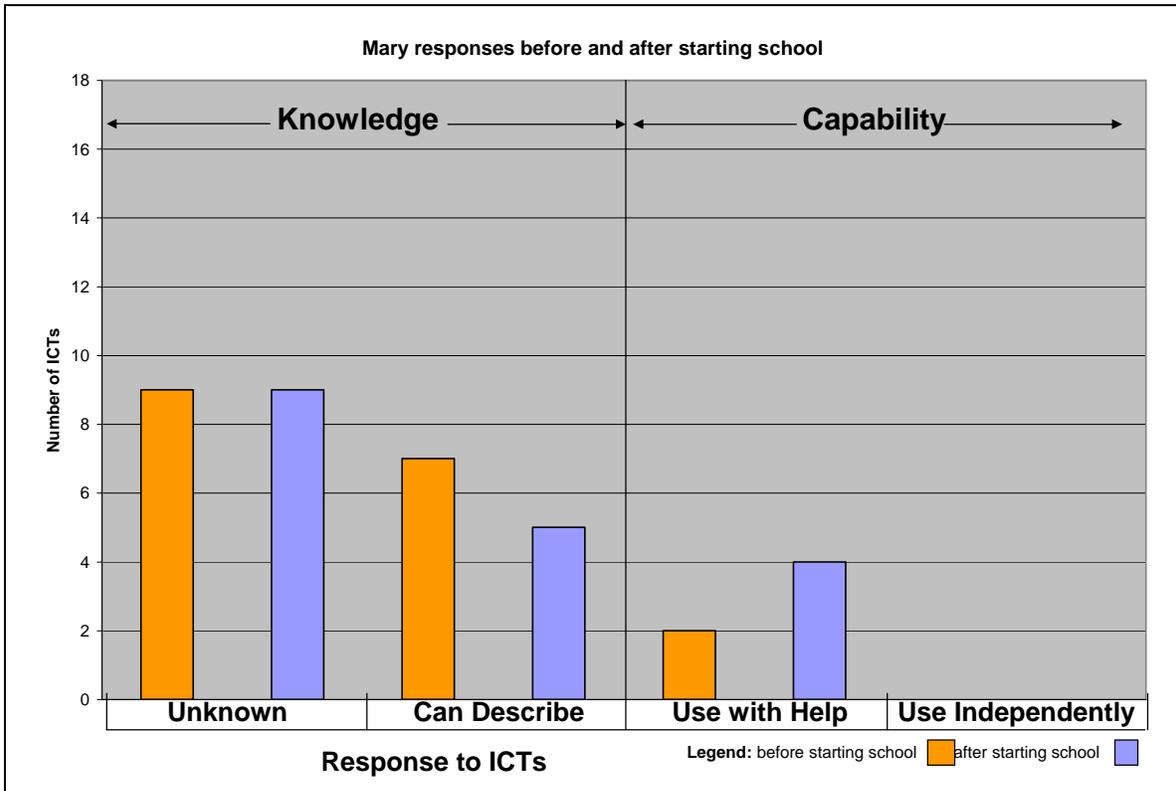
Stuart

Of all the children I interviewed, Stuart was the one who had the most experience using ICT before starting school. Although I saw him downloading photographs and making a slideshow with the teacher at Kindergarten he mostly used the computer and Internet at home with his family. I observed no change in his knowledge or understanding after six weeks at school, (figure 11) and he commented that "Fay said we will use the computer properly later on". He did not consider that using Galaxy™ software was 'proper' use. Given his experience using the computer at home and the fact that after six weeks at school his reading level was well past the emergent level of the software that was being used, this is hardly surprising.

Figure 11: The extent of Stuart's knowledge of and capability with ICT prior to and after starting school.
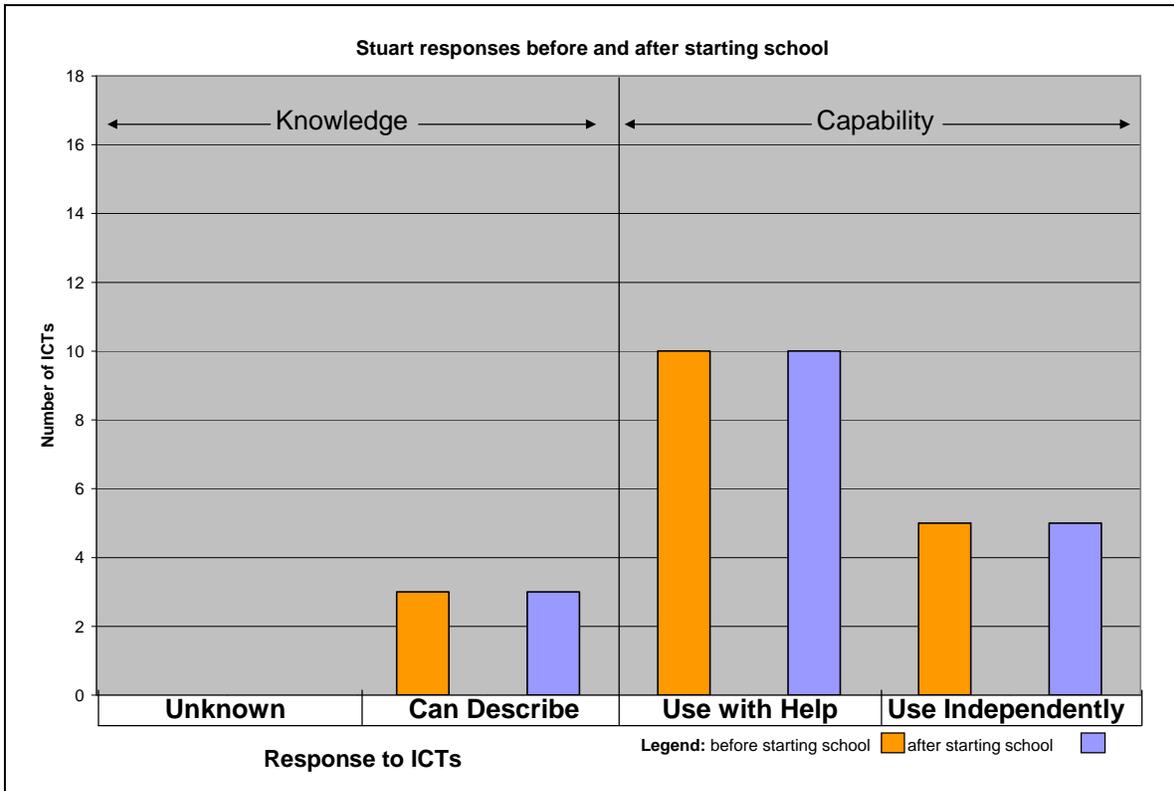
Summary

Fay's focus was on establishing classroom and timetable routines. The ICTs which were in use were those which supported her reading programme – the listening post and maths and reading software. In addition she had helped the children take close-up digital photographs for the school's Art Festival, and had photographs of the children on the classroom wall, and as a screensaver on the desktop computer. The Galaxy™ Software was being used regardless of the children's reading level, very able readers were using the same emergent level software as the children working at the emergent level. When interviewed Fay had talked in a vague way about the importance of Information Literacy and skills in retrieving information, but had not described how this might happen at the new entrant level. When I observed in her classroom the computer was being used as an activity in maths and reading task board rotations. There were no systems for children teaching or helping each other. Fay did not know which children had computers at home or what experiences they had at prior to starting school, The ICT use I observed in her classroom was consistent with what she described her tutor teacher as having encouraged her to use. Of the children, Mary showed a change in her independence with using using the digital camera and using (although unable to locate) the Galaxy™ Reading software. Stuart on the other hand was already a sophistocated user of ICT before starting school. He had shown no change in either his ICT knowledge or capability after 6 weeks at school.

ANALYSIS OF THE FOUR CASE STUDIES

What level of competence do new entrant children have in relation to use of ICTs?

This question is discussed in relation to data from the four case studies prevously described. The following four graphs are based on the individual interviews I undertook with these children. The four criteria used were: which ICTs children knew about; which ICTs children could describe; which ICTs children could use with help; and which ICTs children could use independently.

Some graphs show that an ICT item has a lower response after children start school. With the exception of two items (X-box/Playstation and Cellphone txt which are discussed later),this is due to the fact that the children's skill level has changed after starting school and they therefore appear in a different graph. For example if at the pre-school interview a child 'could describe' logging on, but in the interview after starting school, fitted the 'independent' category, the graph showing what children 'could describe' reflects only that less children fit this category, not which category they have moved to.

Figure 12. The range of ICTs children know about prior to and after starting school
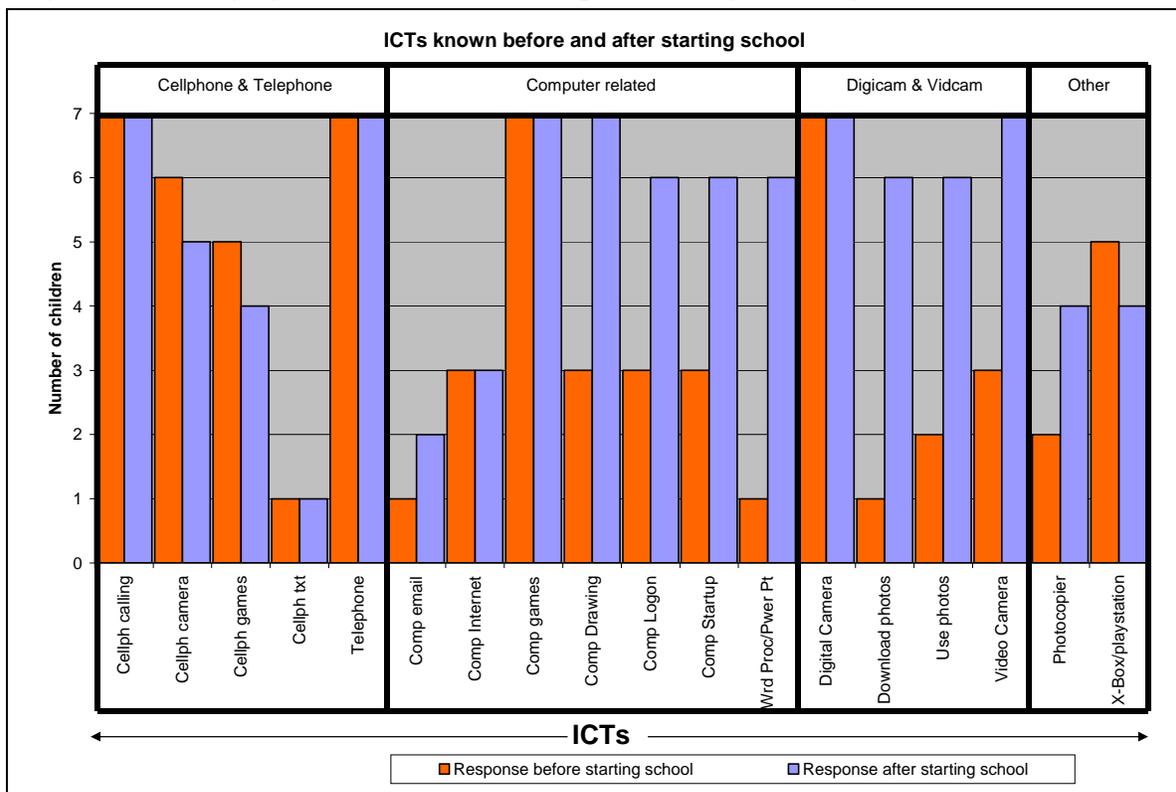
Figure 12 shows that young children were aware of quite a range of technology without necessarily being able to describe the technology. When the children were interviewed before starting school, all children knew something about the following: making calls on cellphones, computer games, digital cameras and telephones. One item, cellphone texting, had no change in children's response from the pre and post data. Five items including downloading photos, using photos, drawing and wordprocessing/powerpoint, all had four or more children moving from not knowing to knowing something about them after they had been at

school.
.
There were two items which fewer children knew about across all four graphs after six weeks at school: cellphone cameras, and xbox/playstation. None of these items are used in classroom programmes. The fact that most children were very keen to please me in the initial interviews and the difficulty with english skills evident with three of the children meant that my question may have been misunderstood, leading to a child claiming to know about something that they realised in the second interview they did not.
.

Figure 13. Compare which ICTs all children can describe before and after starting school
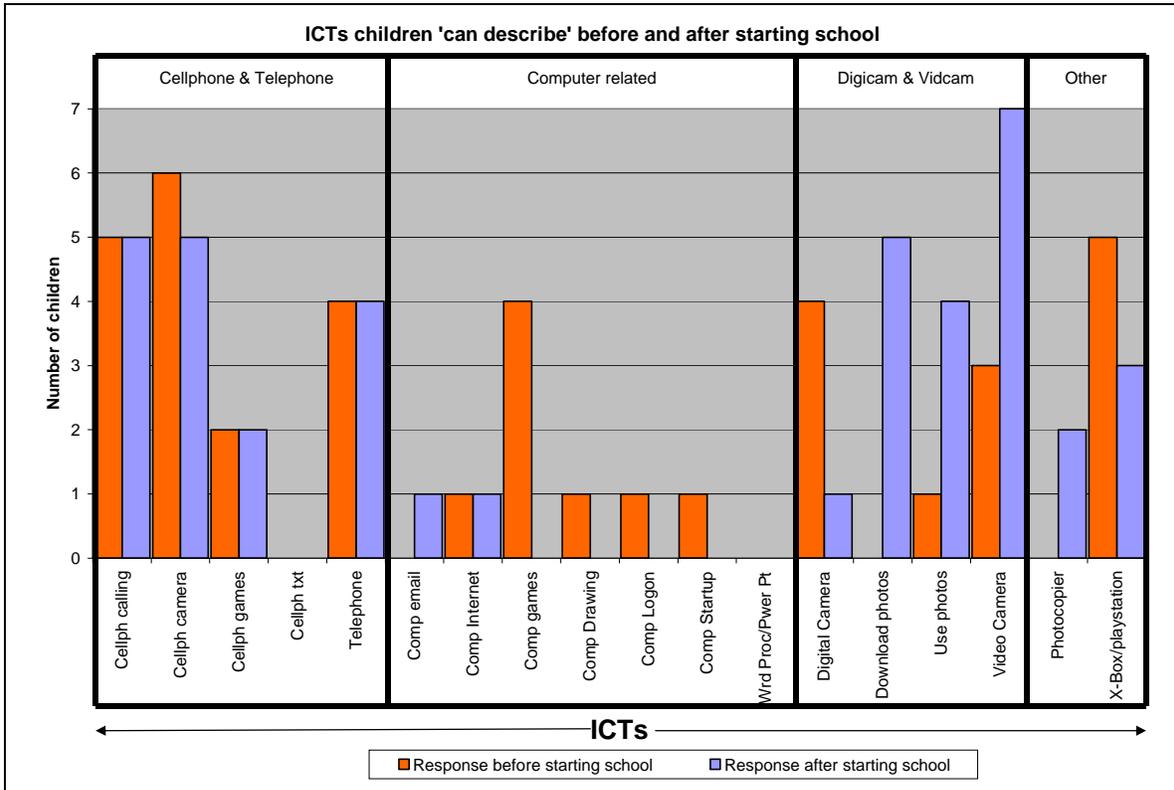
Figure 13 shows what ICTs young children are able to describe prior to starting school (in the orange bars) and compares this to what they can describe 6 weeks after starting school in the blue bars). All of the children could describe a video camera and differentiate between it and a digital camera after six weeks at school. Both computer games and digital cameras showed a shift in response: four children could describe computer games before starting school, all of these children could either use them with help or independently after starting. A similar shift is noted with digital cameras: four children were able to describe them prior to starting school, and three of these children could use either with help or independently after starting school.

If figure 13 is compared with figure 12, on the previous page, then it is clear that young children are more likely to know of the existence of the technology than to be able to accurately describe the function of the technology. Also young children are able to describe technologies they see being used in their homes or by family and friends such as cell phones, telephones, computer and xbox games and digital cameras It is interesting that none of the children could describe the text creation functions of cell phones or computers.

Figure 14 Compare which ICTs all children can use with help before and after starting school

ICTs children 'can use with help' before and after starting school
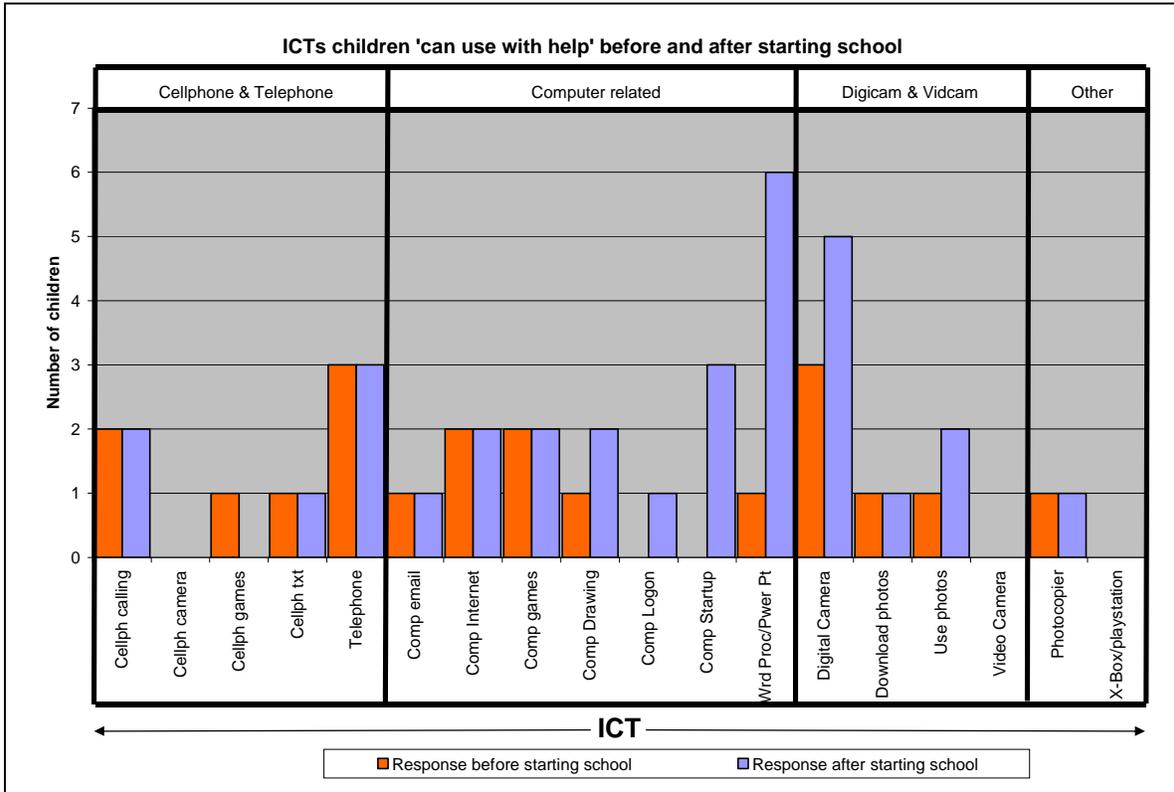
In figure 14 the most marked difference in response is in the greater ability to use word processing and/or powerpoint software with help after six weeks at school. Three children were able to describe how to startup the computer after starting school. There were three more children able to demonstrate that they could startup the computer with help than before starting school. Two more children could use the digital camera with help, and one more child could with help, logon, use drawing software and use photographs after six weeks at school.

Figure 15: Comparison of the ICTs that all children can use independently before and after starting school
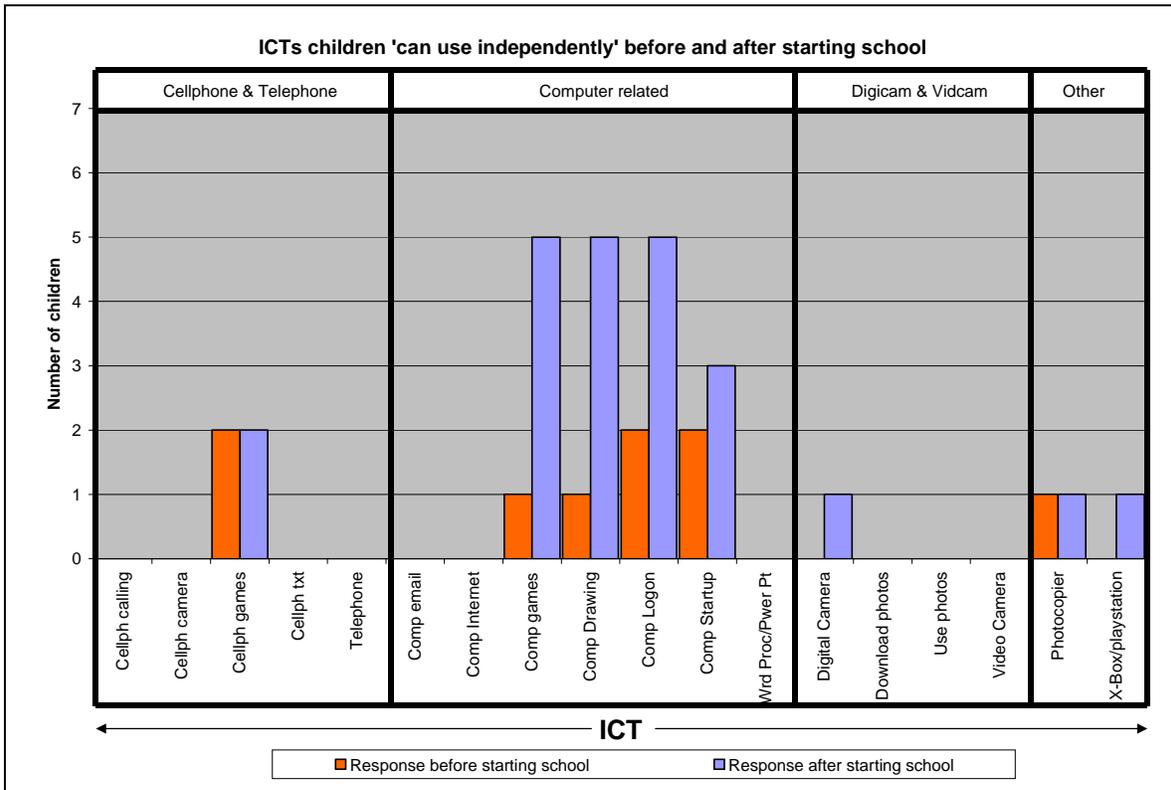

Figure 15 shows that in the pre data there were six items which could be used independently by one or two children. After six weeks at school, seven items were being used independently. The items which showed the greatest change in response were computer games, computer logon and using drawing software.

Discussion:
It is clear from the data which ICTs are not being used at school. The children were able to describe thirteen items before starting school. Of these thirteen items, cellphone calling, cellphone games, the internet and landline telephones showed no change children's knowledge after starting school, suggesting that children were not using these items in the classroom.

The four graphs show definite shifts in children's competence levels with ICTs. These shifts are in ICTs which were either observed by me, or described by teachers, as being used in classrooms. The 'can use with help category' highlights shifts in children's use of digital cameras, word processing/powerpoint, drawing software, computer startup and logon and using photos. Computer games, logging on and using drawing software all showed a marked shift in children's ability to use them independently, with starting up the computer and using the digital camera showing a smaller increase in independence. Two categories, using with help and using independently, highlight the move towards technical independence that many of the children were making after starting school.

There appears to be a difference in what happens in childrens homes with cellphone and X-Box/Playstation predominant, the pre-school setting where I observed some digital camera use occurring and in primary school where technical skills are being enhanced. It is worth noting that although the item 'comp games' (computer games) does not differentiate between the kind of games played on the computer at home and at school, they are fundamentally different. Games at home are bought primarily for entertainment, although some may have an educational component (edutainment), games played in the classroom are generally part of a maths or reading 'task board' and are designed to be support activities at the child's instructional maths

or reading level.

How is children's ICT knowledge assessed by case study teachers?

The teachers in my case studies reported that they all use observation to assess what children know about ICTs when they start school. In addition, Jane, the teacher in Case One had modified part of the school's entry survey to ask children about ICT use at home, and find out whether they had any experience with computers and cameras. In two of the classes I saw evidence that the teacher had made some judgement around who had ICT experience. The teacher in Case Three (Ann) named children she considered to have greater ICT skills to be 'leader' in the group using the computer in her reading programme, with the expectation that the child would be able to help other children who encountered problems. Jane, the teacher in Case 1 also appointed children she knew to have greater skills to be 'helpers' for others on the computer and when using the digital camera. In Cases Two and Four, I did not see evidence of a system to use other children's expertise, and in both cases children who had problems either waited for the teacher to notice, or called out for attention.

What level of use of ICTs are there in new entrant case study classes?

I had expected that Teacher's planning would give me some insight into this question, however only one teacher's planning had explicit reference to ICTs, linking to Learning Outcomes and children's learning needs. The other teachers in the study used maths and reading 'task boards' to show what each group was doing, with the label 'computer' indicating that children would use particular games software eg Reading and Maths Galaxy ™· software or BBC Maths games.

The data from the children's interviews suggest that in the classroom, children are learning computer-based skills.

I saw some evidence in three of the classes that the digital camera was being used, although I only witnessed children using the camera as part of the normal classroom routine in Jane's class (Case One). In the two other classes where there were photographs on display, they had been taken for an Art show and display of who children are in Fay's room (Case Four), and a display about a study of diversity, and a display showing things we do at school in Ann's room (Case Three).

What are new entrant teachers beliefs about ICT use with new entrant children?

All of the case study teachers reported that they believed that children's knowledge varied a great deal on entry to school, from knowing very little, to knowing more than the teacher. All of the teachers believed that new entrant children were capable of using ICTs in classrooms and indicated that they expected that ICTs would be used (to some degree) in their programmes. Fay, the beginning teacher in Case 4 expressed some diffidence about how to manage new entrant children with the computer in the classroom, but she indicated that she intended to use the digital camera and reading and maths games.

Of the four teachers I interviewed only one had a systematic way of finding out what children knew about ICT on school entry. This was a simple checklist that she added to the school entry assessment. The other three felt that they would find out by observing the children when they were working.
The children who demonstrated the greatest change in ICT expertise were from classes in school A, which had structures in place for up-skilling teachers based on their identified needs on a term-by-term basis, collegial support systems, and planning systems which required teachers to be using ICTs and identifying their own professional development needs in order to use ICTs.

Interestingly, only one of the four teachers described herself as a very confident ICT user with the others

describing themselves as 'somewhat' confident, despite obvious differences in their teaching practices, philosophies and competence with ICTs.

In every case study the programmes were teacher-directed. The two teachers who had the most experience in new entrant classes demonstrated some similarities in the way that they managed children's learning and behaviour and a higher level of confidence that children could and would follow instructions. Once activities had been explained the expectation in these two classes was that the children would work independently, referring to 'expert' children when they encountered problems. The classes of the two teachers who were less experienced with new entrant children ran to a similar timetable as the more experienced teachers with maths and reading groups working on a 'task board' system. However there were no systems for children being 'experts' although both these classes had children with the skills and knowledge to do this. Both of the more experienced teachers dealt with off-task or undesirable behaviour by quietly making the consequences of continued poor 'choices' clear and giving the child the chance to choose appropriate behaviour. The less experienced teachers tightly controlled the children and their activities, directing children when their behaviour was off task or disruptive.

The beginning teacher felt unprepared by her training to use ICTs in her programme and was very concerned with control issues and establishing classroom routines. Her only exposure to ICT during training had been to read a chapter in a book about ICT use. She had not seen ICT used in classrooms except for some reading and maths games software and some limited use of digital cameras.

The most experienced teacher in this study was Ann. She had been teaching for 30 years, the last three in new entrant classes. She is an example of a teacher who is slowly developing ICT use in her programme, and is using ICT in 'skill and drill' type activities and as a reward for children. In her own words, "*Apart from that I leave it up to the teacher [in the ICT suite]*". In this school, the decision to withdraw some computers from classrooms in order to create a "computer room" with a dedicated teacher meant that teachers who are less confident or more reluctant to use ICTs in their classroom programmes were abdicating responsibility for ICT skills teaching to the teacher in the ICT room.

Teachers Survey: A SNAPSHOT OF NEW ENTRANT TEACHERS' PROFESSIONAL AND PERSONAL ICT PRACTICES

In order to locate the responses, attitudes and practices of the teachers in my case studies in a wider context, I conducted a survey aimed at understanding new entrant teachers' personal and professional attitudes and practices with ICTs. The case study teachers also completed this survey. I was interested in finding whether any relationships were obvious between personal confidence, teacher's belief, teaching experience and ICT use in new entrant classrooms. Metaphor was used as a way of identifying some factors about teacher's attitudes and beliefs. It is worth noting that of the 32 surveys distributed, 24 teachers completed the survey, one or two teachers omitted some questions, so the total number of responses may vary from question to question.

The teachers survey (Appendix B) was distributed to new entrant teachers in a range of schools in Auckland, Waikato, Hawkes Bay and Christchurch. The schools were selected because I had a contact in the school who would distribute and collect the surveys.

Age of survey respondents

The respondents' ages, shown in Figure 16 roughly mirror the national age data for teachers as described in the Education Counts data. (NZ Ministry of Education, 2005), suggesting that the data is a reasonably representative sample of teachers

Figure 16: The range of ages of teachers who took part in the survey
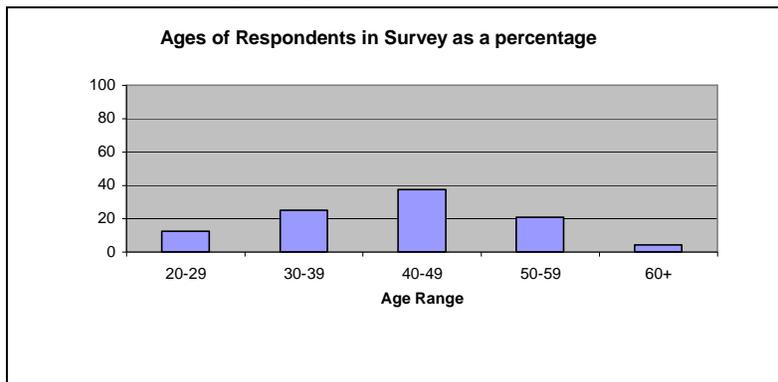
Teaching Experience of survey respondents

Comparing the responses 'total years teaching' with 'number of years teaching new entrant children' (figures 17 & 18), it is evident that a quarter of new entrant teacher-respondents are in the first five years of their teaching careers, and that around a third of the teachers had been teaching new entrant children for more than twenty years.

Figure 17: Respondents overall teaching experience

Years teaching as percentage

(bar chart; x-axis "Years teaching" categories: 1 to 5, 6 to 10, 11 to 15, 15 to 20, 21 to 25, 26 to 30, 31 to 35; y-axis 0.0 to 100.0)
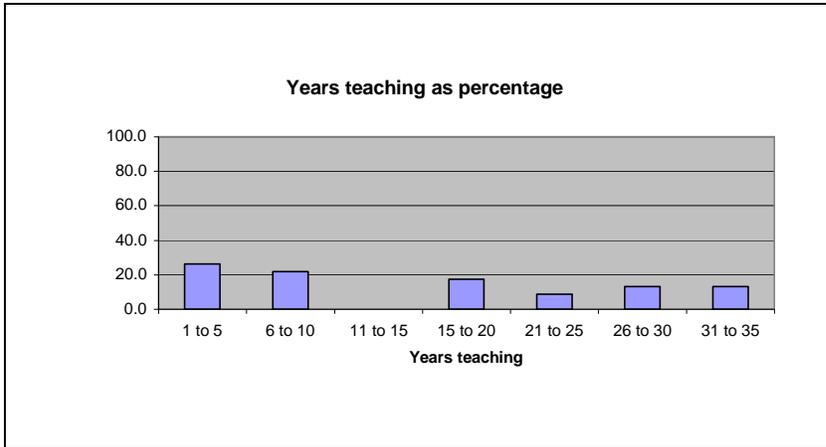
Figure 18: Respondents experience of teaching new entrant children

Time Teaching New Entrants

(bar chart; x-axis "Years" categories: 1 to 2, 3 to 5, 6 to 7, 12 to 15, 24 to 25; y-axis 0.0 to 100.0)

50
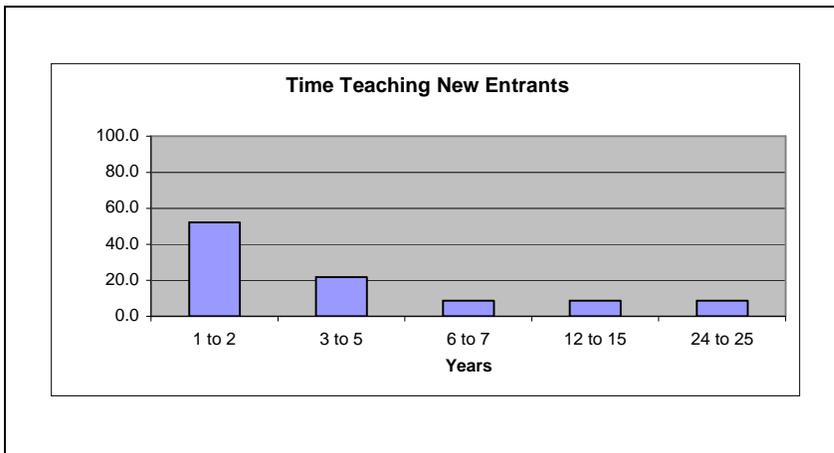
Self Confidence of survey respondents

The respondents were asked to comment on their confidence with ICTs. Over sixty percent described themselves as 'somewhat confident', and twenty percent as 'very confident'. (Figure 19)

Figure 19: Survey respondent's self-reported confidence in using computers in teaching and learning

Survey Respondent's Self-Reported Confidence (Percentage)
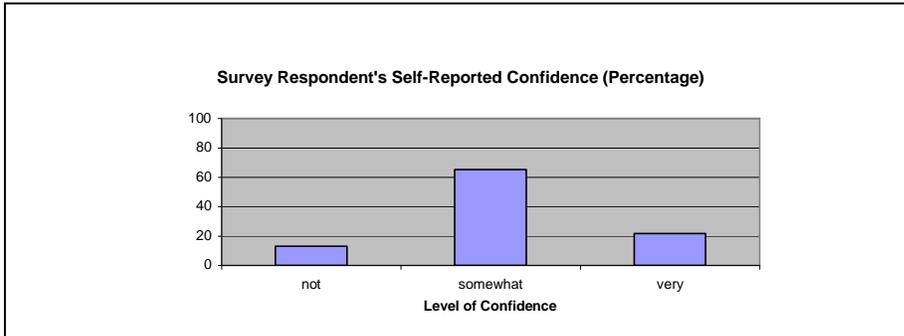
ICT use in new entrant classes?

Figure 20 shows that the ICTs that are being used most in the classrooms of the survey respondents are reading & maths software (85%), the digital camera (70%) and tapes and CDs (65%). Forty percent of respondents have children using drawing software of some kind for example Artrage™, Kidpix ™ or Paint ™ (Figure 20)

Figure 20: ICTs that are being used with new entrant children in respondent's classrooms

ICTs used in New Entrant Classes
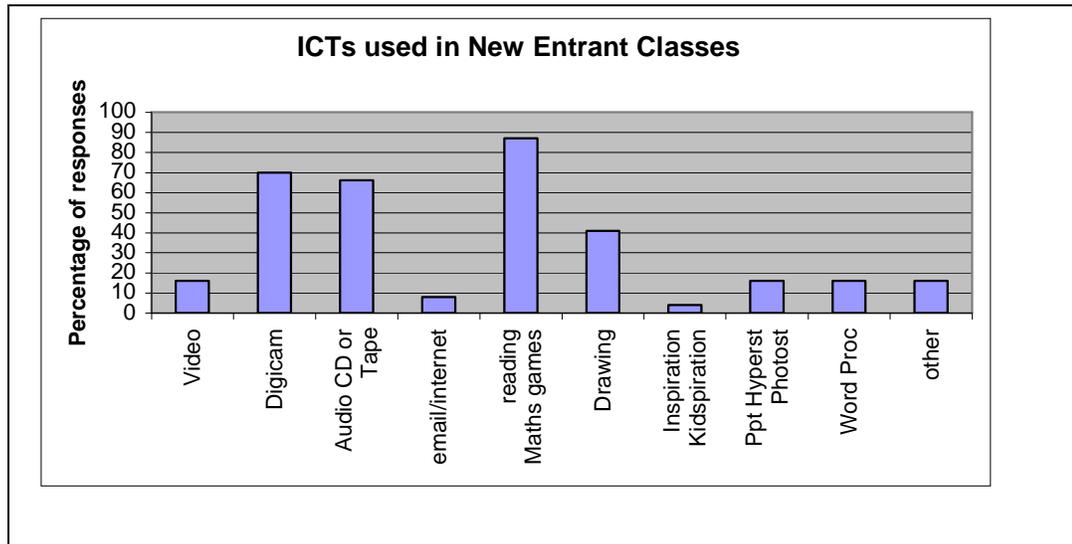
In figure 19 the data shows that sixty-five percent of teachers describe themselves as 'somewhat' confident; figure 20 shows that seventy percent of teachers reported using digital cameras.

How do New Entrant teachers use ICTs personally?

Cellphones

Figure 21: New Entrant teacher's cellphone use in their personal lives.

Personal Cellphone Use
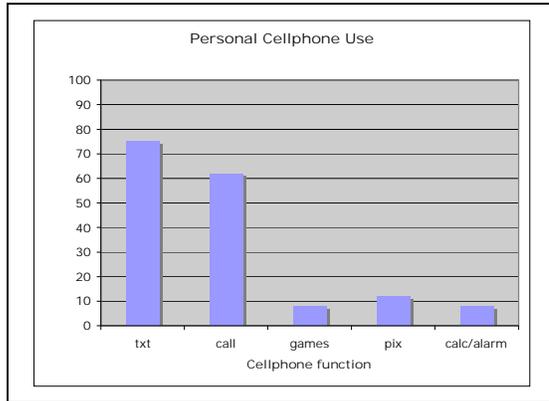
Over seventy percent of respondents use cellphones for texting, with just over sixty percent using the phone for voice calls. Only ten percent use the phone for taking photographs, and less than ten percent use other functions, such as calculators, alarms and games.

Personal Internet Use

Figure 22: The level of Internet use in new entrant teacher's personal lives.

Personal Internet use
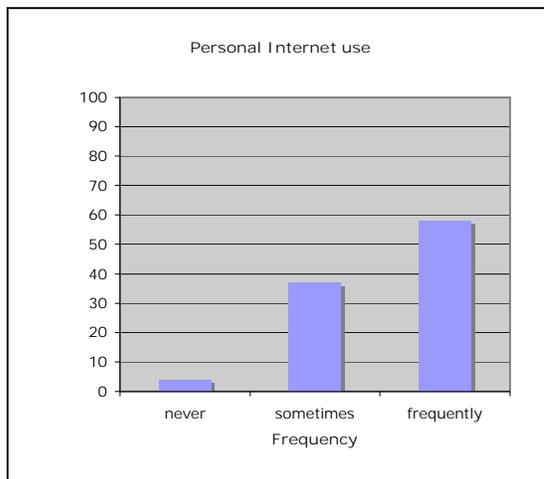
Almost sixty percent of teachers in the survey described their personal internet use as 'frequent', with thirty-six percent reporting that they used it 'sometimes'. Less than five percent don't use the internet at all in their private lives. This contrasts with the less than ten percent of teachers who use the internet or email

with new entrant children. (figure 20)

Personal Video and still Digital Camera use

Figure 23: Use of cameras, both still digital and video, in new entrant teachers private lives.
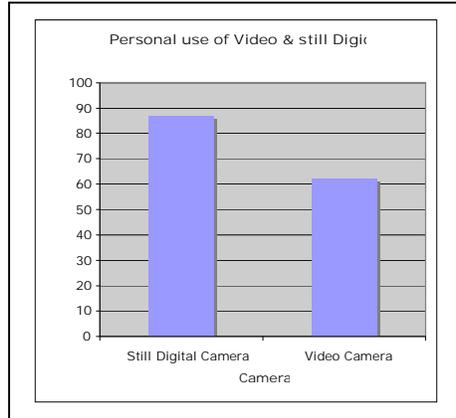
More teachers use still digital cameras at home than video, with over eighty percent taking still photographs, and sixty percent using video cameras. In the classroom seventy percent of teachers use the still digital camera, and only fifteen percent use a video camera (figure 20).

Personal and Professional Email use

Figures 24 and 25: Comparison of personal email use and email used to communicate with colleagues at school.
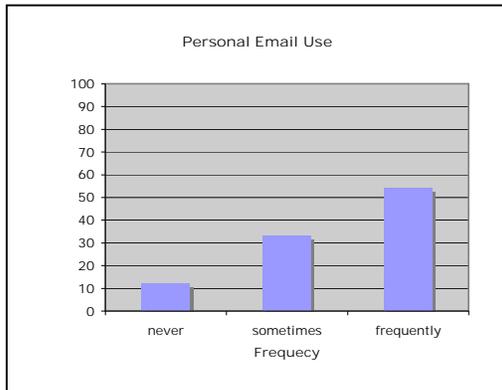
Fig 24   Fig 25
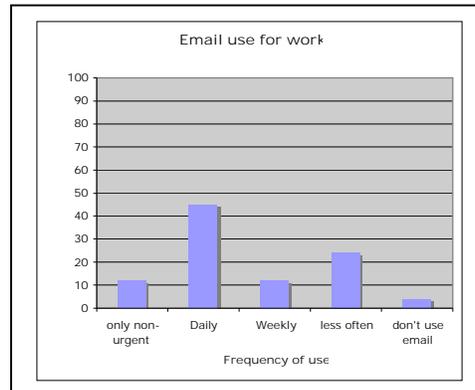
The data in figures 24 and 25 show that just over forty percent of teachers use email frequently in their personal lives, and over forty percent use it daily to communicate with colleagues. Interestingly although ten percent of respondents never use email in their personal lives, less than five percent don't use it at all in their communication with colleagues. If the responses 'less often (than weekly)' and 'only non-urgent' are combined in figure 25, it corresponds with the 'sometimes' response in figure 24

Software used for Planning

Figure 26 and 27: Comparison of software used for writing daily plans and Unit plans.

Fig 26   Fig. 27

Software used for Daily Planning

Software	Percent
No ICT	25
MS Word	65
other in addn to word	16
Excel, Publisher	8

Software used for Unit Pl

Software	Percent
No ICT	8
MS Word	87
Other in Addn to word	4
Software not stated	4
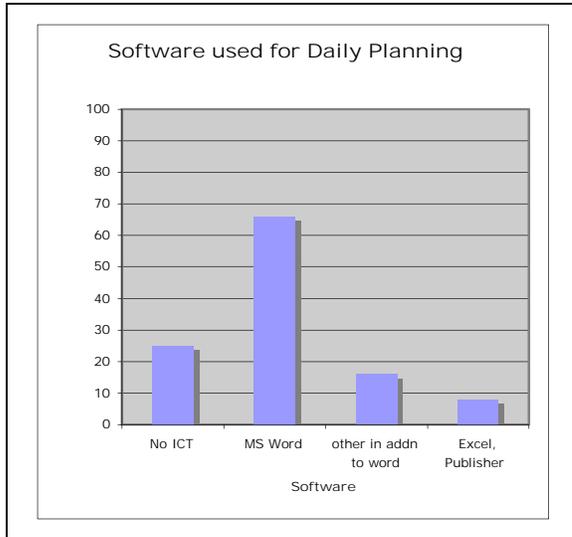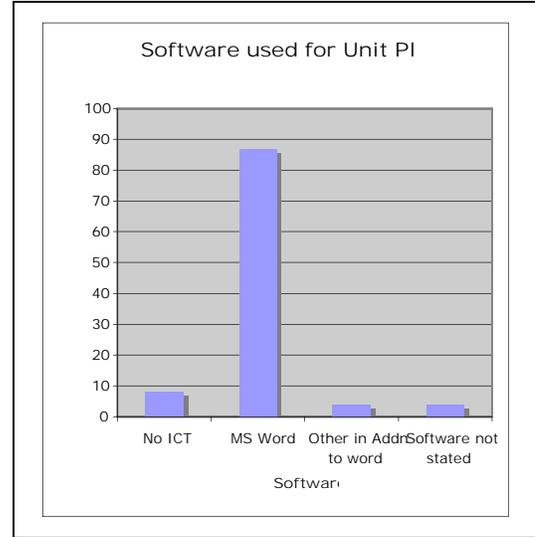
Figures 26 and 27 show that MS Word[TM] is used by sixty five percent of teachers when writing their daily planning, and that almost twenty five percent of teachers are not using their computers to write their daily planning.

By contrast eighty-five percent of teachers in the survey reported that MS Word[TM] is used when writing unit plans and eight percent of teachers are not using ICTs for this kind of planning. The variation in ICT/software use in daily versus unit planning may vary because unit plans are often written collaboratively in teams or syndicates. Some schools prescribe planning formats for either daily and/or unit plans.

What are New Entrant teachers beliefs about ICT use with New Entrant children?

The survey asked teachers what barriers there were to using ICTs with new entrant children. Table 1 below shows that most of the teachers in the survey find few barriers to using ICTs with new entrant children.

Table 1: Possible barriers to teachers using ICTs in their programmes

	Strongly disagree/ disagree	Neither agree nor disagree	Agree/ strongly agree
Main job literacy/ numeracy & ict distracts me	67%	17%	17%
Children will damage gear	92%	8%	
Limited resources – more important older chn have them	96%	4%	
No time	71%	21%	8%
Children need too much supervision	71%	21%	8%
Too long to learn to use (teacher)	91%	4%	4%
Not enough equip for classroom use	71%	13%	17%
Not enough appropriate software	58%	17%	25%
Not enough training	61%	26%	13%

Almost 20% of respondents feel that ICT distracts them from their 'main' job. The same percentage believe that they don't have enough equipment, and 25% do not have enough appropriate software. The table also tells us that 71% of teachers believe they have enough equipment, 58% believe they have enough appropriate software and 60% believe they have enough training.

The other statement that had a higher number of Agree/Strongly agree responses is 'my main job is literacy and numeracy & ICT distracts me', this is consistent with evidence gathered anecdotally prior to this study.

Influence of Professional Development

Figure 28: Professional development undertaken by respondents in the last 3 years

Professional Development Undertaken in past 3 years

Percentage of responses vs *Professional Development* (Numeracy, ICTPD, Literacy, Art, PE, ATOL, Other, Conferences)

All but one of the respondents to the survey have been involved in some Professional Development (PD) initiatives in the last three years, with over half being involved in initiatives which last more than one year (Numeracy, Literacy and ICTPD). (Figure 28)

Metaphor as a way of describing beliefs about teaching

The survey respondents chose from a range of metaphors that describe teaching and learning. The four metaphors that the most teachers identified with are those that describe teaching in terms of nurturing (gardeners tending plants), weaving strands together, and learning as a journey or learning as a journey of discovery. (Figure 29)

Figure 29: Metaphors that respondents identified with

Metaphors that respondents related to

Metaphor (Journeys, Gardening nurturer, Discovery, Weaving, Forest/tour guide, Moving along, Landscape, Mining, Coach, Pouring liquid, Race, Provide tools, arming chn with tools, Zoo-keeper, Actor/Role)

Computers in Respondent's Classrooms

Figure 30: Number of desktop computers in respondent's classrooms
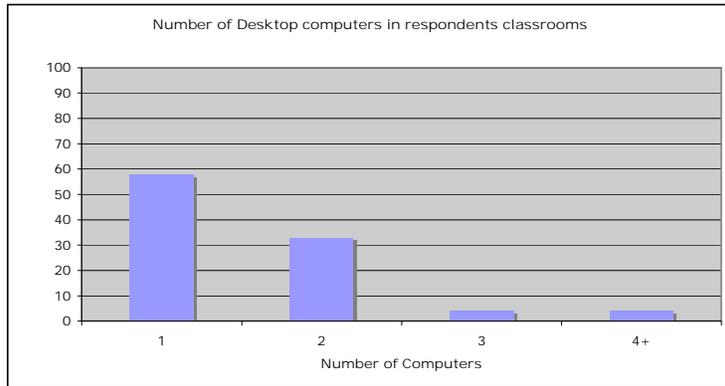
Fifty-eight percent of respondents had only one desktop computer in their classrooms, with thirty-three percent having two. The remaining eight percent had three or more computers.

Digital Cameras in Respondent's classrooms

Half of the twenty-four survey respondents (12) reported that they had digital cameras in their own classrooms. The rest either shared the camera with other classes, or had to send to the office when they wanted to use a camera.

Survey Summary

This survey shows that seventy one percent of teachers who responded were satisfied with the amount of ICT equipment in their classrooms, and fifty-eight percent felt they had enough appropriate software. By contrast seventeen percent thought they did not have enough equipment and twenty-five percent of survey respondents did not believe they had enough software available. The remaining teachers responded nuetrally to both questions. (Neither agree nor disagree.)

Only half of the survey respondents had a digital camera permanently available in their classrooms, the rest either shared with other classes, had to pre-book a camera, or send to the office if they wanted to use one. Fifty-eight percent of respondents had only one desktop computer in their classrooms and thirty-three percent had two. The remaining eight percent had three or more computers.

Four of the five survey respondents who described themselves as 'very' confident were using a wider range of ICTs than most of those who described themselves as 'somewhat' or 'not' confident. However in the surveys there were a few teachers who described themselves as 'somewhat' confident and were using a similar range of ICTs as those who described themselves as 'very' confident.

Confidence may be a factor for the twelve percent who do not use computers or digital cameras with new entrant children at all, this figure is slightly lower than the fifteen percent who described themselves as 'not confident'. Another factor affecting camera use may be access to cameras as described earlier.

Eighty-five percent of the teachers who responded are using the computer predominantly for maths and reading games, slightly more than the combined total of those who described themselves as 'not' and 'somewhat' confident (78%). The number reported using the digital camera is slightly less than the eighty-seven percent who describe themselves as 'confident' and 'very confident'.

Eighteen percent use the computer for a wider range of activities, including resource making and recording events with the digital camera, which is slightly less than the twenty percent of teachers who described themselves as 'very confident'.

About forty percent of teachers use email 'frequently' in their personal lives and 'daily' to communicate with colleagues at school. Interestingly ten percent of respondents never use email in their personal lives, and less than five percent never use it in their communication with colleagues It is possible that some of those who don't use email in their personal lives but do use it with colleagues at school do not have access outside school. The number of teachers who use email with colleagues in the following categories; 'less often (than weekly)' and 'only non-urgent' corresponds with the number who 'sometimes' use email in their personal lives.

The data shows that ninety-two percent of teachers use the computer for writing unit plans (Science, Social Studies, Music, Technology, Physical Education, the Arts) compared with seventy-five percent for their day-to-day teacher planning.
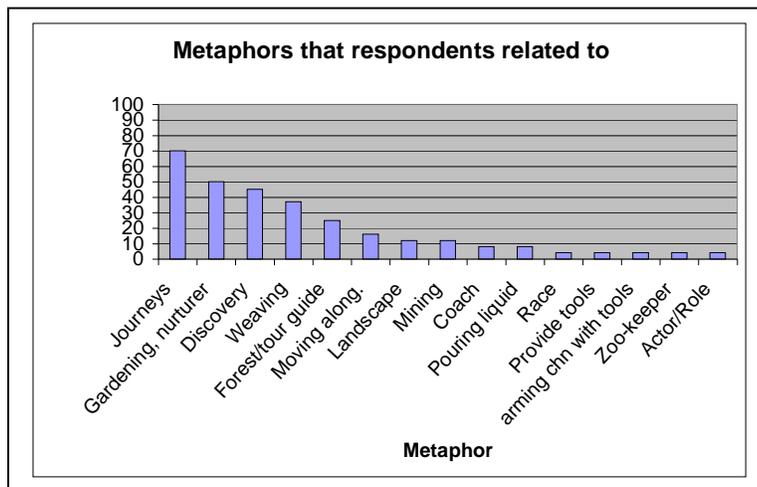
All but one of the respondents to the survey have been involved in some Professional Development (PD) initiatives in the last three years, with over half being involved in initiatives which last more than one year (Numeracy, Literacy and ICTPD). Sixty percent of respondents have been involved in all three of these initiatives. This involves considerable increase in teachers' workload because of the requirement to do professional reading and extra assessments as part of the professional development initiative.

Survey Discussion

The story told by the survey responses are overwhelmingly that new entrant teachers in the survey believe that ICTs have a role to play in the classroom. They rejected statements which reflect the 'folk-lore' comments one hears about ICT use and new entrants – that ICT is a distraction from the 'real job of teaching, that children will damage equipment, that older children should have access first, that too much supervision is required with young children, that there is not enough time, and that there is not enough equipment available. A quarter of respondents did say that they felt that there was not enough appropriate software available for use in the classroom.

The way that computers are used in respondent's new entrant classes can be divided into two main groups: the larger group (85%) comprises teachers who use computers as part of maths and reading activity boards and some drawing software, and the smaller group (18%) who also use them for more open-ended activities, such as story-telling and resource-making with children.

Seventeen percent of teachers thought they did not have enough equipment and twenty-five percent of survey respondents did not believe they had enough software available.

It is possible that the way that computers are used in classrooms may be influenced by how many computers are available, with more than half the respondents having only one desktop computer available in their classroom and a further third of classrooms with only two computers. Only eight percent of respondents had three or more computers in their classrooms.

Access may not be such an influential factor in the case of digital cameras, with half of the teachers reporting that they did not have a digital camera permanently available in their classrooms, but seventy percent using them with new entrant children, although to what extent is not specified.

It is interesting that a quarter of teachers do not use the computer to do their daily/weekly planning, compared with eight percent who do not do unit plans this way. This is likely to be because in many schools, unit plans are written as part of a team or syndicate, with the format being prescribed by the school, whereas often teachers have more freedom to determine the format of their daily/weekly plans.

All but one of the respondents to the survey have been involved in some Professional Development (PD) initiatives in the last three years, with over half being involved in Numeracy, Literacy and ICTPD initiatives which last more than one year (Figure 28). Dr. Vince Ham (Core Education) indicated in a personal communication that 60% of New Zealand schools have participated in ICTPD clusters. This same percentage (60%) of respondents have been involved in an ICTPD cluster, which is the same as those who believe that they have been given adequate training to use ICTs in the classroom".

Professional development initiatives which run for between two and three years have been undertaken by between sixty and eighty per cent of survey respondents in the last three years. Given the heavy workload that these initiatives carry with them, the fact that in the last three years over half of respondents had been involved in ICTPD, Literacy and Numeracy professional development all of which run for two or more years each, must have implications for the amount of time available to teachers for implementing new or challenging ICT practice in classrooms.

When thinking about factors that may influence the choice of metaphor that survey respondents relate to, I have considered the role that various Ministry of Education documents may have had in forming teacher's opinions. In the Ministry of Education documents which teachers use most often, for example; The Curriculum Framework, (NZ Ministry of Education, 1993) English in the New Zealand Curriculum, (NZ Ministry of Education, 2002), Social Studies in the New Zealand Curriculum, (NZ Ministry of Education 1997), Mathematics in the New Zealand Curriculum, (NZ Ministry of Education, 1992) and support material for the curriculum documents, it can be seen that metaphor may be influenced by these documents: the weaving metaphor relates to the idea of 'strands' that has been central in curriculum documents since they were introduced throughout the 1990s; the 'journeying' idea is conveyed in these documents through the use of arrows showing direction in 'koru' (spiral) – like diagrams, and the use of language. The new draft curriculum which was undergoing active consultation with schools during the data gathering phase of this study moves away from the strands and 'weaving' metaphor very noticeably and instead uses the notion of 'pathways' and the notion of 'lifelong learners' – relating directly to the journeying type metaphor.

Synthesis of Case Studies and Teachers Survey

In what ways do new entrant teachers recognise, value and use what new entrant children know about the use of ICT:

What level of competence do new entrant children have with ICTs?

The case study children showed a range of competence and familiarity with ICTs when they started school. Of the seven children, only one had no experience of computers before starting school, and the others ranged from being able to name a computer and some things it can be used for, to those who had experience with and some understanding of the Internet, and who were able to log on and identify features of the way the system was set up at home. For example being able to identify individual logons for different family members, and the fact that some logons allowed more restricted access than others.

There appears to be a difference between what happens at home with cellphone and X-Box/Playstation predominant, the pre-school setting where I observed some digital camera use and some drawing software and slideshow software being used and that occurring in primary school where some technical skills are being enhanced.

The data shows definite shifts in children's competence levels with ICTs after starting school. These shifts are in ICTs which were either observed by me, or described by teachers, as being used in classrooms. Shifts in children's competence in two categories, 'using with help' and 'using independently' highlight the move towards technical independence that many of the children were making after starting school.

Children's experience of digital cameras as pre-schoolers varied as well, with most children being able to differentiate between a camera that you could download pictures from or view on a computer. Most of the children knew to ask how to 'see' photos on my digital camera in order to review them, indicating that they had used one before I interviewed them.

The case study children showed a marked change in their knowledge about word processing and slideshow software. Two classrooms had resources on CD which had been made together by the teacher and children using Powerpoint™. and photos that they had taken. Two of the classes had been involved in publishing using a word processing programme with older children helping. These experiences account for the changes I observed in the case study children's knowledge in word processing & slideshows. This contrasts with the data from the teacher's survey which shows relatively few teachers using word processing and slideshow software.

What level of use of ICTs are there in new entrant classes?

The data from both the teacher's survey and classroom observations indicate that ICTs tend to be used with new entrant children in particular ways depending on teacher's confidence levels. The most experienced teachers in the case studies (Case 1 and Case 4) appeared to be using ICTs in the ways that they described in their interviews. One describing a high level of integrated use of ICTs, the other that she would be using ICTs in maths and reading task boards and as a reward. By contrast the teachers in Case 2 and Case 4 reported that they both felt a little unsure about how they would be using ICT with new entrant children. They appeared optimistic about possible ways that ICTs could be used, but observation showed that they were both predominantly using maths and reading software and the tape/cd player in their programmes. The teacher in Case 4 had also used the digital camera with the children for an Art Show.

It is clear from the data which ICTs are not being used at school. Of the thirteen items that children could describe before starting school, cellphone calling, cellphone games, the internet and landline telephones showed no change in children's knowledge after starting school, suggesting that children were not using

these items in the classroom.

It seems from this study that it is skills that relate to text-based ICT uses that children are acquiring at school when there is an ICT suite with a teacher in charge. The children who already have skills when they start school, particularly in using the computer, have acquired them as a result of what is happening at home. This finding accords with that of McPake et al who also found that it is parental interest which makes a difference to what children know about ICTs when entering pre-school or school in Scotland.

Four of the five survey respondents who described themselves as 'very' confident were using a wider range of ICTs than most of those who described themselves as 'somewhat' or 'not' confident. However in both the case studies and the surveys there were teachers who described themselves as 'somewhat' confident and were using a similar range of ICTs as those who described themselves as 'very' confident. In the case studies, the teacher who described herself as 'very' confident' was not the one who was using and integrating ICTs the most. However this experienced teacher was new to teaching new entrant children and felt rather unsure how ICT might be used at this level, which may explain the difference between her self-assessment and what I observed happening in her classroom. The beginning teacher who expressed the least confidence in the case study was using ICT in ways that were similar to the experienced teacher who was new to this level of teaching, but had said she was unsure about ICT use with new entrant children.

How is children's ICT knowledge assessed by teachers?

Despite the fact that three of the case study teachers indicated that they thought ICT had an important role to play in the classroom, and although they expressed beliefs about children having a wide range of experience, from some 'knowing heaps'[*sic*] to those who have never seen or used computers or cameras before starting school, only one of the four teachers had a systematic way of finding out what children knew about ICTs. This same teacher was the only one in the study to also show ICTs in her lesson planning, linking to learning intentions and learning outcomes. The other three teachers in the study tended to use ICTs as an 'activity' in maths and reading programmes, and a reward for appropriate and on-task behaviour and to use the digital camera in a more limited way (if at all) than the first teacher. The case study teachers made no mention in interviews of the portfolios that children who came from kindergartens bring with them as a source of information about children's experience and expertise, instead saying that they would use 'observation' to determine the child's level of competence.
In two of the case study classrooms I observed teachers making use of children's expertise in a way that suggested that to some degree they had observed children. One of these was the teacher already mentioned who used the checklist, the other was a teacher who said she used used observation alone, although she did acknowledge that she sometimes made incorrect assumptions about what children knew based on experience with older siblings.

What are new entrant teachers beliefs about ICT use with new entrants?

Responses in both the case studies and the teachers survey indicated that teachers believe ICTs are an important part of classroom life. In the survey, teachers strongly rejected notions that suggested that older children should have acces to ICTs before younger children.
The Metaphor responses were similar for three of the case study teachers and the survey respondents; around the notion of learning being a journey, the gardening/nurturing metaphor, and weaving strands together to make cloth, all of which may have been strongly influenced by the language in the curriculum documents and supporting material that has been in use over the last ten years in New Zealand classrooms.. The teacher in Case 1 who was using ICTs the most in her programme chose 'learning is a race to acquire knowledge'. This was reflected in the strong sense of purpose in her classroom.

Suggestions and Recommendations

While this is a small study, anecdotal evidence of conversations with new entrant teachers would suggest that the results are unsurprising. In general new entrant teachers do not systematically find out what

children starting school know about ICTs. This finding corresponds with the findings of the McPake et al (2006) study which found that even when information about children's ICT knowledge and experiences was available, teachers showed little interest in using it.

As primary teachers we are charged with building on children's prior knowledge and experiences. To this end we need to be developing systems which allow us to assess and record all the child's relevant strengths, dispositions and understandings. Teachers do this well for literacy and numeracy, as a result of professional development which is aimed at changing practices in these areas over at least the last three years. (Numeracy, Writing, Reading and Assessment professional development initiatives).

I would suggest that early childhood education institutions need to be pro-active in sharing with schools the many excellent initiatives in literacy, assessment and ICT that are taking place in their centres. In addition new entrant teachers and school management also need to be working to strengthen professional links with the early childhood sector in order to appreciate the depth and breadth of experience that children have prior to starting school. The Mangere Bridge Kindergarten's research (currently underway) looking at transition to school is an example of how transition practice can be enhanced through schools understanding and appreciating the value in Early Childhood Education assessment processes.

New entrant assessment practices need to be re-evaluated so that information provided by parents and from early childhood assessment portfolios is taken into account at school. Systematic recording of more than just literacy, numeracy, oracy and some social skills is desirable. An understanding of Te Whaariki, the early childhood curriculum, (New Zealand Ministry of Education, 1996) and ECE assesment processes as described in Kei Tua o te Pai (New Zealand Ministry of Education 2004) by junior school management and new entrant teachers would help children in the transition from early childhood institutions to school settings.

Of note is the number and duration of professional development programmes being undertaken by teachers. Much of the professional development reported in the survey takes place over several years, with many teachers being involved in several iniatives at the same time. While we would all agree with the notion of teachers as 'lifelong learners', some of the professional development programmes have heavy reading and assessment workloads. Many of the survey respondents said that time was a factor which they felt inhibited their ability to use ICTs. This raises questions about the workload resulting from professional development, whether the amount of professional development taking place in schools concurrently is reaching the point that it is impacting on teachers' time, to the detriment of classroom programmes.

Despite the majority of teachers who responded to my survey identifying with metaphors which suggest child-centred teaching philosophies, the kind of ICT use in respondents' new entrant classrooms was generally low-level games software or skill based. Given the fact that children are starting school with experiences of using ICT in increasingly sophistocated ways, the use of games designed to teach particular skills must be linked to the child's learning needs. Professional development and systems within schools need to encourage new entrant teachers to implement systems of ICT integration in their programmes which encourage independent and creative use of ICTs to complement and strengthen the wonderful teaching and learning that is already taking place. Children need the opportunity to demonstrate and build on their competence and to be involved in problem-solving and group activities. If we are to truly integrate ICTs into our classroom programmes we need to use information about what children know in order to develop robust structures and planning systems which support them as competent, independent learners.

Table of Figures

Appendices

Appendix A   Checklist for interview with children

Telephone
Differentiate between landline and cellphone?
Fax
Photocopier
Cellphone – functions: txt, phone, games, photo,
Camera
Digital camera – review pictures, download pictures
Video camera
x-box
Playstation
Computer/laptop
Name programmes:
Kidpix
Google
Internet
Email
Questions:
How do they use ICTs
Can they describe purpose?
What do parents use at home?

Appendix B Teachers Survey Form

Survey of New Entrant Teacher's ICT use

Section 1 – **about you**

Name of your school: _____Decile_____

Your name (optional) _____

How long have you been teaching? _____

How long have you taught new entrant children? _____

What is your age group? 20-29;   30-39;   40-49;   50-59;   60+
(Please circle the appropriate age group)

How confident are you in using ICTs in the classroom? Please put a tick in the
appropriate response box
- ☐   Very
- ☐   Somewhat
- ☐   Not at all

Section 2 – **Personal ICT use**

1.   Do you use a computer for your daily (teacher) plan?   Yes   No
        How do you do this?
    - ☐   Excel
    - ☐   MS Word
    - ☐   Other (please name) _____

2.   Do you use a computer for writing unit and lesson plans?   Yes   No
        How do you do this?
    - ☐   MS Word
    - ☐   Other (please name _____

3.   How frequently do you use email to communicate with colleagues?
    - ☐   Almost all non-urgent communications
    - ☐   Daily,
    - ☐   Weekly
    - ☐   Less often

4.   How much do you use email in your personal life?
    - ☐   Hardly ever/never
    - ☐   Sometimes
    - ☐   Frequently

5.   Do you use the Internet in your personal life?
        ☐   Hardly ever/never
        ☐   Sometimes
        ☐   Frequently

5a.   Do you use IM (instant messaging - msn or similar)
        ☐   Hardly ever/never
        ☐   Sometimes
        ☐   Frequently

6.   Do you have a cellphone?   Yes   No
If yes, rank the following functions according to frequency of use:
        ☐   Texting
        ☐   Phoning
        ☐   Games
        ☐   Photographs
        ☐   Other (please name) _____

7.   Do you use a PDA (iPaq, Palm or similar)
        ☐   No
        ☐   Yes – mainly for _____

8.   Do you use a digital camera? (Please circle) YES   NO

9.   Do you use a video camera?   YES   NO

Section 3 **Teaching/learning**

10.   Does your school have an ICT suite?   YES   NO

11.   What ICTs are available for use in your classroom?
(eg how many PC or Apple computers, laptops, hand-held computers, digital cameras, video cameras, tape recorders, cellphones, telephones, faxes, photocopiers, etc)

ICT	Number in classroom

12.   Do you use ICTs with new entrant children?   Yes   No

13.   Do any of the following statements reflect how you feel about ICT use in a new
       entrant classroom?
       Please respond as follows: SA – strongly agree, A-agree, N-neither agree nor
       disagree D-disagree SD-strongly disagree

SA A N D SD   My main job is literacy and numeracy, ICT distracts me from this

SA A N D SD   Small children do not have the skills to use ICTs (damage to gear)

SA A N D SD   There are limited resources for ICT in school and it is more
               important that older children have access to them

SA A N D SD   There is not enough time in the day to use ICTs

SA A N D SD   Small children require too much supervision for ICT use to be
               practical in the classroom (independence)

SA A N D SD   It would take me too long to learn to use ICTs, my time is better
               spent in other ways

SA A N D SD   I do not have the ICT equipment that I need for classroom use

SA A N D SD   Appropriate software and games are not available in my school

SA A N D SD   I have not been given the training I need to use ICTs in the
               classroom

Other: (please describe)

_____

_____

_____

_____

   14. List the ICTs (if any) that children use in your classroom, with a brief description
       of how they are used: (eg Software – reading games, drawing, maths games:
       Digital camera – recording events, writing starters: fax: telephone: tape recorder:
       video etc)

ICT	Uses in classroom

15. Do you use the internet, IM (instant messaging) and/or email in your classroom programmes – please briefly describe how.

16. Do you use your own ICT resources in the classroom?   Yes   No
    Please elaborate: (over page)

17. Do you teach any thinking skills or tools? What are they?

18. Do you use any inquiry/problem solving approaches in your teaching? Please describe model briefly.

19. Please add anything which you believe influences or affects your use of ICT in the classroom

20. Have you been offered Professional development in the last 3 years? Yes No

21 What professional development have you been involved in the last 3 years (eg Numeracy Project, Ministry Reading and Writing PD projects, ICT PD Cluster)

22. If you feel that there are pressures which have led you to decline Professional Development opportunities, please comment.

23. There has been much discussion around metaphor as a way of describing the teaching/learning/classroom dynamic. What (if any) metaphor would you use to describe your situation?

Tick those which you agree with. If you agree with several of these responses can you rate them in order of importance for you. For example the one you agree most with mark as a 1 then one that is next most appropriate for you mark with a 2.

☐ I am like a gardener tending plants, I nurture and provide what the plant needs in order to grow

☐ I am like a zoo-keeper, my classroom is a zoo.
☐ I am guiding them through the forest, like a tour guide pointing out items of importance along the way
☐ I am an actor – teaching is a role I put on every morning
☐ I am a policeman, ensuring that everybody is orderly
☐ I am a train-driver, pulling the class along with me
☐ Teaching and learning are journeys
☐ Knowledge is a landscape that students travel through
☐ I like to keep my programme moving along.
☐ Learning is a journey of discovery
☐ Learning is a race to acquire knowledge
☐ I am a coach, training my students for what lies ahead
☐ Teaching is like pouring liquid into a container (children are like empty vessels or sponges waiting to be filled with knowledge)
☐ Teaching is like weaving together all the strands to make cloth
☐ Teaching is like mountain climbing
☐ Teaching is like mining for precious metals or gems

Do you have an opinion about teaching that may be different to any of these. (Please comment on next page)

_____

24. Do you feel that you are supported by your school/principal/education system in your beliefs around teaching New Entrant children? Please comment

_____

25. Is there any other comment you would like to make?

_____

If you would like have a copy of the research findings sent to you at the end of 2006, please supply your email address.

_____

Many thanks for taking the time to reply to this survey. I appreciate that you are a very busy teacher and time is precious.

.

Appendix C Children's responses - first and second interview

Pre Misa

ICT	D/K	DESCR	HELP	INDEP	
					D/K don't know
Cellph calling		1			DESCR can describe use or purpose
Cellph camera		1			HELP can use with help
Cellph games				1	INDEP can use independently
Cellph txt	1				
Comp email	1				
Comp games		1			
Comp Internet	1				
Comp Logon	1				
Comp Startup	1				
Digital Camera			1		
Download photos	1				
Photocopier	1				
Telephone		1			
Use photos	1				
Video Camera		1			
Wrd Proc/Pwer Pt	1				
X-Box/playstation		1			
Drawing		1			
Totals	9	7	1	1	

Post Misa

ICT	D/K	DESCR	HELP	INDEP
Cellph calling		1		
Cellph camera		1		
Cellph games				1
Cellph txt	1			
Comp email		1		
Comp games				1
Comp Internet	1			
Comp Logon				1
Comp Startup				1
Digital Camera				1
Download photos		1		
Photocopier		1		
Telephone		1		
Use photos		1		

ICT	D/K	DESCR	HELP	INDEP
Video Camera		1		
Wrd Proc/Pwer Pt			1	
X-Box/playstation		1		
Drawing				1
Totals	2	9	1	1

Pre Mike

ICT	D/K	DESCR	HELP	INDEP
Cellph calling		1		
Cellph camera		1		
Cellph games		1		
Cellph txt	1			
Comp email	1			
Comp games		1		
Comp Internet	1			
Comp Logon	1			
Comp Startup	1			
Digital Camera		1		
Download photos	1			
Photocopier	1			
Telephone		1		
Use photos	1			
Video Camera	1			
Wrd Proc/Pwer Pt	1			
X-Box/playstation		1		
Drawing	1			
Totals	11	7		

ICT	D/K	DESCR	HELP	INDEP
Post Mike				
ICT	D/K	DESCR	HELP	INDEP
Cellph calling		1		
Cellph camera		1		
Cellph games		1		
Cellph txt	1			
Comp email	1			
Comp games				1
Comp Internet	1			
Comp Logon				1
Comp Startup			1	
Digital Camera			1	
Download photos		1		
Photocopier	1			
Telephone		1		
Use photos		1		
Video Camera		1		
Wrd Proc/Pwer Pt			1	
X-Box/playstation		1		
Drawing				1

| Totals | 4 | 8 | 3 | 3 |

Pre William

Wrd Proc/Pwer Pt	D/K	DESCR	HELP	INDEP
Cellph calling		1		
Cellph camera		1		
Cellph games		1		
Cellph txt	1			
Comp email	1			
Comp games		1		
Comp Internet	1			
Comp Logon	1			
Comp Startup	1			
Digital Camera		1		
Download photos	1			
Photocopier	1			
Telephone		1		
Use photos	1			
Video Camera	1			
Wrd Proc/Pwer Pt	1			
X-Box/playstation		1		
Drawing	1			
Totals	11	7		

Post William

Wrd Proc/Pwer Pt	D/K	DESCR	HELP	INDEP
Cellph calling		1		
Cellph camera		1		
Cellph games		1		
Cellph txt	1			
Comp email	1			
Comp games			1	
Comp Internet	1			
Comp Logon				1
Comp Startup			1	
Digital Camera			1	
Download photos		1		
Photocopier	1			
Telephone		1		
Use photos		1		
Video Camera		1		
Wrd Proc/Pwer Pt	1		1	
X-Box/playstation		1		
Drawing				1
Totals	5	8	4	2

Pre Nigel				
ICT	D/K	DESCR	HELP	INDEP
Cellph calling			1	
Cellph camera		1		
Cellph games			1	
Cellph txt	1			
Comp email	1			
Comp games			1	
Comp Internet			1	
Comp Logon		1		
Comp Startup		1		
Digital Camera		1		
Download photos	1			
Photocopier	1			
Telephone			1	
Use photos		1		
Video Camera	1			
Wrd Proc/Pwer Pt	1			
X-Box/playstation		1		
Drawing	1			
Totals	7	5	5	0

Post Nigel				
ICT	D/K	DESCR	HELP	INDEP
Cellph calling			1	
Cellph camera		1		
Cellph games			1	
Cellph txt	1			
Comp email	1			
Comp games				1
Comp Internet			1	
Comp Logon				1
Comp Startup			1	
Digital Camera			1	
Download photos			1	
Photocopier	1			
Telephone			1	
Use photos		1		
Video Camera		1		
Wrd Proc/Pwer Pt			1	
X-Box/playstation		1		
Drawing				1
Totals	3	4	8	3

Pre Arianna

ICT	pre d/k	pre descr	pre help	pre indep
Cellph calling		1		
Cellph camera	1			
Cellph games	1			
Cellph txt	1			
Comp email	1			
Comp games				1
Comp Internet	1			
Comp Logon				1
Comp Startup				1
Digital Camera			1	
Download photos	1			
Drawing software	1			
Photocopier	1			
Telephone			1	
Use photos	1			
Video Camera	1			
Wrd Proc/Pwer Pt	1			
X-Box	1			
	12	1	2	3

Post Arianna

ICT	post d/k	post descr	post help	post indep
Cellph calling		1		
Cellph camera	1			
Cellph games	1			
Cellph txt	1			
Comp email	1			
Comp games				1
Comp Internet	1			
Comp Logon				1
Comp Startup				1
Digital Camera			1	
Download photos		1		
Drawing software			1	
Photocopier		1		
Telephone			1	
Use photos		1		
Video Camera		1		
Wrd Proc/Pwer Pt			1	
X-Box	1			
Totals	6	5	4	3

Pre Stuart

ICT	D/K	DESCR	HELP	INDEP
Cellph camera		1		
Cellph calling			1	
Cellph txt			1	
Cellph games				1
Telephone			1	
Comp games			1	
Comp Internet			1	
Digital Camera			1	
Download photos			1	
Use photos			1	
Wrd Proc/Pwer Pt			1	
X-Box		1		
Comp Startup				1
Comp Logon				1
Comp email			1	
Video		1		
Photocopier				1
Drawing				1
	0	3	10	5

Post Stuart

ICT	D/K	DESCR	HELP	INDEP
Cellph camera		1		
Cellph calling			1	
Cellph txt			1	
Cellph games				1
Telephone			1	
Comp games			1	
Comp Internet			1	
Digital Camera			1	
Download photos			1	
Use photos			1	
Wrd Proc/Pwer Pt			1	
X-Box		1		
Comp Startup				1
Comp Logon				1
Comp email			1	
Video		1		
Photocopier				1
Drawing				1
totals	0	3	10	5

Pre Mary

ICT	pre d/k	pre descr	pre help	pre indep
Cellph camera		1		
Cellph calling		1		
Cellph txt	1			
Cellph games	1			
Telephone		1		
Comp games		1		
Comp Internet		1		
Digital Camera		1		
Download photos	1			
Use photos	1			
Wrd Proc/Pwer Pt	1			
X-Box	1			
Comp Startup	1			
Comp Logon	1			
Comp email	1			
Video		1		
Photocopier			1	
Drawing			1	
totals	9	7	2	0

Post Mary

ICT	post d/k	post decr	post help	post indep
Cellph camera		1		
Cellph calling		1		
Cellph txt	1			
Cellph games	1			
Telephone		1		
Comp games			1	
Comp Internet		1		
Digital Camera			1	
Download photos	1			
Use photos	1			
Wrd Proc/Pwer Pt	1			
X-Box	1			
Comp Startup	1			
Comp Logon	1			
Comp email	1			
Video		1		
Photocopier			1	
Drawing			1	
totals	9	5	4	0

Appendix D Teachers' Survey data analysis

Confidence level -v- inquiry model

Count of Confidence	Confidence			
inquiry	not	somewhat	very	Grand Total
Action Learning, 3 Doors			1	1
Action learning.		1		1
action Learning. Key word, key questions		1		1
AFL	1			1
Ask, aquire, apply - school developed own model		2		2
Blooms. Cummins empowerment model.			1	1
Inspector Tui-own school model		1		1
Maths challenges		1		1
not used	1	6	1	8
Own school inq model.				
School inq model		1		1
Tchr models use. Chn not using it			1	1
yes (model not specified	1	1		2
(blank)		1	1	2
Grand Total	3	15	5	23

Confidence & Thinking hats

Count of Confidence	Confidence				Grand Total
thinking	not	somewhat	very	(blank)	
6 hats		1			1
6 hats, blooms			1		1
Blooms, 6 hats		1			1
Hats	1	3			4
Hats & Mind-Maps		1			1
Hats, Habits of mind, Blooms, Action Learning			1		1
Hats, Thinking maps			1		1
Hats. Brainstorming. CORT. PMI. Servants Q techniques.					
Hats. Thinkers keys			1		1
n	1	7			8
Open ended questions	1				1
Questioning		1			1
y		1			1
(blank)			1		1
Grand Total	3	15	5		23

Thinking skills and Inquiry

thinking	Action Learning, 3 Doors	action Learning. Key word, key questions	AFL	Cummins empowerment model.	own school model	not used	y	(blank)	Grand Total
6 hats									
6 hats, blooms									
Blooms, 6 hats					1				1
Hats	1					2	1		4
Hats & Mind-Maps						1			1
Hats, Habits of mind, Blooms, Action Learning	1								1
Hats, Thinking maps						1			1
Hats. Brainstorming. CORT. PMI. Servants Q techniques.					1				1
Hats. Thinkers keys						1			1
no			1		2	5			8
Open ended questions				1					1
Questioning					1				1
Yes (no detail)							1		1
(blank)				1					1
Grand Total	2		1	1	1	5	10	2		22

Coding teacher's metaphor responses.

Metaphor	Pedagogy	Constructivist	mining	transmission	Tchr has knowledg	moving along	actor		other
Teaching & learning are journeys, Teaching is like weaving strands to make a cloth, Learning is a journey of discovery, Knowledge is a landscape students travel through	c1, jl3	1			3				
Teaching is like weaving strands to make a cloth, Teaching and learning are journeys	c1, jl1	1			1				
Learning is a journey of Discovery, Teaching and Learning are Journeys, I am like a gardener tending plants	c1, jl2, t1	1		1	2				
Teaching & learning are journeys, Learning is a journey of discovery, Teaching is like pouring liquid into a container, Teaching is like weaving strands to make a cloth	c1, jl1, t1	1		1	1				
Teaching and learning are journeys. I am guiding them through the forest like a tour guide pointing out items of importance along the way. Knowledge is a landscape students travel through. I am like a gardener tending plants. Teaching is like weaving together all the starnds to make cloth	c1, jl2, t2	1		2	2				
Learning is a journey of Discovery, Teaching and Learning are Journeys, Teaching is like weaving together all the starnds to make cloth, I am like a garener tending plants, I like to keep my programme moving along, I am an actor- teaching is a role I put on each morning.	c2, jl1, t1, o2	2		1	1	1	1		
I am a gardener tending plants. I am guiding them through the forest like a tour guide pointing out items of importance along the way. Teaching and learning are journeys. Knowledge is a landscape that students travel through. I like to keep my programme moving along. Learning is a journey of discovery. I am a coach training my students for what lies ahead. Teaching is like mining for precious gems.	c1, jl2, t3, o1	1		3	2	1			
Teaching & Learning are journeys. Learning is a journey of discovery. I am like a gardner tending plants I nurture and provide whatever the plant needs to grow. I am guiding them through a forest like a tour guide pointing out items of importance along the way. Knowledge is a landscape the students travel through.	c1, jl2, t2	1		2	2				

I am a gardener tending plants. Teaching and learning are journeys. Learning is a journey of discovery. I am a coach training my students for what lies ahead. I like to keep my programme moving along.	c1, jl1, t2, o1	1		2	1	1		
Teaching and learning are journeys. Teaching is like weaving together all the strands to make a cloth.	c1, jl1, t1	1		1	1			
Teaching and learning are journeys. I am like a gardener tending plants. Learning is a journey of discovery.	c1, jl1, t1	1		1	1			
Teaching and learning are journeys. Teaching is like mining for precious metals or gems.	jl1, o1		1		1			
I am like a gardney tending plants. I am guiding them through a forest. Teaching and learning are journeys. Learning is a journey of discovery. Teaching is like weaving together strands to make a cloth. Teaching is like mining for precious gems.	c2, jl1, t2, o1	2	1	2	1			
I like to keep my programme moving along. Teaching is arming children with the tools to make sense of the world	t1, o1			1		1		
Teaching and learning are journeys	jl1				1			
Like a gardener tending plants I nurture and provide what the plant needs in order to grow. Teaching is like weaving together all the strand to make cloth. Teaching and learning are journeys. Learning is a journey of discrovery. I am like a zoo-keeper, my classroom is a zoo some days.	c1, jl2, t1 o1	1		1	2			zoo
Teaching is like pouring water into a container (empty vessel); Teaching and learning are journeys; I am like a gardener tending plants I nurture and provide what the plant needs in order to grow.	jl1, t2			2	1			
Learning is journey of discovery. Teaching and learning are journeys. I am like a gardener tending plants I nurture and provide what the plant needs in order to grow. I am guiding them through the forest like a tour guide pointing out items of interest along the way. Teaching is like weaving together all the strands to make cloth.	c2, jl1, t2	2		2	1			
I am like a gardener tending plants, I nurture and provide what the plant needs in order to grow	t1			1				
Learning is a race to acquire knowledge	o1							race to aquire knowledge
Student centered learning - I provide tools, they make the learning happen	c1	1						

Metaphor codes:c=constructivist, m=mining,t=transmission, jl=journey,landscape, o=other

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