AN INVESTIGATION OF ADOPTING, ADAPTING AND INTEGRATING OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND INCORPORATING THE EXPLICIT TEACHING OF THINKING SKILLS ACROSS THE CURRICULUM

submitted by

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A thesis submitted in total fulfillment of the requirement for the degree of Doctor of Philosophy

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MARCH 2007
STATEMENT OF AUTHORSHIP

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis presented by me for another degree or diploma.

No other person’s work has been used without due acknowledgement in the main text of the thesis.

This doctoral research has been conducted with the assistance of the Royal Melbourne Institute of Technology University.

The RMIT University Higher Degrees Committee, Design & Social Context Portfolio Human Research Ethics Sub-committee Approval and the RMIT University Human Research Ethics Committee have approved all research procedures reported in the thesis.

Signed
Date  20/03/07
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ABSTRACT

The research presented in this thesis investigates ways in which learners are empowered and learning can be enhanced through introducing and implementing various teaching and learning practices. These practices included the adopting, adapting and integrating of information and communication technologies (ICT) and incorporating the explicit teaching of thinking skills across the curriculum where daily classroom practice utilised meaningful, engaging and purposeful learning experiences.

The study was established within the paradigm known as constructivism (Guba & Lincoln, 1994), using constructivist (naturalistic) inquiry, qualitative methods of data collection (Denzin & Lincoln, 1994), case study method (Stake, 1994, 1995) and action research (Kemmis & McTaggart, 1982, 2004; Cherry, 1998). The study describes through interpretative analysis and triangulation of data ways in which ICT, thinking skills and inquiry based learning impacted on learning and empowered Year 1/2 students in a primary school with the Catholic Education system within Victoria, Australia.

Qualitative inquiry typically focuses in depth on relatively small samples, which are selected purposefully to provide insight into the questions under study (Patton, 2002). The field of inquiry was that of qualitative research which is multi-method in focus, involved an interpretive naturalistic approach to its subject matter: things are studied in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. It also involved the studied use and collection of a variety of data from case study information, personal experiences, interviews and observational texts (Denzin & Lincoln, 1994). The natural setting of the research was the classroom the participants attended on a daily basis and the opportunity existed for the collection of materials and artefacts, records of personal experience, interviews and focused observations. Classroom action research occurred where the teacher was the researcher and the site was the school setting.

This study began under the umbrella of Curriculum and Standards Framework 2, referred to as CSF II (BOS Vic, 2000). This a framework that was developed for use
in Victorian government schools and is designed to support teachers and parents in meeting the learning needs of all students. It provides a strong focus for teaching and learning (the curriculum) and clear statements of what students are expected to achieve (the standards) in eight key learning areas during the P - 10 years at school. This edition takes into account the skills and knowledge students now need to prepare them for work and further learning in an increasingly information-rich world. This is reflected in a stronger emphasis on information technology in all learning areas and the development of workplace-related skills for a range of vocational opportunities (BOS Vic, 2000).

In the time span during which this study was conducted new curriculum frameworks were produced. In November 2003, as part of the Blueprint for Government Schools, the Minister for Education and Training asked the Victorian Curriculum and Assessment Authority (VCAA) to develop a new curriculum for all Victorian schools in both government and non-government sectors. Throughout 2005 the Victorian Curriculum and Assessment Authority (VCAA) undertook a number of projects to validate the Victorian Essential Learning Standards. The Victorian Essential Learning Standards describe what is essential for students to achieve from Years Prep to 10 in Victorian schools. They provide a whole school curriculum planning framework that sets out learning standards for schools to use to plan their teaching and learning programs, including assessment and reporting of student achievement and progress. Implementation of the Standards commenced at the beginning of 2006 (Victorian Curriculum Assessment Authority, 2004).

The literature review examined the diversity that exists in what constitutes or even defines thinking as well as the many approaches in existence that teach and promote this aspect of learning with children. The review included perspectives of integrated inquiry learning that enable and empower learners to engage in authentic learning experiences and therefore construct their own meaning. The review provides insight into the type and range of ICT being utilised in education settings locally and globally in the 21st century.

The themes and patterns that emerged from this process encompassed four observable stages related to patterns of behaviour exhibited by the student participants. These
stages are identified as Discovering and Engaging stage, Demonstrating stage, Analysing stage, and Synthesising stage. In addition to displaying behaviours related to these key stages, the participating students clearly developed the features of engaged learning providing insight into the teaching and learning practices essential for the development of these behaviours. Recommendations for enhancing practice flow from this thesis which expands and enlightens research regarding the integration of ICT and explicit thinking skills into the school curriculum.
CHAPTER 1

INTRODUCTION

1. 1. THE FOCUS

This thesis explores the influences of integrating information and communication technologies (ICT); incorporating the explicit teaching of thinking skills across the curriculum; planning and implementing inquiry-based learning, reflecting the approach of Murdoch (1992; 1997; 1998; 1999; 2004; Hamston & Murdoch, 1996), on students’ learning in a Victorian context. The research was undertaken within a primary school setting. The case study site is located in metropolitan Melbourne in Victoria, Australia. The investigation provides documentation of the explicit and implicit influences on the learning of the students in this primary classroom.

This study sets out to achieve the following research objectives:

- to investigate the ways in which the influences impact on Year 1/2 students’ learning in a Victorian primary class context, thus addressing the main research question: what effects do the integrating of ICT, the incorporating of the explicit teaching of thinking skills across the curriculum, and the planning and implementing of integrated inquiry have on students’ learning?

- to describe and interpret the findings regarding the practices that influence the students’ learning in the primary classroom in metropolitan Melbourne in Victoria, Australia.

1. 1. 1. The Significance of the Study

Basic human learning can occur in a variety of ways: rote, mimicry and unquestioning acceptance of facts. But human learning has the capacity to be far richer than this. We can learn in a way that transforms; in a way that endows our experience with meaning; in a way that empowers us to perceive differently, to value and appreciate differently, to adapt and create (Vosniadou, 2001; Eisenberg & Johnson, 2002;

In 1999 The Adelaide Declaration on National Goals for Schooling in the Twenty-First Century, which provides a foundation for the intellectual, physical, social, spiritual, moral and aesthetic development of young Australians, was developed by the Commonwealth of Australia Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). This set out desired characteristics of Australians in their different life roles as citizens, family members and workers, and addressed the notion of what learning is, and what it is in the nature of learning that we value.

Aspects of the goals of the Adelaide Declaration (State Territory and Commonwealth Ministers of Education, 1999) and those included in the overview of CSF II (BOS, 2000) are implicit in the research undertaken. For example the following set of goals was incorporated into the curriculum planning and implemented in this study.

**Goals**

1. **Schooling should develop fully the talents and capacities of all students. In particular, when students leave schools they should:**
   1.1 have the capacity for, and skills in, analysis and problem solving and the ability to communicate ideas and information, to plan and organise activities and to collaborate with others
   1.2 have qualities of self-confidence, optimism, high self-esteem, and a commitment to personal excellence as a basis for their potential life roles as family, community and workforce members
   1.3 have the capacity to exercise judgement and responsibility in matters of morality, ethics and social justice, and the capacity to make sense of their world, to think about how things got to be the way they are, to make rational and informed decisions about their own lives and to accept responsibility for their own actions
   1.4 be active and informed citizens with an understanding and appreciation of Australia’s system of government and civic life
   1.5 have employment-related skills and an understanding of the work environment, career options and pathways as a foundation for, and positive attitudes towards, vocational education and training, further education, employment and life-long learning
   1.6 be confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society
1.7 have an understanding of, and concern for, stewardship of the natural environment, and the knowledge and skills to contribute to ecologically sustainable development

1.8 have the knowledge, skills and attitudes necessary to establish and maintain a healthy lifestyle, and for the creative and satisfying use of leisure time.

(Ministerial Council on Education, Employment, Training & Youth Affairs, 1999, National Goals section, para. 1)

Many factors, including the publication of these documents, impacted on schools and places of learning. The ICT in existence today impinges on all aspects of daily life – including those of schools. Affordability, availability and capability have placed personal computers in workplaces, homes and schools all over the world. One can obtain a computer today that is fast and efficient, with multimedia abilities, vast storage and capabilities, and that can be carried around easily. Many students have a great awareness of these technologies and are adept in their usage. Over the 27 years spanning 1980–2007, there have been extraordinary developments in ICT. Emails can have text, photographic images, video clips and sound. Chat rooms exist where people from geographically diverse locations can communicate in real time for relatively little cost and with the possibility of viewing each other using web cams. ICT exists now that allows instantaneous communication across boundaries of space and time with impressive quality.

In Victoria, schools such as the Navigator schools (State of Victoria, Department of Education & Training, 1998) and LaTTiCE (Catholic Education Office, 2004) schools in the Catholic system have been set up in order to fully utilise new ICT. These technologies are incorporated with an approach to learning and teaching that enhances students’ opportunities for access and promotes independent learning. Students are challenged with complex, authentic tasks with an emphasis on lengthy multidisciplinary projects, cooperative learning groups and flexible scheduling.

The following two educational authorities in the state of Victoria, the Victorian Department of Education and Training (renamed Department of Education Victoria in 2006) and the Catholic Education Office, introduced initiatives that brought ICT to the forefront in school experiences.
The Technology for Catholic Schools (TCS) initiative of the Catholic Education Office commenced in 1999 with the establishment of the Catholic Education Victoria Network (CEVN). The CEVN links all Catholic Education Offices and most Catholic schools throughout Victoria. The TCS initiative connected all participating schools to the Internet, assisted in establishing schools with a Local Area Network (LAN) and provided support for schools in learning technology planning and professional development.

The TCS initiative also incorporates:

- A Professional Development program for schools that is informed and supported by the Learning & Teaching Technologies in Catholic Education (LaTTiCE) project
- The LaTTiCE project that has undertaken practical research on the implementation and integration of ICT into the classroom, and that has assisted with the training and professional development of all staff in Catholic schools
- Collaborative initiatives of the Catholic Education Office with the Department of Education & Training (DE&T) to provide access for schools to appropriate educational online resources through the Education Channel

(Catholic Education Office, 2004, Technology for Catholic Schools section, para. 1)

Many educationalists endeavour to support the development of all students as active, independent and reflective learners by providing a wide range of teaching strategies and learning opportunities. The integration of ICT supports students as they learn through a process of Inquiry. ICT is used as an integral tool to enhance our learning and teaching practices. The students have been involved in designing and developing an intranet that is used to foster effective communication and collaboration throughout the school community (St Vincent de Paul School Strathmore, cited in Catholic Education Office, 2004).

The Navigator Schools Project was launched in October 1995 by the Premier of Victoria, the Hon. Jeffrey Kennett, MP.

The objectives of the project were to:

- create a network of exemplar schools with accessible models of new learning environments where there is access to technology in every classroom
- share with others what is learned in creating those environments
• provide evidence of additional teaching and learning outcomes in a technology rich environment, and
• provide a premium professional development resource for teachers and principals across the state.
(State of Victoria, DE&T, 1998, Navigator Schools Project pdf, p. 5)

It was anticipated that benefits would include individual schools restructuring and working to enhance teaching and learning, while also benefiting from shared goal setting and information sharing organised by the Learning Technologies section of a school.

The expectation behind the establishment of the Navigator School Project in 1995 was that routine access to a range of learning technologies, networked communications and a commitment to changed classroom practice would:

• lead to enhanced student learning outcomes, including levels of achievement, engagement, motivation and understanding
• provide students, teachers and administration with the infrastructures to better manage, organise and distribute information, and extend learning beyond the classroom, to include resources and collaborators in other places, both local and global.
(State of Victoria, DE&T, 1998, Navigator Schools Project pdf, p. 6)

Powerful human learning involves constructing and reconstructing our own meaning in the world and, while there are vital facts that one needs to know in order to facilitate further learning, the challenge for educators is to discern what facts are essential and what procedures and skills need to be automated to ensure that further learning and thinking are not impeded. New perspectives and new tools can enhance the quality of education. Many researchers are investigating and writing about the ways in which we can harness new technologies and integrate them into meaningful and purposeful activities and learning for the classroom (Jones, Valdez, Nowakowski & Rasmussen, 1995).

Holt (1971) writes of each of us having four worlds. The first world is the world inside our skin; the second world is the world the individual knows about from direct experience; the third world is the world the individual knows about, but has not experienced in any direct way through the senses; the fourth world is the infinite
world of possibilities which the individual has not yet heard of or even envisaged. Natural learning is dynamic, and involves the interaction and growth of all of these worlds, where our ways of knowing integrate gradually and naturally to form a coherent whole. This study is concerned with investigating the ways in which one classroom has endeavoured to embrace aspects of learning that assist the students in venturing into this fourth world.

In the past this has not necessarily occurred for learners in a formal setting, where learning has traditionally been less about learning and more about gaining of knowledge of the world we know about, but do not know from experience. However what is most important in the learning process is thinking about knowledge and experience, and constructing personal meaning, which is what humans do, and the learners’ feelings and emotions are integral parts of the process. While learning, learners experience the world in meaningful patterns or organised wholes. They respond to meanings and make intellectual connections so as to make sense (Rogers, 1994).

1.2. RATIONALE

Computers and the Internet have introduced dramatic changes to work processes and to the organisation of corporate structures over the past decade (Lindbeck & Snower, 1999). Correspondingly, students are faced with computers both at home and at school, and governments worldwide have initiated schemes to equip schools with classroom computers and Internet connections (Fuchs & Woessmann, 2004). The ICT in existence today impinges on all aspects of daily life and many students’ awareness of these technologies will mean they are more capable in using them than many teachers. How are schools adapting to these issues? Are these technologies being incorporated into teaching and learning situations? If so, how? Have teaching practices been modified to embrace these technologies?

There are conflicting opinions about the impact of technology arising from the research. Means and Olsen (1994) consider that certain technologies have definitely found niches in education; however, they opined that the technology of the previous
two decades had changed schools far less than it had the worlds of work, entertainment and communication. Early efforts to introduce technology in schools failed to have profound effects because the attempts were based on the wrong model of teaching with technology, and the applications provided were an incomplete and imperfect match with the bulk of the core curriculum. Means and Olsen (1994) also consider that the applications either focused narrowly on drill and practice in very basic skills, or on more challenging material that only covers a narrow slice of a subject domain but is commonly reserved for the fast-working, gifted or affluent.

Fuchs and Woessmann (2004), in endeavouring to estimate the relationship between computers and student learning empirically, use the student-level dataset of the Programme for International Student Assessment (PISA), an international student achievement test of 15-year-old students conducted in 2000 by the Organisation for Economic Co-Operation and Development (OECD). The study tested student performance in reading, maths and science in 32 developed and emerging countries, 28 of which are OECD countries. The PISA sampled a representative random sample of the population of 15-year-old students in each country. The OECD (2001) reports bivariate correlations of student performance with such features as reading interest, motivation, engagement and different teaching techniques. Fuchs and Woessmann (2004) found disappointing results in terms of effects on students’ educational performance in the areas of computer availability and use at school which corroborate previous work on school computers such as Angrist and Lavy (cited in Fuchs & Woessmann, 2004) and Rouse and Krueger (cited in Fuchs & Woessmann, 2004).

Bivariate results on computer availability at school are severely biased because the availability of school computers is strongly correlated with the availability of other school resources. While the bivariate correlation between the availability of computers at school and student performance is strongly and statistically significantly positive, the correlation becomes small and statistically indistinguishable from zero once other school characteristics are held constant. That is, students who never use computers or the Internet at school show lower performance than students who sometimes use computers or the Internet at school. However students who use them several times a week perform even lower. Two possible explanations for this pattern are offered. On the one hand, teachers might refrain from using computers with
students of a low ability level. Then, the first part of the pattern may simply reflect an ability bias, and the second part of the pattern may reflect that computer use might actually have decreased student learning, as has also been found in a previous quasi-experimental study (Angrist & Lavy, cited in Fuchs & Woessmann, 2004).

In contrast, the BellSouth Foundation in 2000 launched the ‘Power to Teach Program’ in nine Southern US States and set out to explore ways to help create a critical mass of teachers who could capably incorporate technology into everyday classroom experiences. In-depth examination of the data occurred and particular note was made of the vast differences between student and teacher perceptions of instructional technology practices. Teachers conveyed that they felt they were making dramatic leaps in their ability to harness the power of technology to create stimulating, engaging and challenging learning experiences for students. The students, however, conveyed that they themselves felt they had seen few changes in classroom instruction and revealed that they were hungry for more opportunities to use technology in challenging and meaningful ways in the learning environment (BellSouth Foundation, 2002).

Sandholtz, Ringstaff and Dwyer (1997) present information based on 10 years of data gathered from a cross section of elementary and secondary schools in America through participation in the Apple Classrooms of Tomorrow (ACOT) project. The project started in 1985 and is research collaboration between universities, public schools, and Apple Computer, Inc. to investigate the results of teachers and children routinely using technology for learning. The information includes case studies and teachers’ personal perspectives from experiences in ACOT classrooms.

The fundamental skills of reading, writing, and arithmetic remain the cornerstones of schooling and student learning. Studies have shown that students with routine access to technology learn these basic skills faster and better when they have a chance to practice them using technology. One of the reasons cited for this improvement is that students are engaged by the technology. As a result, they spend more time learning and practicing the basic tasks than students who approach the same tasks in a traditional paper-and-pencil manner. Students are more motivated to learn when technology is part of their daily school experience. (Sandholtz, Ringstaff & Dwyer, 1997 cited in Apple Education, 2002, Mastering Fundamental Skills section, para. 1)
The findings of a research study conducted by Rockman ET AL (2000, 1998, 1997) in various American schools supports technology's positive effect on writing skills. Researchers found that students who use laptops regularly at school and at home are better writers, outperforming their peers in all four scored areas of writing assessment – content, organisation, language/voice/style and mechanics. When asked what impact using laptops had on their writing, students reported that computers allowed them to do more extensive editing, which led to better writing.

Research has also shown that the benefits of technology go well beyond the classroom. A study conducted by the U. S. Department of Education revealed that when schools provided students with home computers and modems so they could connect to the schools’ networks, students increased the amount of time spent on educational activities outside of school. Furthermore, students with home computers spent less time watching television, enhanced their problem solving and critical thinking skills, improved their writing and maths skills, and showed greater computer literacy (U. S. Department of Education, 1996).

Valdez, McNabb, Foertsch, Anderson, Hawkes and Raack (2000) observe that researchers have a difficult time studying technology’s impact on learning because they have been studying a moving target. Rapid technological changes and advances in software development have made some findings obsolete even before they are published. Furthermore, contextual factors surrounding uses of technology have made generalising findings difficult. Valdez et al.’s work on computer-based teaching and learning suggests that to understand the value and impact of technology in education, there must be recognition of three distinct phases in the evolution of its uses and expectations: Print Automation, Expansion of Learning Opportunities, and Data-Driven Virtual Learning.

Most of the studies undertaken during Phase I (Print Automation) reflected the use of technology at that time and examined the success of computer-assisted software in improving the learning of segmented content and/or isolated skills. A number of studies of students identified as at risk of failure reported dramatic improvements in student achievement after the introduction of technology into the classroom (Fuchs, Fuchs, Hamlett, & Allinder, 1991; Griffin, 1991;Wilson, 1993). A study conducted by
Sinatra, Beaudry, Pizzo and Geisert (1994), which examined the effect of integrated learning systems on the achievement of fourth-grade students with reading disabilities, reported dramatic improvement in test scores and found that at-risk students show substantial improvement when technology is introduced into their curriculum. They considered that the reason for this is that technology provides educators with a way to individualise and customise the curriculum to match learners’ developmental needs, and also provides a non-threatening and motivating environment for repetitious learning tasks.

In the Phase II (Expansion of Learning Opportunities), the research suggested that computer-based technology could enhance learning. In a meta-analysis that examined the impact of technology on student learning, Statham and Torell (1996) found increased teacher-student interaction, cooperative learning, problem solving and inquiry. Technology tools could amplify, extend and enhance human cognition, and could also facilitate access to human, material and technological resources while helping students to store, reshape and analyse information. Technology tools enabled students to be hypothesis testers, with the result that the knowledge that was acquired could be used more effectively (Jonassen & Reeves, 1996). However, Statham and Torell (1996) cite one essential condition for student learning to take place: computers should be used less for drill-and-practice in the classroom and more as open-ended thinking tools and content resources.

In Phase III (Data-Driven Virtual Learning) of using computers to increase classroom resources there exists both an impetus for and outcome of transforming the role of the teacher in the classroom. Once the sole disseminator of information, teachers are now guides, mentors, facilitators and co-learners, whose roles are to motivate students and engage them in discussion and reflection. On-line communication brings other experts and community members into the classroom where content experts provide real-world examples and model performances, and offer otherwise unavailable enrichment opportunities for students (Moller, 1998).

As an added response to the third phase, Kamil and Intrator (1997) suggest that it is important to monitor these trends because we are in danger of having rapid hardware and software development overwhelm
any input that might come from educational research. The product life cycle of hardware and software is far shorter than the typical timeline for educational research studies. (p. 395)

Teachers who use technology need to become action researchers who can produce and publish research findings on a more rapid cycle. Data-driven practices are key to helping this happen. One result is the feasibility of technology-based educational institutions. The structures and curricula, which could result from technology-based education, have far-reaching implications (Valdez et al., 2000).

Hanley (1994) expresses concerns about the students of the USA lagging behind other countries on achievement tests. Her solution to address this is to prepare students to become good adaptive learners and be able to apply what they learn in schools to the various and unpredictable situations that they may encounter. This could be achieved by changing the focus of classrooms from teacher-dominated to student-centred, using a constructivist approach. Constructivism is based on the notion that human beings are not passive recipients of information but actively take knowledge, connect it to previously assimilated knowledge, and make it theirs by constructing their own interpretation.

Lau (2004), in preparing international guidelines for an information literacy programme, states that life-long learning relies on the information skills of learners.

Constructivist approach centers pedagogy on students’ constructing their own understanding by active investigation and thought, instead of memorizing facts presented in the class lecture. Such pedagogical approach places information at the center of the learning process, where information literacy is needed to enable students to be qualified learners. Information literacy is or should be based, on the other hand, on resource-based-learning, information discovering and inquiry-based-instruction. (Chapter 1, Constructivist Approach section)

Educational authorities and institutions have provided, and are continuing to provide, financial resources, support personnel and opportunities for professional development to support initiatives set up to enhance learning through increased use of technology in schools. I was keen to investigate the interrelatedness between how young learners
learn, an inquiry-based approach to learning, the explicit teaching of thinking skills and the use of ICT. The student participants are part of this technologically advanced age and yet for many, participation was generally related to the viewing of television/video/DVD’s, listening to music on radio or CD, and playing electronic games. I considered that there existed a wonderful opportunity to be part of and observe an exciting learning journey.

This study incorporates an inquiry-based approach to learning, the explicit teaching of thinking skills and the use of ICT in the learning experiences of a Year 1/2 class in a Catholic school in Victoria, Australia. The documentation of such influences is an important step in understanding the process and, in turn, improving such processes. This study is based on constructivist inquiry (Denzin & Lincoln, 1994; Geertz, 1973; Guba & Lincoln, 1994), individual case study analysis (Stake, 1978, 1980, 1988, 1994, 1995, 2000; Yin, 1981, 1984, 1989, 2002) and action research (Cherry, 1998; Kemmis & McTaggart, 1982, 1988, 1990, 2004), and highlights the complexity of such research and the need for ongoing research of this nature. The current lack of literature and documentation makes this research timely, given the massive technological changes that continue to occur.

1.3. THESIS ORGANISATION

1.3.1. Background

This study describes, interprets and provides an understanding of what effects the integrating of ICT, the incorporating of the explicit teaching of thinking skills across the curriculum, and the planning and implementing of integrated inquiry have on students’ learning. The study must address several issues in order to give a contextual framework to the investigations.

The present chapter introduces the focus of the study.

Chapter 2 explores the relevant literature related to the topic and research question under investigation. The literature review examines interrelated areas of investigation that are relevant to this study.
• Setting the Victorian Educational Context
• Engaged learning (Jones, Valdez, Nowakowski & Rasmussen, 1995)
• Integrating learning technologies (Jonassen, 1994; Jonassen & Reeves, 1996; Lajoie, 2000)
• ICT (White, 2005; Newhouse, 2002)

Chapter 3 explores and explains the research methodology used in this study. The type of information sought here is to do with understanding and describing ways, through interpretative analysis and triangulation of data, in which ICT, thinking skills and inquiry-based learning are impacting on learning and empowering learners. The study is established within the paradigm known as constructivism using constructivist (naturalistic) inquiry (Denzin & Lincoln, 1994; Geertz, 1973; Guba & Lincoln, 1994) and combines qualitative methods of data collection (Patton, 2002), a case study approach (Stake, 1978, 1980, 1988, 1994, 1995, 2000; Yin, 1981, 1984, 1989, 2002) and action research (Cherry, 1998; Kemmis & McTaggart, 1982, 1988, 1990, 2004).

Chapter 4 outlines the case study site and the participants involved in the study who were members of the participant researcher’s classroom. Extended involvement with the participants through action research and selected case studies was the linchpin in this investigation. Chapter 5 describes the main findings. Four observable behavioural stages emerged from the research data collected and illustrate the behaviours exhibited by the participating students as they progressed through the stages.

Chapter 6 summarises the findings and draws conclusions relevant to discovering what effects the integration of ICT, inquiry-based learning and the explicit teaching of thinking skills has on children’s learning.
Analysis and problem solving are central to the explicit teaching of thinking and the related tasks that are fundamental to this research, as are the communication of ideas and information gathered by the participants and the collaborative practices they displayed during the implementation. Confidence and increased self-esteem appeared evident as the participants developed deeper understandings and were striving for excellence. Learning about and learning through the use of technology were very much part of what was undertaken by the participants as they became confident, creative and productive users of ICT and displayed understanding and skill that empowered them with the confidence to embrace future technology. The participants deepened their knowledge, developed skills and formed attitudes that will assist them in discriminating in future choices.

1.4. **BOUNDARIES OF THE RESEARCH**

A Doctor of Philosophy dissertation is limited by the very nature of the investigation: one person exploring an issue in a limited time frame. In addition, this research is contextualised to a group of participants in a particular classroom in a Victorian urban school site. The data is established within this setting, which is the strength and the limitation of the constructivist inquiry approach. To obtain rich data requires engaged and prolonged interaction with the class of children involved. Multiple in-depth case studies are therefore not possible. This research, through interpretative analysis and triangulation of data, presents a comprehensive background of the circumstances at a given point in time and under the contextual restrictions (outlined above) contained within this thesis. This study investigates one class of children’s interaction and use with an ICT and thinking skills curriculum.
CHAPTER 2

LITERATURE REVIEW

2. 1. INTRODUCTION

This research study investigates how the adopting, adapting and integrating of information and communication technology (ICT) and the incorporation of explicit teaching of thinking skills across the curriculum impact on student learning. Questions that the study seeks to address are how are learners being empowered and how is learning enhanced through the introduction and implementation of various ICT and thinking curriculum practices. An integrated-inquiry approach to learning (Murdoch (1992, 1997, 1998, 1999, 2004; Hamston & Murdoch, 1996), which provides meaningful, engaging and purposeful educational activities, was used during the investigation.

The first section of this chapter considers what is meant by the term ‘learning’ and what are some of the issues impacting on the ways in which schools plan for and implement learning opportunities in an ever-changing world.

Our curriculum prepares students for a world in which work, society, community and personal relationships are subject to increasingly complex pressures and influences. It is a world which is global in its outlook and influences, constantly changing at an ever-increasing pace, complex in its political and economic structures and processes and underpinned by high speed and interactive information and communication technology (ICT). (Victorian Curriculum Assessment Authority, 2004, p. 2)

The second section of this chapter explores the concept of thinking skills. Educational writers have explored the place of thinking skills in schools and much debate has occurred regarding the definition and types of thinking and thinking skills, and whether or not thinking skills can or ought to be taught explicitly (Atkin, 1999; Buzan, 1995; Beyer, 1984; Carr, 1990; Clark, 2001; de Bono, 1969, 1976, 1983, 1984, 1986, 1992; Falkof & Moss 1984; Gardner, 1983; Goodman, 1990; Gough 1991; Johnson, 1984; Park & Black, 1990; Raths, Wassermann, Jonas & Rothstein, 1967; Reid, 1993; Sadler & Whimbey, 1985; Shrestha, 1989; Sternberg, 1985, 1997;...

The new framework will identify a focused set of core concepts and skills which are essential to the development of students’ learning. The knowledge derived from the disciplines underpins the way all of us make sense of the world. Providing access to these powerful ways of thinking and understanding the world is the central and unique task of education. Equally important is the capacity to develop skills and attributes that students will need to become active and productive citizens. The metacognitive skills proposed in particular need to be much more explicitly valued and developed across the curriculum than is currently the case. (Victorian Curriculum Assessment Authority, 2004, p. 6)

These metacognitive skills – inquiring, processing information, creative thinking, reasoning, problem solving and evaluation – are considered essential to ongoing learning across the curriculum and beyond formal schooling.

Another framework which is widely used in educational communities and was developed from the MI (multiple intelligences) theory also addresses the issue of thinking skills. The theory of multiple intelligences developed by Gardner (1983) suggested that the traditional notion of intelligence, based on IQ testing, was far too limited. He proposed seven different intelligences to account for a broader range of human potential in children and adults. These intelligences are described as linguistic, logical–mathematical, spatial, bodily–kinaesthetic, musical, interpersonal and intrapersonal. More recently, Gardner (cited in Gilman, 2001) has nominated three additional intelligences: naturalist, spiritual and existential intelligence. ‘The monopoly of those who believe in a single general intelligence has come to an end’ (Gardner, 1999, p. 203). The theory of multiple intelligences shares some common ideas with other theories of individual differences, such as Cronbach and Snow’s (1977) Aptitude-Treatment Interaction (ATI) theory, Guilford’s (1967) Structure of Intellect (SI) theory and Sternberg’s (1977) Triarchic Theory (cited in Kearsley (n.d.).

The main idea of the MI framework is that people are smart in ways beyond those traditionally associated with school learning: that of being linguistically smart and
mathematically smart. With this belief in mind, Gardner (2001) tells us that the primary cognitive purpose of education for the young should be to help students understand the world around them – the physical world, the biological world, the social world and the world of personal experiences. He proposes that this can best be done by first training them in the three basic literacies of reading, writing and calculation, with possible inclusion of computing, and then introducing them to the major families of disciplines. Here, Gardner differentiates between the capacity to think intelligently and knowing lots of information, suggesting that understanding is more likely to come about if one has a rounded, three-dimensional familiarity with a subject in order to probe it in many different ways. This is the premise of MI, in that if we are willing to spend time on a topic and probe it penetratingly, it does not have to be approached in just a single way, which is almost always through written texts or lectures.

Instead we can learn about it in many different ways, using our multiple intelligences, and that concept or topic is much more likely to remain with us, embedded in our neural networks and to be usable in flexible and innovative ways.

(Gardner, 2001, iv Looking in Both Directions section, para. 3)

Edward de Bono, regarded by many to be the leading authority in the world in the field of creative thinking and the direct teaching of thinking as a skill, has written over several decades of the importance of the explicit teaching of thinking skills. Programmes have been devised for use with learners ranging in age from kindergarten to senior executives in business. De Bono (1969) states that ‘the whole of our thinking, the whole of our language, the whole of our education, perhaps the whole of our Western culture, is concerned with the formation and communication of ideas. Therefore, there is a need for thinking tools that make possible the re-forming of ideas’ (p. 9).

The third part of the chapter is concerned with ICT) what this term generally means in an educational setting at this point in time and in what ways technology impacts on student learning.

Imaginative progressive teachers who had computers in the classrooms and were prepared to give students the time and support to learn often created wonderfully fertile learning
environments – children can learn to use computers in a masterful way; learning to use computers can change the way they learn everything else.
(cited in Casey, 2000, p. 1776)

The Australian Council of Deans of Education’s (2001) charter: *New Learning: A Charter for Australian Education* is a charter for change. This charter presents eight propositions that will shape the future environment of learning. The fifth proposition is concerned with technology and states that technology will become central to all learning. This proposition contends that we need to learn through, but also about technology. Technology is not just a tool for learning. It should be one of the main things that learning is about – a message as well as a medium.


Inquiry approaches provide conditions which allow learners to take control of their learning, to build on their prior knowledge, to make and test predictions, to gather and organise information and to synthesise their findings. These conditions encourage risk-taking, approximation, the exploration of patterns and relationships, reflection on experience and an understanding of differing interests, points of view and value positions.
(Pigdon & Woolley, 1992, p. 16)

The inquiry approach for use in the classroom is a recognised method for classroom interaction (Erdal & Ongel, 2003; Sandoval, Deneroff & Franke, 2002; Otieno, 1999; Peck & Hughes, 1994; Bonnett, 1991). Alexander and Murphy (1998) tell us that cooperative and inquiry-based approaches can help teachers to focus on creating interest and a positive environment for learners as learners who have positive self-concepts and who believe they are in control of their own learning are more likely to succeed in learning. This construction of meaning is enhanced by inquiry learning and cooperative learning and through social interaction.
From a constructivist perspective learning can be thought of as a social process of making sense of experience in terms of what is known. Under this constructivist world view, teaching methods such as inquiry learning and cooperative learning are important as they move from teacher-centred instruction to student-centred instruction enabling learners to construct their own knowledge. (Erdal & Ongel, 2003, p. 2)

2.2. LEARNING THEORY

2.2.1. Historical Context

Learning is relative to the world in which one lives and the demands of one’s world change constantly. What needs to be learned also changes and educators need to be mindful of this. ‘Do not confine your children to your own learning, for they were born in a different time.’ (Hebrew Proverb, n. d. para. 10)

Toffler (as summarised in Atkin, 1999) reflects on ways in which life has changed over time. This summary highlights the increased amount of learning and different learning that arose over time as developments evolved and discoveries were made.

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<th>Human life viewed over time …</th>
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<td>It has been observed, for example, that if the last 50,000 years of man’s existence were divided into lifetimes of approximately 62 years each, there have been about 800 such lifetimes. Of these 800, fully 650 were spent in caves. Only during the last 70 lifetimes has it been possible to communicate effectively from one lifetime to another – as writing made it possible to do. Only during the last 6 lifetimes did masses of people ever see a printed word. Only during the last 4 lifetimes has it been possible to measure time with any precision. Only in the last 2 lifetimes has anyone anywhere used an electric motor. And the overwhelming majority of all the material goods we use in daily life have been developed within the present, the 800th lifetime.</td>
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Figure 1: Atkin’s (1999) summary of Toffler’s work

What it is not able to reflect is the further developments that have occurred and are still occurring that continue to shape and change the world and the various needs related to the changes. As with continued development, demands are made in many
areas of human life, and in particular that of learning as people come to terms with the increased demands of what is still needed to be learned.

2.2.2. Defining Learning

What is learning? The Oxford dictionary (1969) tells us that to learn is to ‘get knowledge of or skill in by study, experience or being taught’ (p. 455). Agnes (1999) has defined learning as acquiring knowledge or skills. Schools have always been concerned with this scholarship or formal learning, and this has been the subject of much consideration.

Behaviourists believe that environment shapes behaviour and are concerned with the changes in a student’s behaviour that occur as a result of learning. Skinner (1953, 1957, 1968), often called the father of behaviourism, identifies two types of conditioning: respondent and operant. Behaviourist theory is based upon the idea that learning is a function of change in overt behaviour.

Cognitive theorists including Piaget (1955), Bandura (1986) and Vygotsky (1962/1934) are concerned with the changes in a student’s understanding that result from learning and believe that learning must be meaningful. Cognitive learning is based on mental structures through which students organise their perceived environment. Vygotsky’s (1962/1934, 1978) social cognition learning model asserts that culture is the prime determinant of individual development. Humans are the only species to have created culture and every human child develops in the context of a culture; therefore a child’s learning development is affected in various ways by the culture in which he or she is situated.

Experiential theorists believe the focus on experiential learning which requires personal involvement, self initiation and evaluation addresses the needs of the learner (Kolb & Fry, 1975). Rogers (1969), in writing of experiential theory, distinguish two types of learning: cognitive (meaningless), which corresponds to academic knowledge such as learning vocabulary or multiplication tables, and experiential (significant), which refers to applied knowledge such as the learning one needs in order to (for example) repair an engine in a car.
Gardner (1983) suggests there are at least seven ways that people have of perceiving and understanding the world, and labels each of these ways as a distinct intelligence, a set of skills allowing individuals to find and resolve genuine problems they face. Bransford, Brown and Cocking (2000, p. 2) state that it is now known that very young children are competent, active agents of their own conceptual development.

Learning is about people constructing meaning and understanding the world beyond merely that of knowledge acquisition and doing this through using varying skills and abilities.

2.2.3. Learning Theories

Brain-based theories exist. Brain-based learning (Caine & Caine, 1991) is based on the structure and function of the brain, meaning that as long as the brain is not prohibited from fulfilling its normal processes, learning will occur. McCarthy’s (1980, 1987) ‘right brain versus left brain’ theory of the structure and functions of the mind suggests that the two different sides of the brain control two different modes of thinking. It also suggests that each of us prefers one mode over the other.

Constructivists, following on from the works of Piaget (1955), Dewey (1916, 1933, 1938) and Vygotsky (1962/1934), believe that learning is constructed by a student. Piaget’s theory is based on the idea that the developing child builds cognitive structures for understanding and responding to physical experiences within his or her environment. The learner determines his or her own best way of learning, and this should not be externally determined and controlled. The learner must be active, and select and interpret information from the environment. Knowledge is a personally meaningful construction. Learning is about reflecting on our experiences and constructing our own understanding of the world in which we live. ‘Learning is not discovering more, but interpreting through a different scheme or structure’ (Brooks & Brooks, 1993, p. 5).

Learning is generally considered as making meaning from experience. In more recent times, change has occurred where the conventional beliefs of positivism that looked for an external reality conventional paradigm have yielded to the naturalistic,
hermeneutic or interpretive paradigm – the constructivist paradigm (Lincoln & Guba, 1989). Research continues to offer new insights into the learning process and the development of knowledge in many subject-matter areas. Consequently, curricula and instruction have changed in schools as they attempt to become more student-centred than teacher-centred, to connect the school to real-life situations, and to focus on understanding and thinking rather than on the memorisation, drill and practice methods of the past.

Every educational process contains some notion that learning takes place, and generally educational work carries an implicit concept of learning: what it is, who does it, how it happens and what can be done to facilitate it. Researchers are putting forward ways of looking at learning that promote engaged, meaningful learning and collaboration. People are able to learn in ways that transform and enrich experiences, and empower perceptive and creative abilities. A critical aspect in designing education for learning is to determine what it is in the nature of learning we value. In general educational terms, a view of learning that is grouped under the theories of constructivism, with its emphasis on holism and on learners making connections, is forming the basis for curriculum development across states in Australia in the form of essential learning frameworks (Department of Education, Training and Employment, South Australia, 2001; Victorian Curriculum Assessment Authority, 2004; Department of Education Tasmania, 2004; Department of Employment Education and Training Northern Territory, n. d.; The State of Queensland (Department of Education and the Arts), 2004).

Vosniadou (2001), in writing for the International Academy of Education, developed a booklet of educational practices that generally improve learning. This booklet focuses on aspects of how children learn and provides a synopsis of research on educational topics of international importance. The principles attempt to integrate research coming from diverse areas of psychology – including educational, developmental, cognitive, social and clinical psychology – and as a whole are meant to provide a framework for instruction and curricula. The summary of these principles is tabled below.
Learning requires the active, constructive involvement of the learner (Elmore, Peterson & McCarthy, 1996; Piaget, 1978; Scardamalia & Bereiter, 1991).

Learning is primarily a social activity and participation in the social life of the school is central for learning to occur (Brown, Ash, Rutherford, Nakagawa, Gordon & Campione, 1996; Collins, Brown & Newman, 1989; Rogoff, 1990; Vygotsky, 1978).

People learn best when they participate in activities that are perceived to be useful in real life and are culturally relevant (Brown, Collins & Duguid, 1989; Heath, 1983).

New knowledge is constructed on the basis of what is already understood and believed (Bransford, 1979; Bransford, Brown & Cocking, 1999).

People learn by employing effective and flexible strategies that help them to understand, reason, memorise and solve problems (Mayer, 1987; Palincsar & Brown, 1984; White & Fredericksen, 1998).

Learners must know how to plan and monitor their learning, how to set their own learning goals and how to correct errors (Brown, 1975; Boekaerts, Pintrich & Zeidner, 2000; Marton & Booth, 1997).

Sometimes prior knowledge can stand in the way of learning something new. Students must learn how to solve internal inconsistencies and restructure existing conceptions when necessary (Carretero & Voss, 1994; Driver, Guesne & Tiberghien, 1985; Schnitz, Vosniadou & Carretero, 1999; Vosniadou & Brewer, 1992).

Learning is better when material is organised around general principles and explanations, rather than when it is based on the memorisation of isolated facts and procedures (Halpern, 1992; Resnick & Klopfer, 1989; Perkins, 1992).

Learning becomes more meaningful when the lessons are applied to real-life situations (Bruer, 1993; Bransford, Brown & Cocking, 1999; Bereiter, 1997).

Learning is a complex cognitive activity that cannot be rushed. It requires considerable time and periods of practice to start building expertise in an area (Bransford, 1979; Chase & Simon, 1973; Coles, 1970).

Children learn best when their individual differences are take into consideration (Case, 1978; Chen, Krechrevsky, Viens & Isberg, 1998; Gardner, 1991, 1993).

Learning is critically influenced by learner motivation. Teachers can help students become more motivated learners by their behaviour and the statements they make (Deci & Ryan, 1985; Dweck, 1989; Lepper & Hodell, 1989; Spaulding, 1992).

**Figure 2:** Educational practices that improve learning (Vosniadou, 2001), pp. 8–22

These principles present the essence of a constructivist approach in the construction of meaning by the learner in an environment where the learner’s experiences are challenged, enriched, expanded and elaborated through the support of educators who assist the learner in meaning making. There are many names and labels given to the constructivist notion of learning, but the learning process is described as an ongoing spiralling process, with good learning as the desired outcome.

In writing of learning, Holt’s (1971) model of constructing and reconstructing our own meaning presents each of us as having four worlds, with natural learning being a dynamic interaction and growth of all of these worlds, through which our ways of knowing integrate gradually and naturally to form a coherent whole.
World One is the world inside my skin, World Two is what I might call ‘My World’, the world I have been in and know, the world of my mental model. This world is made up of places, peoples, experiences, events, what I believe, what I expect. While I live, this world is part of me, always with me. When I die it will disappear, cease to exist. There will never be another quite like it. I can try to write or talk about it, or express it or part of it in art or music or in other ways. But other people can get from me only what I can express about my world. I cannot share that world directly with anyone.

World Three is something different. … It is the world I know of, or know something about, but do not know, have not seen or experienced. It has in it all the places I have heard about, but not been to; all the people I have heard about, but not known; all the things I know I have done, and that I might do, but have not done. It is the world of the possible. World Four is made up of all those things or possibilities that I have not heard of or even imagined. (Holt, 1971, p. 20)

For many students learning in formal settings has been involved with the acquisition of knowledge of the world we know about, but do not know from personal experience. Powerful human learning involves constructing and reconstructing our own meaning in the world, and while there are vital facts that one needs to know in order to facilitate further learning, the challenge for educators is to discern what facts, what procedures and what skills need to be automated to ensure that further learning and thinking are not impeded (Atkin, 2000).

As Hennessey states:

Constructivist Theory frames learning as an active, continuous process whereby learners draw on experiences from their environment to construct personal interpretations and meaning by using their existing knowledge to make sense of their new experiences. Moreover, learners actively construct knowledge by reflecting on their physical actions and mental constructs (metacognition) through social interaction with members of their learning community.
(Hennessey, 1993, p.16)

The world has never changed more rapidly than it is doing now in the 21st century and the change is mostly caused by unprecedented rates of technological development which will continue and become more global in nature. More and more countries will
develop economic systems dependent on brain power, creativity and enterprise, with wealth being increasingly based on what one knows and what skills one has.

Knowledge and skill, both totally dependent on the education system have become increasingly the dominant factors of wealth generation. This rapid change, combined with increased economic importance of learning, is catalysing the development of cultures of lifelong learning in first world countries, and increasingly in other countries too.

... All of this means that we need to remain adaptable, to be as broadly educated as possible, and to commit ourselves to a system of lifelong learning. (Ellyard, 1989, p. 29)

Educators have many factors to consider when endeavouring to determine what aspects of teaching and learning need to be incorporated in planning curricula in this era of increased knowledge, developing technologies and contextualised learning.

Formal learning in the past has had more of a focus on knowing about the world and knowing what others know about the world – filling up on facts that were then not generally connected to personal experiences. Realisations have emerged that have challenged that stance and a different view, constructivism, is now being widely used to describe the nature of human learning. There are varying names and labels being given to the constructivist notion of learning, yet they all share key components and the essence of this approach is the construction of meaning by the learner. This will be more fully discussed in Chapter 3.

2. 3. CONSTRUCTIVISM AND EDUCATION

2. 3. 1. The Theory of Constructivism

Every educational process contains some notion of the learner and of the society or situation in which the learning takes place. All educational work carries an implicit concept of learning: what it is, who is involved in it, how it happens and what can be done to facilitate it. The theoretical basis for the conception of learning is provided by the family of theories of learning that are grouped under the title of constructivism (Montessori, 1965; Piaget, 1977; Bruner, 1986; Vygotsky, 1962, 1978, 1986, 1987).
The central thesis of constructivism is that the learner is active in the process of taking in information and building knowledge and understanding; in other words, of constructing their own learning. Learning then is the active process of engaging inexperience and its internalisation in terms of thinking. All forms of experience can be called upon here. Constructivism also has clear implications for the social situation or context in which learning happens, in so far as learners are more likely to engage in constructing their own understanding in a supportive social environment.

(Department of Education Training and Employment, 2001, Learners and Learning: Constructivism and the SACSA Framework section, para. 3)

Learners are not social isolates but exist in a cultural context with others and other groups. Individuals enter a context where there are already many shared understandings which can be classed as cultural knowledge. While individuals actively give personal meaning to a particular situation, they do so within frames of cultural understandings that are made up of some knowledge that is relatively stable and some knowledge that is relatively dynamic.

It follows that learning is an active process in which learners construct new ideas or concepts based upon their current and past understandings. That is:

- the learner selects, interprets and transforms information; constructs hypotheses; and makes decisions, relying on a cognitive structure to do so
- mental models provide the means by which an individual interprets and organises experience in order to elaborate and extend current understandings, and their overall framework of knowledge.

(Department of Education Training and Employment, 2001, Learners and Learning: Constructivism and the SACSA Framework section, para. 6)

As with learners constructing their own meaning, educators make different meanings of constructivist learning theory – understanding is constructed by readers who bring prior knowledge and experience to a text and make their own meaning as they interact with the author’s word. Gagnon and Collay (n. d.) present an interpretation of constructivist learning that has emerged as a prominent approach to teaching during the past decade with the work of Dewey (as cited in Gagnon & Collay, n. d.), Montessori (1965), Piaget (1977), Bruner (1986) and Vygotsky (1962, 1978,1986,
1987) providing historical precedents. It represents a paradigm shift from education based on behaviourism to education based on cognitive theory.

Collins (1991) notes that until recently, behavioural psychology has influenced education and the ways in which textbooks were defined and how lessons were planned and implemented. Over more recent years constructivist theory has come to the forefront. Dewey (1916, 1933, 1938, 1964) advocated it at the turn of the century, Montessori based her educational model on constructivism, as did Bruner, and more recent work has been based on the work of Vygotsky (1962, 1978, 1986, 1987). Constructivism is child-centred and it ‘proposes that learning environments should support multiple perspectives or interpretations of reality, knowledge construction, context-rich, experience-based activities’ (Jonassen, 1991, p. 28). Constructivists believe that knowledge is constructed, not transmitted, and that individuals make sense of their world and everything with which they come in contact by constructing their own representation or models of their experiences.

Fosnot (1996) has provided a summary of these theories and describes constructivist teaching practice wherein constructivist epistemology assumes that learners construct their own knowledge on the basis of interaction with their environment. Four epistemological assumptions are central to this: knowledge is physically constructed by learners who are involved in active learning; symbolically constructed by learners who are making their own representations of action; socially constructed by learners who convey their meaning making to others; and theoretically constructed by learners who try to explain things they do not completely understand.

Gagnon and Collay (2001) propose a constructivist learning design approach that focuses on the development of situations as a way of thinking about the constructive activities of the learner rather than the demonstrative behaviour of the teacher – where students are more active participants than passive recipients of information by engaging in the learning process and, in so doing, make their own meaning and construct their own knowledge. ‘Basically, constructivism proposed that knowledge or meaning is not fixed … but rather is constructed by individuals through their experience … in a particular context’ (Honebien, Duffy & Fishman, 1993, p. 88).
2. 3. 2. Constructivist Teaching and Learning

Constructivism is an approach to teaching and learning based on the premise that cognition – learning – is the result of mental construction where students learn by fitting new information together with what they already know. Constructivists believe that learning is affected by the context in which an idea is taught as well as by the beliefs and attitudes of the students. Constructivist teaching is based on research about the human brain and what is known about how learning occurs. Caine and Caine (1991) suggest that brain-compatible teaching is based on 12 principles:

1. ‘The brain is a parallel processor’ (p. 80). It simultaneously processes many different types of information, including thoughts, emotions and cultural knowledge. Effective teaching employs a variety of learning strategies.
2. ‘Learning engages the entire physiology’ (p. 80). Teachers cannot address just the intellect.
3. ‘The search for meaning is innate’ (p. 81). Effective teaching recognises that meaning is personal and unique, and that students’ understandings are based on their own unique experiences.
4. ‘The search for meaning occurs through “patterning”’ (p. 81). Effective teaching connects isolated ideas and information with global concepts and themes.
5. ‘Emotions are critical to patterning’ (p. 82). Learning is influenced by emotions, feelings, and attitudes.
6. ‘The brain processes parts and wholes simultaneously’ (p. 83). People have difficulty learning when either parts or wholes are overlooked.
7. ‘Learning involves both focused attention and peripheral perception’ (p. 83). Learning is influenced by the environment, culture and climate.
8. ‘Learning always involves conscious and unconscious processes’ (p. 84). Students need time to process ‘how’ as well as ‘what’ they have learned.
9. ‘We have at least two different types of memory: a spatial memory system, and a set of systems for rote learning’ (p. 85). Teaching that heavily emphasises rote learning does not promote spatial, experienced learning and can inhibit understanding.
10. ‘We understand and remember best when facts and skills are embedded in natural, spatial memory’ (p. 86). Experiential learning is most effective.
11. ‘Learning is enhanced by challenge and inhibited by threat’ (p. 86). The classroom climate should be challenging but not threatening to students.
12. ‘Each brain is unique’ (p. 87). Teaching must be multifaceted to allow students to express preferences.

(Caine & Caine, 1991, pp. 80–87)
A constructivist perspective of knowledge development has multiple implications for teaching. An important implication, therefore, is that teaching for conceptual understanding needs to be rooted in a particular view of how students learn, reflecting the findings of Caine and Caine (1991). Two ideas emerge from these implications. One cannot know an ontological reality, but one constructs forms and content of knowledge through experiences and viable use of that knowledge, the learner being ultimately responsible for his or her knowledge of the world in which the learner lives.

Central to this belief about teaching and learning is that ideas and action are integral and interdependent, and that essential aspects of the learning process and effective teaching must engage the learner while providing opportunities for experimentation that lead to learning experiences. Learning is constructed through experience. Problematic experience can initiate the learning process and subsequent experiences lead to changes in understanding and action. Learning is an active process requiring students’ engagement. It is developmental and occurs when new experiences lead to changes in understanding. Formal knowledge, with which schools have largely been concerned, plays an important role in the construction of new knowledge. The role of the teacher in the learning process is not as a giver of formal knowledge, but as a facilitator who guides growth by focusing inquiry, engaging students, challenging ideas, providing resources, assessing learning and providing feedback while knowledge construction occurs (Osterman, 1999).

2. 2. 3. Constructivism in the Classroom

Learners control their learning and, as educators, we develop classroom practices and negotiate the curriculum to enhance student learning. However, controlling what students learn is virtually impossible as the search for meaning takes a different direction for each student. Even when classroom lessons and curricula are structured to ensure that all students learn the same concepts at the same time, each student constructs his or her own individual meaning through the student’s own cognitive processes. In other words, as educators we have great control over what we teach, but far less control over what students learn (Brooks & Brooks, 1999).
In seeking to understand what motivates students to learn, Brooks and Brooks (1999) identify five central tenets of constructivism which occur when students want to know more about an idea or topic.

First, constructivist teachers seek and value students’ points of view. Second, constructivist teachers structure lessons to challenge students’ suppositions. Only through asking students what they think, how they think and why they think they know it are we and they able to confront their suppositions. Third, constructivist teachers recognise that students must attach relevance to the curriculum. Fourth, constructivist teachers structure lessons around big ideas, into small bits of information. Finally, constructivist teachers assess student learning in the context of daily classroom investigations, not as separate events. (Brooks & Brooks (1993), cited in Brooks & Brooks, 1999, p.19)

As constructivism has gained support as an educational approach, two main criticisms have emerged. Brooks and Brooks (1999) note that one critique of constructivism is that it is overly permissive and suggests that constructivist teachers often abandon their curricula to pursue the whims of their students. In maths and science, critics are particularly concerned that teachers jettison basic information to permit students to think in overly broad mathematical and scientific terms. Good, Wandersee and St. Julien (1993) urge educators to exercise caution in embracing the idea of constructivism because their view of how the mind works is continually being revised, and suggest that the best strategy may be to reserve judgment about constructivism while monitoring how it compares with new theories of learning and the findings of cognitive science.

The other critique of constructivist approaches to education is that they lack rigor. The concern here is that teachers cast aside the information, facts and basic skills embedded in the curriculum in the pursuit of more capricious ideas. Dick (1992) believes that no ultimate, shared reality exists between the student and the teacher; rather, that reality is the outcome of constructive processes and one can never be certain that the student and the teacher’s understandings are identical. The national inquiry into the teaching of literacy (DEST, 2005) reports that ‘much curriculum design, content, teaching and teacher preparation seems to be based, at least implicitly, on an educational philosophy of constructivism (an established theory of
knowing and learning rather than a theory of teaching’) (p. 12). The findings of the inquiry suggested there is a serious lack of supporting evidence for its effectiveness in teaching children to read, with emphasis given to the nature of the child’s environment or background rather than how a teacher should teach. This results in insufficient attention being given to both ‘what’ teachers should teach and ‘how’ teachers should teach children to read and write.

Over time there have been critics of constructivism (Suchting, 1992; Matthews, 2000, 1993; Phillips, 1995; Osborne, 1996), and others who have been urging caution in its adoption (Millar, 1989; Solomon, 1994); however few would dispute Fensham’s claim that ‘the most conspicuous psychological influence on curriculum thinking in science since 1980 has been the constructivist view of learning’ (Fensham, 1992, p. 801).

These critiques are contrary to what an evolving body of research tells us about learning. Battista (1999), speaking specifically of mathematics education, writes:

Many … conceive of constructivism as a pedagogical stance that entails a type of non-rigorous, intellectual anarchy that lets students pursue whatever interests them and invent and use any mathematical methods they wish, whether those methods are correct or not. Others take constructivism to be synonymous with ‘discovery learning’ from the era of ‘new math’, and still others see it as a way of teaching that focuses on using manipulatives or cooperative learning. None of these conceptions is correct.

(p. 429)

The organisation of a constructivist classroom requires much work from the teacher as well as the intellectual commitment and perseverance of students. Constructivist teachers recognise that students bring their prior experiences with them to each school activity and that it is crucial to connect lessons to their students’ experiential repertoires.

State and federal government curricula address what students learn; constructivism, as an approach to education, addresses how students learn. The constructivist teacher, in mediating students’ learning, blends the what with the how and constructivist classrooms demand far more from teachers and students than lockstep obeisance to prepackaged lessons.

(Brooks & Brooks, 1999, p. 23)
2. 3. 4. Constructivism and Technology


Issues of learning and technology are more critical today than ever before. The advances being made in technology continue to both increase and astonish; however the only real measure of the effectiveness of technologies and technology-enhanced educational programs* is the extent to which they promote and support student learning. Early use of computers and various forms of information technology had a focus on the technology itself or its use within rather narrow confines. A 1983 national survey of computer uses showed that drill-and-practice was the most common use of microcomputers (Becker, 1985, cited in Jonassen, Peck & Wilson, 1999), along with learning to program in BASIC. Approaches and attitudes to technology use, as with approaches to teaching and learning, have evolved and changed, and in the early 1980s educators began to perceive the importance of computers as tools as the business world became more productive through the use of word processing, databases, spreadsheets, graphics programs and desktop publishing.

Information technologies offer new possibilities for innovation and enterprise, with skilled users translating ideas into practice to meet particular needs and opportunities. The rapid pace of recent technological change is likely to continue exponentially in the future. It is imperative, for reasons of equity, that all learners have the skills to access the possibilities that information technologies offer to expand personal and vocational lifestyle choices. It is also important that consumers develop the critical skills to select and use emerging technologies wisely. (Department of Education Tasmania: Essential Learnings, 2004, p. 22)

Teaching is a process of helping learners to construct their own experiences. In the past, technology has been largely used in education to learn from, but technologies are

*In this study the term ‘program’ is used by researcher in reference to ICT.
more effectively used as tools with which to think and learn with, and to construct knowledge (Jonassen et al., 1999).

In developing a research project on how children think and learn, and to develop educational approaches and technological tools to help those children learn, Papert (1991) coined the term constructionism. This affirms the constructivists’ view of learning and asserts that knowledge is not simply transmitted from teacher to student, but actively constructed by the mind of the learner. It is through this avenue of constructing that technology can be integrated into the instructional processes, in that it prompts teachers to teach from a constructivist model (Blocher, Sujo de Montes, Tucker & Willis, 2000).

For educators working with technology, once the emphasis was on ‘computer literacy’ and learning about the computer and its use. This focus has been replaced by ‘information literacy’, which describes the ability to find, evaluate, retrieve, manipulate, store and present data in a meaningful form. ‘We are looking at a learner taking unconnected bits of information, making meaningful connections between these to construct knowledge …’ (Smyth, 1997, p. 34). Jonassen et al. (1999) suggest that students cannot learn from technology but that technology can support meaning making by students. A set of assumptions arising from this is thus presented.

- Technology is more than hardware. Technology consists of the designs and the environments that engage learners. Technology can also consist of any reliable technique or method for engaging learning, such as cognitive learning strategies and critical thinking skills.
- Learning technologies can be any environment or definable set of activities that engage learners in active, constructive, intentional, authentic, and cooperative learning.
- Technologies are not simply conveyors or communicators of meaning. Nor should they prescribe and control all of the learner interactions.
- Technologies support learning when they fulfil a learning need – when interactions with technologies are learner-initiated and learner-controlled, and when interactions with the technologies are conceptually and intellectually engaging.
- Technologies should function as intellectual tool kits that enable learners to build more meaningful personal interpretations and representations of the world. These tool
kits must support the intellectual functions that are required by a course of study.

- Learners and technologies should be intellectual partners in the learning process, where the cognitive responsibility for performing is distributed to the part of the partnership that performs it the best.

(Jonassen et al., 1999, p. 13)

Recent research builds a powerful case against previously accepted practices in models of teaching and learning technology. Researchers are positing new ways of looking at learning that promote engaged meaningful learning and collaboration, involving challenging and real-life tasks, and technology as a tool for learning, communication and collaboration. Engaged learners are responsible for their own learning, energised by learning, both strategic and collaborative (Jones et al., 1994). In writing about effective teaching and learning, Means, Blando, Olson, Middleton, Morocco, Remz, and Zorfass (1993) present components of educational reform at the system, school and classroom levels, and note that the classroom level should include student exploration, interactive modes of instruction, authentic tasks, challenging assignments, multidisciplinary approaches, collaboration, teacher as facilitator, heterogeneous student groupings, and performance-based assessment.

Learning is not about passive reception of information but about active participation in the process and construction of meaning. ‘Learners do not just take in and store up given information. They make tentative interpretations of experience and go on to elaborate and test interpretations’ (Perkins, 1992, p. 49). Active learning involves student interaction, connections among schools, collaboration between teachers and students, involvement of teachers as facilitators, and an emphasis on technology as a tool for learning.

Many features of technology are important to learning, and for effective high technology performance certain conditions should be met. Access, operability, organisation, engagability, ease of use, and functionality of the technology all need to be in place in order for engaged learning to occur. If these conditions are met, then the incorporation of technology will enhance learning. Technology can facilitate constructivist methodologies through helping teachers create information-rich environments that allow students to explore and construct meaning. The use of the
Internet will facilitate students’ searches for information and allow more time for analysing information instead of locating it. This will also promote higher-order thinking skills (Nicaise & Barnes, 1996).

The development of thinking is supported and enhanced by the use of technology. Technology is a broad term for human tool systems through which human learning can be mediated. Thinking is both individual and social, and there is a constant movement of the internalisation of social thinking into individual thinking and externalisation out again into social thinking. Higher-order thinking is to be found in the whole movement of thought, socially and individually, and is enhanced through the use of ICT in three main ways. The ways in which this occurs are with technology as tutor or teaching machine, with technology providing mindtools, and with technology as a support for learning conversations (NESTA, 2002). Explicit teaching utilising and incorporating these three aspects is very important in the development of thinking processes. Technology as a tutor can engage a learner in ways different to the ways in which a teacher is able to do so and often provides immediate and individual feedback. The use concept maps or programming languages can be used for teaching transferable thinking skills, which are often enhanced by pair or group work. Technology as a support for learning conversations occurs as learners articulate their thoughts and strategies as they work together. Technology also provides opportunities for learning conversations to occur beyond the classroom and in a variety of ways including use of email, web cams and intranet and Internet chat.

A review of the evidence suggests that using technology does not, by itself, lead to transferable thinking skills. The success of the activity crucially depends on how the technology is used. Learners need to know what the thinking skills are that they are learning and these need to be explicitly modelled, drawn out and reapplied in different contexts. The evidence also suggests that collaborative learning improves the effectiveness of most activities.

(NESTA, 2002, Executive Summary: What is the role of technology in teaching thinking skills? section, para. 2)

Constructivist classrooms place an emphasis on the meaning and significance of what the child learns and the child’s active participation in constructing this meaning.
(Selley, 1999), and technology and its use are intrinsic to children’s learning in this process.

Technology is seen as an integral part of the cognitive activity … this view of distributed cognition significantly impacts on how we think of the role of technology in education and training, the focus is not on the individual in isolation and what he or she knows but on the activity in the environment. It is the activity – focused and contextualised – that is central … The process of construction is directed towards creating a world that makes sense to us, that is adequate for our everyday functioning.

(Duffy & Cunningham, 1996, pp. 187–188)

In incorporating technology into learning experiences, the tasks of the learner are dynamic and the computer is a cognitive tool that makes new learning opportunities available (Jonassen, 1994; Jonassen & Reeves, 1996; Lajoie, 2000). The traditional view of instructional technologies as conveyors of information and communicators of knowledge is supplanted by the active role the learner plays in learning with technology.

Technologies, primarily computers, help build knowledge bases, which will ‘engage the learners more and result in more meaningful and transferable knowledge … Learners function as designers using the technology as tools for analysing the world, accessing information, interpreting and organising their personal knowledge, and representing what they know to others.’

(Jonassen, 1994, p. 2)

Technological tools and applications – such as spreadsheets, databases, expert systems, video conferencing and many others – offer opportunities for further development. These can be used by students to analyse subject matter, develop representative mental models, and transfer and transcribe these into knowledge bases (Jonassen, 1994; Jonassen & Carr, 2000; Jonassen & Reeves, 1996).
2. 3. 5. Constructivism and Thinking

The development of thinking skills is a necessary and vital part of the process through which learners go as they build personal knowledge. Constructivism focuses on knowledge construction, not knowledge reproduction. Constructivist theory posits that students make sense of the world by synthesising new experiences into what they have previously understood. They form rules through reflection on their interaction with objects and ideas. When they encounter an object, idea or relationship that does not make sense to them, they either interpret what they see to conform to their rules or they adjust their rules to better account for the new information (Brooks & Brooks, 1993).

In the constructivist perspective, knowledge is constructed by the individual through interactions with the environment. Knowledge is not a transferable commodity and communication is not a conveyance (von Glasersfeld, 1987). How we perceive knowledge and the process of coming to know provide the basis for educational practice. If we believe that learners passively receive information, then the focus in instruction will be on knowledge transmission. If we believe that learners actively construct knowledge in their attempts to make sense of their world, then the focus of learning will be on the development of meaning and understanding (Murphy, 1997). Jonassen (1991) states that the mind is instrumental and essential in interpreting events, objects and perspectives on a base that is personal and individualistic, and that our view of the external world differs from others because of our unique set of experiences. One does not describe the world one sees; one sees the world that one can describe. From describing what they see in the world, learners, with the use of thinking skills, can then focus on knowing how and what to learn (Senge, cited in Matusevich, 1995).

Many theories of learning have been proposed and Kizlik (2004) notes that there is no shortage of descriptions or labels for activities that may be classified as instruction. These range from the lecture method to complex student–teacher, student–student interactions, and encompass a broad range of teacher behaviours. At one end of the range is the lecture method, where the teacher is an imparter of information and the students are the intended recipients of the information the teacher imparts. At the
other end of the range of teacher behaviours are methods in which teachers interact with students in vastly more complex ways. Agreement exists that the most permanent and meaningful learning takes place at this end of the range, and where students construct their own meaning. In support of this, Kizlik (2004) presents strategic teaching and strategic learning techniques in which significant student–teacher interaction and resultant learning and thinking are at the high end of the scale.

Strategic teaching is described as instructional processes that focus directly on fostering student thinking, and where a strategic teacher has an understanding of the variables of instruction such as the characteristics of the learners, the relevant curriculum content and the learning strategies to promote engagement. The strategic teacher is aware of the cognitive requirements of learning, is a thinker and decision maker, possesses a rich knowledge base, and is a modeller and a mediator of instruction guided by focusing on learning strategies that foster thinking skills in relation to the content. In connecting new information to what a student already knows, learning becomes more meaningful.

Strategic learning is learning in which students construct their own meanings, and in the process, become aware of their own thinking. The link between teaching, thinking, and learning is critical. As a teacher, if you are not causing your students to think about what you are presenting, discussing, demonstrating, mediating, guiding, or directing, then you are not doing an effective job. You must be more than a dispenser of information. You must create conditions and an environment that encourages thinking, deepens and broadens it, and which causes students to become aware of how they think.

(Kizlik, 2004, p. 2)

The process of thinking in constructivist paradigms requires higher-order skills, delving deeper and more thoroughly into content and context (Black & McClintock, 1995; Jonassen, 1991; Manzo, 1998; Swain & Pearson, 2001). Traditional schooling, according to Manzo (1998), discourages constructive thinking with goals of transmitting existing knowledge that conflicts with any real attempt to generate new understanding. Manzo opines that constructivist thinking combines both the critical and creative intellectual processes. It can be practised by encouraging critical analysis in activities. Schools, teachers and students can be conditioned to veer away from the traditional schooling regimen to encourage constructive thinking. Cognitive tools help
in knowledge construction, not knowledge reproduction. The knowledge constructed by the learners reflects their comprehension and conception of the information. Cognitive tools, along with constructivist learning environments, guide and activate cognitive learning strategies and critical thinking (Jonassen, 1994).

In their work on thinking skills, Black and McClintock (1999, cited in Nanjappa & Grant, 2003) introduce the notion of interpretation and stress its importance as being central to cognition and learning. A programme based on constructivist design principles – and which focused mainly on the interpretive construction of authentic artefacts in the context of rich background materials and spanning different fields of study – was designed. The results of this study showed that students were able to acquire generalisable interpretation and argumentation skills, as well as learning specific content.

Reflective thinking requiring careful deliberation is encouraged by constructivists (Kafai, Ching & Marshall, 1997; Swain & Pearson, 2001; Walker, 2000). Metacognition is also emphasised. New knowledge is composed and added to previous representations. These may be modified in the process, utilising external scaffolding in the form of people, books or technologies such as computers. Swain and Pearson (2001) advocate the practice of reflective thinking to evaluate technology use. Jonassen (1994) describes technological tools as intellectual partners and powerful catalysts in the process of learning, scaffolding the important processes of articulation and reflection, which are the foundations of knowledge construction. Constructivists consider that thinking skills, learning and technology are closely related and that human learning and thinking is mediated by tool systems. There is an emerging consensus that new technology is bringing about a new kind of economy, and that in this new economy the main products are information and knowledge rather than material goods. Workers in this new economic climate require transferable thinking skills more than content knowledge or task-specific skills (NESTA, 2002).

2.3.6. Constructivism and Inquiry Learning

Constructivism is a theory about the nature of knowledge, and while different interpretations of constructivism exist their common denominator seems to be a belief
that knowledge is created by people and influenced by their values and culture (Phillips, 1995). As thinking and the integration of technology are vital components to the building of knowledge by learners, the incorporation of inquiry-based learning also enhances this process.

During the 1990s brain research came to the fore and educators began to explore the implications of brain research for teaching and learning (Caine & Caine, 1991). Constructivist research has strongly influenced education through recent paradigm shifts in various areas: assessment (Alleman & Brophy, 1998), language arts (Bruner, 1986), science (Yager, 1991), mathematics (Schifter, 1996) and, in more recent times, social studies literature (Scheurman & Yell’s study, cited in Gibson & McKay, 2001). While social studies teaching and learning had remained largely teacher-centred, a more student-centred approach – incorporating multiple and varied sources of information – increased the emphasis on group processes and student-generated questions to guide inquiry, allowing children to learn about citizenship concepts while viewing issues and problems from different angles, identifying multiple perspectives and developing their own viewpoints (Hope, cited in Gibson & McKay, 2001).

Curriculum development that proceeds from a constructivist perspective would recognise the centrality of the following four tenets.

The first of these tenets is that the human mind has the ability to represent through symbols. Language, as one of our major symbol systems, is recognised as having a primary relationship to thinking and learning. Meaning is also created and expressed through other symbol systems such as art, music, drama and dance. The second major tenet is that constructivist theory focuses on the individual as an active constructor of meaning rather than a passive recipient of knowledge. Thirdly, learning is viewed as a complex process involving the interaction of past experience, personal intentions, and new experience. Finally, social context is recognised as a crucial element in the meaning making process. (Gibson & McKay, 2001, Insights from Constructivism for Curriculum Development section, para. 4)

Brooks and Brooks (1993) also argue that there are principles of constructivist pedagogy that also must be considered. These reflect inquiry learning and include: posing problems of emerging relevance to learners; structuring learning around primary concepts; seeking and valuing children’s points of view; adapting curriculum
to address student suppositions; and assessing children’s learning in the context of teaching.

The construction of meaning, the ways in which children learn and the way in which the brain works, are linked. Brain research suggests that we think of the brain as a complex, whole and interconnected system (Edelman, 1992). We have come to know a great deal more about the connection between the brain and learning, and it is these connections that can inform curriculum development for significant learning. The brain innately seeks meaning through seeking patterns. The patterns give context to information that may otherwise be discarded as meaningless (Coward, 1990). Freeman (1995) suggests that it is the making of familiar connections (relevance) and the locating of conforming neural networks (pattern making) that are critical to the formation of meaning. For younger children, learning that is hands-on, experiential and relevant enables patterns to develop. Relevance helps children to make personal connections between what they already know and the work they do in class. Relevance can be created through linking with prior learning and experiences, and context and pattern making may result from the use of universal concepts and core organising principles (Jensen, 1998).

Constructivist theory and brain research offer compelling support for renewed examination of inquiry as a powerful curriculum model of integrated curriculum. The inquiry approach emphasises students investigating, inquiring and thinking for themselves, as well as being provided with experiences in order to acquire competence in skills such as inquiry, communication, critical thinking and decision making.

An old adage states: ‘Tell me and I forget, show me and I remember, involve me and I understand’ (Brightquotes, n. d., para. 9). The last part of this statement is the essence of inquiry-based learning (Exline, 2004, What Is Inquiry-based Learning? section, para. 1). The process of inquiry is about asking questions and gathering information and data. Effective inquiry results when learners attempt to convert information and data into useful knowledge. Useful application of information in inquiry learning involves several factors: a context for questions, a framework for questions, a focus
for questions and different levels of questions. Well-designed inquiry learning produces knowledge formation that can be widely applied (Exline, 2004, A Context for Inquiry section, para. 2). Exline (2004, Importance of Inquiry section, para. 1) noted that memorising facts and information is not the most important skill in today’s world. Facts change and information is readily available – what is needed is an understanding of how to get and make sense of the mass of data.

Inquiry is a learner-centred process. All learning begins with the learner. What learners know and what they want to learn are the foundations for learning.

For students, this method of learning ends the listen-to-learn paradigm of the classroom and gives them real and authentic goal challenges to overcome. For the teacher, inquiry-based education ends their paradigm of talking to teach and recasts them in the role of a colleague and mentor engaged in the same quest as the other younger learners around. (Inquiry page, 2004, Our Definition of Inquiry section, para. 5)

Inquiry is an approach to learning that involves a process of exploring the natural or material world, that leads to asking questions and making discoveries in the search for new understandings (Inquiry page, 2004, Our Definition of Inquiry section, para. 6).

Through the process of inquiry, individuals construct much of their understanding of the world. Inquiry is not so much a question of the seeking the right answer, but of seeking appropriate resolutions to questions and issues. Alongside this is the development of inquiry skills and inquiring attitudes that will enable individuals to continue on a quest for knowledge – the skills and the ability to continue learning.

Traditional learning focuses more on learning things, while inquiry learning focuses more on learning about things.

2. 4. COGNITIVE SKILLS

2. 4. 1. Conceptualisation

Thinking skills and their inclusion in frameworks and other curriculum documents is not a new approach for the 21st century. In a poll of professional educators taken in the USA during 1984, Beyer (1984) noted that nine out of ten respondents said that better instruction in thinking skills should be a major priority in educational planning
for the coming years. Beyer went on to identify five steps that educators should take to bring about this improvement.

These steps include:

- clearly defining a core of thinking skills that we all ought to teach;
- identifying as precisely as possible the components of each of these skills;
- providing direct systematic classroom instruction in how to use these skills in all appropriate content areas and across all appropriate grade levels;
- devising and implementing developmental curricula that integrate the teaching of selected thinking skills and their combined use within various content areas;
- devising measures of competence in the use of thinking skills that are congruent with the skills we have chosen to teach and that are as valid and reliable as possible.

(Beyer, 1984 p. 559)

The belief was that these tasks must be accomplished if the learning and thinking in schools is to be improved, together with the development of K–12 thinking skills curricula. Beyer (1984) noted that an effective curriculum as such should exhibit five important features with instruction in each skill and should move through four stages – introduction, reinforcement, extension and practice.

These features are:

- introduce a limited number of thinking skills (perhaps three to five) at each grade level;
- clearly describe for teachers the key components of each skill to be taught;
- provide for the teaching of the same skill across all appropriate content areas;
- provide instruction in each skill in a variety of media and contexts;
- provide sequenced development of each skill from the primary through to the secondary grades.

(Beyer, 1984, p. 559).

One can debate some of the details in what Beyer has expressed, but his overall stance is well supported and, more recently, Jonassen, Peck and Wilson (1999) highlighted the importance of the thinking process by telling us that students learn from thinking – about what they are doing or what they did, about what they believe, about what others have done and believe, about the thinking processes they use – just thinking. Thinking mediates learning and learning results from thinking.
The Victorian Curriculum Assessment Authority (VCAA) in its 2004 reform consultation paper echoes this belief.

As identified in the Adelaide Declaration on National goals for Schooling in the Twenty-First Century (MCEETYA, 1999), regardless of the disciplines taught to them, all students need to develop a set of generic skills, values and attributes to prepare them to thrive and survive in today’s rapidly changing society. In recognition of this urgent need to promote lifelong learning and active citizenship, the VCAA will specify a range of ‘Generic Skills, Values, and Attributes’ as part of the new approach, approach to each level.

Students should develop a range of cognitive and metacognitive skills essential to ongoing learning across the curriculum and beyond formal schooling such as:

- inquiring – identifying and asking questions; planning research; predicting outcomes and anticipating consequences; drawing and testing conclusions
- processing information – finding relevant information; classifying and organising information; comparing and contrasting different information; identifying and analysing relationships
- creative thinking – generating and developing ideas; hypothesising; applying information and taking risks; seeking and testing innovative alternatives
- reasoning – providing reasons for arguments, opinions and actions; inferring from information; making deductions; making informed judgments and decisions; clarifying and using appropriate language to reason
- problem solving – identifying and clarifying problems; planning, identifying and testing out options; checking the effectiveness of solutions and determining if problems have been solved
- evaluation – developing and applying relevant evaluation criteria; judging the value and effectiveness of information, ideas and actions.

(VCAA, 2004, p. 9)

The skills, values and attitudes presented as requirements by the VCAA are echoed in documents developed by other educational authorities (US Department of Labor, 1991; Department of Education, Training and Employment South Australia, 2001; VCAA, 2004; Department of Education Tasmania, 2004; Department of Employment
In a report on the skills and competencies needed to succeed in today’s workplace, the USA’s Department of Labor identified competencies, skills and personal qualities for future success, and thinking skills were among those identified.

**Thinking Skills:** Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons
- Creative thinking – generates new ideas
- Decision making – specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternatives
- Problem solving – recognizes problems and devises and implements plan of action
- Visualizing – organizes and processes symbols
- Knowing how to learn – uses efficient learning techniques to acquire and apply new knowledge and skills
- Reasoning – discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

(US Department of Labor, 1991 pp. xvii-xviii)

Effective thinking is a trait that is valued by schools at all levels, however it is something which is rarely given a great deal of attention in practice (Gardner, 1991). Johnson (2000) also encourages the use of thinking skills and their inclusion in the curriculum by writing about the importance of using thinking skills to enhance learning. He suggests that a thinking skill is any cognitive process broken down into a set of explicit steps that are then used to guide thinking. He identifies three terms that are related to thinking skills but which he considers to be quite different – high-level thinking, complex thinking and critical thinking – and posits that these can and should be embedded in any reading or literacy curriculum.

The VCAA (2004), in developing the Victorian Essential Learning Standards, presents a model of three core and interrelated strands of essential knowledge, skills and behaviours students need to prepare for further education, work and life. One of these core strands, the Interdisciplinary Learning strand, identifies a range of knowledge, skills and behaviours which cross disciplinary boundaries and are essential to ensuring students are prepared as active learners and problem solvers for success at school and beyond. This strand consists of four domains that focus on ways
of thinking, communicating, conceiving and realising ideas and information, and assist students to develop the capacity to design, create and evaluate processes as a way of developing creativity and innovation. The domain of Thinking Processes encompasses beliefs pertinent to this study.

Our world and the world of the future demand that all students are supported to become effective and skilful thinkers. Thinking validates existing knowledge and enables individuals to create new knowledge and to build ideas and make connections between them. 

(VCAA (2004) Victorian Essential Learning Standards, Thinking Processes section, para. 1)

Developing students’ thinking, through focused and explicit teaching is necessary if one is to move students beyond lower order thinking skills such as recall and comprehension to the higher order thinking skills needed for creative problem solving, decision making and conceptualising. The capacity to be reflective and manage one’s own thinking, metacognition, also needs to be promoted. This occurs when the school and classroom cultures value and promote thinking by providing students with sufficient time to think, reflect, and engage in sustained discussion, deliberation and inquiry. Students need challenging tasks that stimulate, encourage and support skilful and effective thinking, and emphasise the view that such knowledge, skills and behaviours are important to lifelong learning.

2. 4. 2. Cognitive and Metacognitive Skills: Inquiring

Inquiring into the world around us is the basis of the inquiry approach to learning and can be used in an integrated manner across all curriculum areas. Inquiry encompasses the content subjects of social education, science, environmental education, personal development and technology studies, and production is enabled through the process subjects of language, art, drama, mathematics, music and movement (Pigdon & Woolley, 1992). Inquiry approaches provide conditions that allow learners to take control of their learning, to build on their prior knowledge, to make and test predictions, to gather and organise information, and to synthesise their findings. Effective teaching and learning must take into consideration that many students cope with various learning and emotional disabilities, economic challenges, varying socio-cultural contexts and limited English proficiency. Instruction must be designed to
engage all students, including those who are gifted, while appealing to multiple learning styles. Instruction becomes more meaningful for students as they work through material if it is presented in an integrated, individualised manner. The challenge is to promote learning and inclusiveness by engaging and scaffolding students with varying abilities. This is accomplished through thematic, integrated lessons that utilise various media and technologies (Tate & DeBroux, 2001).

The importance of inquiring and inquiry is further supported by Goddard (2002), who highlights this importance in the area of science, where it serves as an exemplary model that promotes strategies, values, and attitudes essential to inquiring minds. Inquiry supports the development of process skills, active and autonomous learning, verbal expressiveness, persistence, logical thinking, and a tolerance for ambiguity. Goddard suggests that the teacher controls the interaction and prescribes the procedures, but simultaneously the students can feel in control of their own learning through cooperation and intellectual freedom.

2. 4. 3. Cognitive and Metacognitive Skills: Processing Information

Tinzmann, Jones, Fennimore, Bakker, Fine & Pierce (1990) write of the influence of Vygotsky. Vygotsky (1962, 1978, 1986, 1987) was a Russian developmental psychologist and researcher who worked in the 1920s and early ’30s and who has influenced some of the current research on collaboration among students and teachers and on the role of cultural learning and schooling. His principal premise is that human beings are products not only of biology, but also of their human cultures. Intellectual functioning is the product of our social history, and language is the key mode by which we learn our cultures and through which we organise our verbal thinking and regulate our actions. Children learn such higher functioning from interacting with the adults and other children around them.

Effective communication and collaboration are essential to becoming a successful learner. It is primarily through dialogue and examining different perspectives that students become knowledgeable, strategic, self-determined and empathetic. Tinzmann et al. (1990) support this notion by telling us that new learning and thinking curricula require collaboration. Collaborative learning affords students enormous advantages
not available from more traditional instruction, because a group – whether it be the whole class or a learning group within the class – can accomplish meaningful learning and solve problems better than any individual can alone.

Talk is essential for everyday communication and social interaction as it meets the learner’s needs for self-expression and facilitates the processing of information. It provides a powerful tool for thought and an effective medium for learning. Together with listening, talking is an essential catalyst across all curriculum areas.

The links between talking and thinking are strong with these two skills being interdependent and complementary to each other. Through talk, the child can acquire new concepts and ideas, reflect on and clarify existing ideas, concepts and values and formulate and develop higher order thinking skills.

(Dalton, 1985, p. 7)

Thirty years ago, the Department of Education and Science: Great Britain (1975) produced a report, known by many as the Bullock Report, which emphasised the importance of using language to develop thinking skills.

A child is at a disadvantage in lacking the means to explain, describe, inquire, hypothesise, analyse, compare and deduce if language is seldom or never used for these purposes. This is the kind of language that is of particular importance to the forming of higher order concepts.

(Department of Education and Science: Great Britain (1975) p. 54)

Modelling the use of this language and allowing opportunities for learners to experiment with and use the purposeful and specific language enhances thinking processes. Thinking is the deliberate exploration of experience for a purpose. That purpose may be understanding, decision making, planning, problem solving, judgment, action and so on, but the thinking is the operating skill with which intelligence acts upon experience.

The ability to identify, locate, select and collect information and materials required to complete tasks is an essential part of learning, particularly in an information-rich world. The learner’s ability to transform, synthesise and evaluate the data obtained, and to make judgments about its authenticity and relevance, is a critical aspect of dealing with information.

(Department of Education: Tasmania, Essential Learnings section, p. 15)
The ability to communicate what has been learned and thought about, and to do so in a consistent, coherent, relevant and persuasive way, is essential in enabling learners to participate fully in schools, communities and workplaces.

The whole of our thinking, the whole of our language, the whole of our education, perhaps the whole of our Western culture, is concerned with the formation and communication of ideas. Therefore there is a need for thinking tools that he calls mental tolls, that make possible the re-forming of ideas. (de Bono, 1969, p. 9)

Johnson (2002) also reflects the importance of incorporating the explicit teaching of thinking into the curriculum. He describes high-level thinking as a cognitive operation that places high demand on the processing taking place in the short-term memory, and suggests that if the desired outcome is for students to be able to compare and contrast, then the process must be broken down into parts and taught explicitly. He also includes complex thinking skills which he describes as high-level thinking with an organisational or planning focus included.

2.4.4. Cognitive and Metacognitive Skills: Creative Thinking

Reid (1993) suggests that creative thinking be defined as the act of being able to produce along new and original lines. Her research indicates that an individual’s creative abilities can be developed through systematic training, and posits that educators should teach creative thinking so that students will be producers of knowledge rather than consumers of knowledge. The results of this would be that teaching the skills of creative thinking would encourage divergent thinking abilities, the use of higher-level thought processes and the development of a variety of talents.

The Department of Education: Tasmania (2004) has developed an essential learnings curriculum reform which presents five curriculum organisers. These organisers present a framework that provides a focus for teaching and learning, and a means of selecting significant content. Thinking is one of these curriculum organisers. It is suggested that learners need to seek, analyse and evaluate evidence on the basis of careful reasoning when considering possible solutions.
At the same time, however, learners need to recognise that being curious, creative and imaginative enables them to see new ways of doing things and helps them to deal flexibly with changing contexts.

Learners who explore alternatives and recognise possibilities, who are open to new ideas, and who actively problem-seek and set challenges when planning their own learning, are able to generate constructive and creative solutions to problems and use their learning for a variety of new purposes. (Department of Education: Tasmania, Essential Learnings section, p. 15)

In the past schools have often placed an emphasis on convergent thinking that has operated on a factual level with the consumption rather than the production of knowledge. There is a need to foster other types of thinking, with children being given opportunities to learn to think for themselves, to let their minds flow across a broad spectrum of ideas and solutions so as to seek many different and alternative answers to a given problem, and to be involved in the creative exploration of ideas and their relationships. This is divergent thinking with which creative thinking, as well as critical thinking, is linked. Dalton, (1985) argues these skills do not occur automatically and need to be planned for and developed.

Ennis (1987), a prominent figure in the critical thinking movement, defines critical thinking as reasonable reflective thinking that is focused on deciding what to believe or do. Ennis also makes the point that, by his definition, critical thinking does not exclude creative thinking. He says that formulating hypotheses, alternative ways of viewing a problem, questions, possible solutions and plans for investigating something are creative acts that come under this definition of critical thinking. While Ennis considers critical thinking to be inclusive of creative thinking, Johnson (2002) presents critical thinking as a type of thinking that converges on a single thought or entity that requires information to be organised, analysed or evaluated. In his opinion creative thinking diverges from a single point or entity and requires that information be generated, synthesised, adapted or elaborated. However, like Ennis, he considers that it is only by teaching thinking skills that we help students become better critical and creative thinkers.
Bonnett (1991), in writing about developing children’s thinking and evaluating the issues raised by the conception of the National Curriculum in Britain, also distinguishes between two main kinds of thinking. These he terms the rational–calculative version of thinking and poetic thinking, with an additional distinction between these thinking styles of self-expressive thinking (personal or authentic) and thinking that is a reflection of structures (external to individuals) and provides a set of concepts for exploring and interpreting the world. Rational–calculative thinking has an emphasis on mastery of the environment, and Bonnett emphasises the importance of poetic thinking, in which learners attempt to apprehend things as they are in themselves, as a necessary balance to rational–calculative thinking, which has been long equated with good thinking.

2. 4. 5. Cognitive and Metacognitive Skills: Reasoning

Johnson (1984), in writing of concerns he held some years ago about declining literacy standards, claimed that there was evidence to suggest that although youth were performing far better on basic skills such as the three Rs than their counterparts had a few years previously, the problem lay not in the teaching of basic skills, but in the need for teaching complex skills such as reasoning and philosophical inquiry. He advocated that it is the teaching of complex skills with which schools should be concerned, through the implementation of philosophy for children’s programmes such as the one developed by the Institute for the Advancement of Philosophy for Children, the main thrust of which was to encourage children to think clearly. The tenet was that complex thinking skills could be developed by focusing upon both formal and informal rules of thought that included aspects such as making analogies, making inferences, and comparing and contrasting (Lipman, Sharp & Oscanyan, 1979).

As part of the learning process, learners need to develop the ability to consider the results of proposed solutions, understand how to recognise benefits, discover essential assumptions and gauge any risks or limitations. They need to learn about the consequences and merits of an assortment of options and make relevant decisions. They also need to develop an understanding that investigations and analyses are influenced by personal points of view, biases and emotions. Knowing how to reach, explain and justify conclusions in an impartial way helps learners to work
cooperatively and collaboratively with others in looking for the most favorable solutions to shared problems.

Achieving this goal includes: being able to present ideas accurately, clearly and persuasively; understanding how to identify and frame questions, giving reasons for opinions, distinguishing good reasons from bad ones; and establishing effective criteria to evaluate arguments and information. It also involves learners developing skills to assess the reasonableness of ideas and the accurate use of evidence.

(Department of Education: Tasmania, Essential Learnings section, p. 16)

2. 4. 6. Cognitive and Metacognitive Skills: Problem Solving

Problem solving is clearly linked to developing high-quality questions. Knowing how to ask good questions to classify and identify problems incorporates several aspects. These aspects include learning how to link past and present experience, how to illuminate and consider the issues and ideas involved, and how to select and monitor the most valuable process to use.

Learners need to identify why there is a problem, what the problem is, what the present context is and what purpose, interest or need makes it desirable to improve the present situation. Learning is more effective, interesting and relevant when learners consciously choose and use particular methodologies, devise their own strategies to deal with challenges, solve problems and apply their understandings to real-life contexts.

(Department of Education: Tasmania, Essential Learnings section, p. 15)

Thinking skills are not confined for use in any one curriculum or key learning area. Goodman (1990) writes of their use in the area of written language and the importance of good planning in this area. To bring about improvement in expression in written language, writing should be guided by some reflection and by some adherence to a plan, and not just words on paper. In other words there is a need for children to think about and plan for their writing with adherence to a thoughtful plan in order to provide well-sequenced writing. Englert (1987), in working with special education students in Michigan, also found appropriate planning useful in helping students improve and evaluate their writing. Think sheets were designed for the
specific purpose of helping those students by scaffolding their writing. The framework of the think sheets assisted in planning, organising, editing and revising the writing by providing a specific guide. Also included was a guide to assist with self-evaluation of the final written product.

The incorporation of metacognition, which generally is considered to mean thinking about thinking, is also advocated by Goodman (1990). This involves developing the ability to plan a strategy for producing necessary information and the relevant steps and strategies required during the act of problem solving. Students who were involved in activities that required that particular type of thinking, and where related learning strategies were introduced, showed an increasing awareness of the steps needed in arranging and planning ideas, which resulted in better idea generation and stories of increased length and fluency. This was a well-thought-out plan that facilitated written expression.

2.4.7. Cognitive and Metacognitive Skills: Evaluation

The skill of evaluation is an important part of the learning process. Consideration needs to be given to the possible outcomes of proposed solutions, and an understanding of how to evaluate benefits, uncover underlying assumptions and assess risks and limitations needs to be developed. Learners need to learn how to gauge the importance of consequences and think about the merits of various options before deciding which option is most appropriate. They also need to understand that investigations and analyses are influenced by personal points of view, biases and emotions.

The concept of evaluation is further supported as part of self-assessment which is related to ongoing monitoring of progress toward achievement of learning goals. It includes evaluating whether one has learned the intended lesson, the effectiveness of learning strategies, the quality of products and decisions about which products reflect one’s best work, the usefulness of the materials used in a task, and whether future learning is needed and how that learning might be realised (Tinzmann et al., 1990).

A recent study examined the beliefs and classroom practice of 17 technology-using teachers. Their efforts were powered by their perceptions that technology leads to
increased student motivations and achievement outcomes. Teachers perceived that technology, when used well, helped students make connections within and across subject areas, making content more meaningful and authentic. A shared vision for students was their development as self-regulated learners, capable of setting goals, making choices, monitoring progress and evaluating learning outcomes. This vision was coupled with the expectation that students would become independent learners and critical thinkers through the use of technology (Ertmer, Ross & Gopalakrishnan, 2000).

2. 4. 8. Further Reflections on Teaching Thinking

Wilson (2000) raises the question of whether or not thinking skills can be taught, and while her conclusions are cautious, others value the teaching of thinking skills. Nisbet (1990) notes that the concept of teaching thinking is not new: From the ancient Greeks onwards, improving the intellect was perceived to be prime aim of education.

For Falkof and Moss (1984) a spark was created when a casual remark was overheard: ‘If I could start over again, I would teach kids how to think before teaching them how to write.’ This remark led to research that in turn led to the development of a district-wide thinking skills programme, which led to further investigation of teaching and learning methods. Anecdotal findings noted the best teachers used analogies to help children see relationships between new ideas and concepts they already understood. An early childhood teacher also noted that ‘the practice of making inferences does not begin as we teach reading comprehension but rather in early childhood when children make inferences from body language, sounds and visual clues long before they enter school’ (p. 5).

Falkof and Moss, in following up aspects of the research, claimed that 80 to 85 per cent of all questions asked by teachers are on a factual level. This prompted teachers at the school to look further into their practice, where they began to see the connection between regularly practised ideas and a process of thinking. This led to the development of a simple list of question types that could be used to promote thinking: factual, interpretive, evaluative and creative questions. Falkof and Moss noted that these question types helped students integrate new material with concepts already
familiar to them, and teachers could see the sequential stages necessary to develop a thinking skill. As various strategies were worked through, Falkof and Moss also began to see the interconnection between one thinking skill and another, such as when students, in comparing and contrasting ideas, were led to identify relationships and make analogies. The teachers involved determined that asking the appropriate questions could raise the level of thinking from literal to interpretative.

Clark (2001) writes of the importance of developing and setting the foundation for an ecology of learning that incorporates latest brain research, Multiple Intelligences (MI), learning styles and shared vision, and leads to the development of higher-level thinking. A framework which has been developed, and is titled ‘thinkbox’, identifies levels of thinking and the skills and tools associated with each of them. Technology is incorporated in the process as a tool, and explicit teaching occurs using the inquiry method. Student portfolios – which include specific, measurable and realistic criteria and which are developed collaboratively with students – are also used. Clark believes such an approach will prepare learners for their future and also challenges learners not just to acquire facts and gain knowledge, but to take learning further by using the skills and methods that have been developed in the process.

Thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world, and specific knowledge will not be as important to tomorrow’s workers and citizens as the ability to learn and to make sense of new information. Sources, including the National Assessment of Educational Progress (NAEP) (1990), have documented information indicating that many students lack higher-order thinking abilities. NAEP results found improved average student performance on lower-order thinking, such as mathematical computation and word recognition, but show poor student performance on higher-order skills such as analysing and interpreting information, and the challenge is for schools to address this (Gough, 1991).

For Sadler and Whimbey (1985) a focus on improving thinking skills is more noticeable with some nations than with others, and they tell us that the study of thinking has shown that learning is an active process. They formulated six principles which, if applied in a systematic way, will develop generic thinking competencies and
help students grow smarter. These principles are: teaching active learning; articulating thinking; promoting intuitive understanding; structuring courses developmentally; motivating learning; and establishing a positive social climate for learning. They promote a message similar to that of de Bono (1969, 1983, 1984, 1986, 1992), emphasising the importance of improving thinking skills to enhance learning in general.

Raths, Wassermann, Jonas and Rothstein (1967) saw relationships existing between behaviour and thinking: Certain behaviours reflect an incompleteness or inconsistency of thought, and experience with thinking that has not been adequately rigorous. Data was gathered from hundreds of classroom teachers who were asked to describe pupils who seemed to have difficulty thinking for themselves. Eight behavioural types or patterns of behaviours that pointed to deficits in thinking were identified, with these behavioural types then being dealt with through activities that contributed to growth in thinking. More than a dozen studies testing the hypotheses drawn from Raths et al.’s (1967) thinking theory have been undertaken and the data clearly support the theory. In the presence of a curriculum that emphasised thinking, pupil behaviour did change observably and for the better, and for some studies – in which academic skills were also examined – pupils tended to show significant gains in these skills as well. Thinking skills include a particular set of mental functions that are amenable to training and that, when trained, result in a greater range of competence (Wassermann, 1987).

De Bono (1969, 1983, 1984, 1986, 1992) is direct in his advice about thinking and tells us that while thinking and the teaching of it are of the utmost importance, critical thinking is not enough.

The emphasis on critical thinking has long been the bane of society and of education. Critical thinking is reactive. It lacks the creative, constructive and design elements necessary for social progress. Point scoring, debate, arguments and error spotting are only a small part of thinking, but a part that has been allowed to dominate the whole. (de Bono, 1984, p.16)
De Bono (1983) states that thinking should be taught in its own right with a specific place in the curriculum being set aside for the teaching of thinking skills. This would lead to the possibility of establishing both habits of mind and specific techniques that can be applied in any subject area. Teaching thinking as a separate unit is preferable, as attending to content distracts from the thinking tools being used. If this cannot be accommodated, de Bono considers it essential that thinking skills be incorporated into the curriculum in some way.

2.4.9. Six Thinking Hats Concept

For de Bono (1986), thinking is the ultimate human resource, and this belief led to the development of a very simple concept to enhance thinking. This concept allows a thinker to separate emotion from logic, creativity from information, positivity from negativity, and organisational thoughts from creativity. The idea behind this concept was that thinking could become clouded by unrelated issues. By providing a tool that allows thinkers to focus thinking effectively, thinking is enhanced. The concept is the ‘six thinking hats’ concept, which is presented as deliberate thinking. De Bono makes the distinction between automatic thinking and deliberate thinking. Automatic thinking is what is done all the time: the switching in and out of routines and a type of thinking of which we do not have to be conscious. He suggests that there exists a different type of thinking that is not automatic but much is more deliberate and focused. It involves the action of doing a task together with the thinking that is related to performing the task. Learners can use ‘six hat thinking’ in a tangible way to translate intention into performance. The brain is an active information system in which the information organises itself into patterns, and it is the formation and the use of such patterns that give rise to perception.

De Bono (1992) further developed ‘six hat thinking’ to a programme for use in schools called the Six Thinking Hats programme. This programme is designed to be used with children and is the one used in this research project. The purpose of the Six Thinking Hats programme is to establish a framework that guides thinking. This occurs through the use of defined role-playing, which avoids risking egos by
providing direction for participants’ thinking. The technique focuses attention through the use of familiar and convenient ideas and objects, and places the participants in a context that is similar to having rules for a game. The symbolism of the six different hats provides a convenient way for participants to switch thinking, leading to the promotion of deliberate thinking. The following description of the Six Thinking Hats programme outlines the colour of each of the hats and the mode associated with each colour.

**Red Hat.** Emotions. Intuition, feelings and hunches without need to justify the feelings. How do I feel about this right now?

**Yellow Hat.** Good points. Why is this worth doing? How will it help us? Why can it be done? Why will it work?

**Black Hat.** Bad points. Caution. Judgment. Assessment. Is this true? Will it work? What are the weaknesses? What is wrong with it?

**Green Hat.** Creativity. Different ideas. New ideas. Suggestions and proposals. What are some possible ways to work this out? What are some other ways to solve the problem?

**White Hat.** Information. Questions. What information do we have? What information do we need to get?

**Blue Hat.** Organisation of thinking. Thinking about thinking. What have we done so far? What do we do next?

de Bono (1992, pp.10–11)

The hats are always referred to by their colour and not ever by their function, as we can ask children to put on, take off, switch or signal hats. It is convenient and efficient, and the combination of the formality of what the hats represent and the game aspect of the method is one of its greatest virtues for use with children (de Bono, 1986).

There is a clear message regarding the importance of teaching thinking and many writers and researchers have been imparting a similar message. The teaching of thinking and thinking skills is vitally important as their effect impacts on all areas of the curriculum. It can be argued however that students do not learn from teachers or technologies. Students learn from thinking: about what they are doing or have done; about their beliefs and those of others; about what others have done; and by thinking about thinking. Thinking is engaged by activity. Different activities engage different
kinds of thinking. These can be presented and supported by teachers and technologies but they do not necessarily cause thinking and learning – their role is indirect. They can stimulate and support activities that engage thinking, and may subsequently result in learning, but the learners construct their own knowledge. People have always constructed personal and socially acceptable meaning for events and objects in the world (Jonassen, Peck & Wilson, 1999).
2. 5. INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

2. 5. 1. Technology

The children who participated in this study have not known a world that does not have plasma colour television; DVDs (digital versatile discs) and DVD players; CDs (compact discs) and CD players; satellite transmission; video-conferencing; mobile telephones with Internet, chat and photographic capabilities; personal computers; and electronic games. The ability to send and receive information digitally in a variety of visual formats has grown enormously and continues to do so. Over the last 27 years, 1980–2007, the advances in technology have been amazing. We now have technologies that allow instantaneous communication across boundaries of space and time with impressive quality and speed while we sit comfortably in our homes, schools, work places or even outdoor venues.

Technology is a general term for the processes by which human beings fashion tools and machines to increase their control and understanding of the material environment. Technology is a condition of advanced industrial civilisation, and the rate of technological change has developed momentum over recent centuries. For the purposes of this study, the term ‘technology’ will be used to refer to ICT, with an emphasis on computers and the related devices and infrastructures that exist today.

The history of computing goes back to the 1600s, when a six-digit machine that could be used to add and subtract was developed. People have continued to investigate, develop and refine machines. In 1943 the first program-controlled calculator – the Mark 1, which was 60 feet long and weighed 5 tons – was developed. This later led to the conception of an electronic digital computer. Work was continued in an endeavour to develop such a machine. Howard Aitken, who with his team at Harvard University developed the Mark 1, later offered an observation that only six electronic digital computers would ever be required to satisfy the computing needs of the entire USA. This observation appeared to be true for some years, until the change from using vacuum tubes in these machines to transistors and silicon chips. The subsequent
development of microprocessors, which had all their circuitry on one small chip, meant that machines that had previously been huge could now fit on a table top. This development led to a knowledge revolution (Bigelow, 1980).

2.5.2. Technology in Schools

While there was a revolution taking place because of the advances being made in technology, there was not an immediate impact in all schools, and in some schools there was none at all. Certain technologies definitely found niches in education, but the technology of the last two decades of the 20th century changed schools far less that it had the worlds of work, entertainment and communication. ‘On the whole, teachers simply closed their classroom doors and went on teaching just as they were taught’ (Smith & O’Day, 1990, p. 238).

Means and Olsen (1994) take the view that the early efforts made to introduce technology in schools failed to have profound effects because the attempts were based on the wrong model of teaching, with the technology and applications providing an incomplete and imperfect match with the bulk of the core curriculum. The applications either focused narrowly on drill and practice in very basic skills, or on more challenging material that only covered a narrow aspect of a subject area and was often reserved for the use of fast-working, gifted or affluent students.

This lack of early success in incorporating technology has been subsequently addressed on a global scale by government authorities and education departments in many parts of the world. The inclusion of thinking skills has been presented as an essential element in various teaching and learning documents. So too, the inclusion of ICT in educational documents has been similarly regarded (VCAA, 2004; US Department of Labor, 1991; Department of Education Training and Employment: South Australia, 2001; Department of Education Tasmania, 2005; Department of Employment Education and Training Northern Territory, 2005; The State of Queensland (Department of Education and the Arts), 2004).

Access to technology is an important issue for teachers and students (Barnett, 2003; Goddard, 2002; Gahala, 2001; Blocher, Sujo de Montes, Tucker & Willis, 2000;
Walters, 1999; Goldman, Cole & Syer, 1999; Means, 1997; Smyth, 1997; Jonassen, 1994) and in more recent times there has been a push to make provision for technology in schools in various way. Some of these ways have included increased funding for Internet access, hardware, software and infrastructure needs as well as addressing the learning needs of teachers and students.

In Australia, in the state of Victoria, there have been ICT initiatives in the government sector and Catholic/Independent systems. Seven schools in the government sector were nominated to become Navigator Schools (schools which have been pioneering the effective integration of Learning Technologies to improve teaching and learning and school administrative practices), and in the Catholic sector four schools were nominated to become pilot LaTTiCE (Learning and Teaching Technologies in Catholic Education) schools. The Navigator Schools Project was launched in 1995.

The objectives of the Navigator Schools Project were to:

- create a network of exemplar schools with accessible models of new learning environments where there is access to technology in every classroom
- share with others what is learned in creating those environments
- provide evidence of additional teaching and learning outcomes in a technology rich environment, and
- provide a premium professional development resource for teachers and principals across the state.

(Rethinking Learning and Teaching: the Navigator Schools’ Experience (Part 1), 1998, p. 1)

LaTTiCE is a project of the Catholic Education Office, Melbourne, that commenced in 1997. Since 2000 six schools in total have been involved in the LaTTiCE project.

The LaTTiCE project supports school-based professional learning teams in the effective integration of Information and Communication Technologies (ICT’s) in the learning process. During 2001 & 2002 LaTTiCE schools have been supported in the development and implementation of Quality Teacher Programme (QTP) projects which further explore the use of ICT in the learning process. These projects have informed the professional development of teachers facilitated by staff of the Catholic Education Office. It is a requirement of the LaTTiCE and Quality Teacher Programme that LaTTiCE schools provide professional development to teachers in other Catholic Schools. LaTTiCE
Teams can offer professional development in the effective integration of ICT in the curriculum. Professional development is provided through central CEO programmes, network meetings, negotiated school visits, staff meetings, school closure days and workshops conducted at LaTTiCE schools. (Catholic Education Office Website, 2004)

The setting up of exemplary schools is significant. Teacher attitudes go through various stages of acceptance, or in some cases non-acceptance, when confronted with curriculum initiatives. This is particularly true for technological initiatives. The concept of setting up schools as exemplars – as has been used by the Department of Education and Training, State of Victoria (1998) (known as the Department of Education and Training in 2004) and the Catholic Education Office in Victoria – in this process somewhat reflects Rogers’ (1995) theory which illustrates what teachers’ experiences and attitudes are when dealing with curriculum innovations. Rogers details a five-stage innovation diffusion theory that outlines the stages an individual may go through to achieve knowledge, have a change of attitude and subsequently embrace new technology. I believe that the stages he outlines reflect the experiences of many teachers. These stages are the knowledge stage, the persuasion stage, the decision stage, the implementation stage and the confirmation stage, and are set down in more detail in the subsequent paragraphs. This may be due by and large to funding provisions, professional development opportunities and curriculum initiatives that have occurred throughout the late 1990s and the early 21st century.

The first stage, or Knowledge Stage, occurs when teachers are not technology users but are aware that it exists. At this stage, students may be users of technology, but it may be used in ways determined by someone other than the teacher. The teacher’s level of dissonance may be high, particularly if the decision regarding the use of technology is one that has been imposed.

The second stage, or Persuasion Stage, occurs when teachers are making their first interpersonal contacts with peers whom they will endeavour to emulate, gaining new information about the technology currently available. At this stage technology is used as support for traditional work practices, such as attending to correspondence. The level of discomfort begins to decline as new information is assimilated.
The Decision Stage occurs when teachers choose to accept or reject the new changes: either accepting or rejecting a change relieves dissonance. At the point of acceptance, teachers begin the process of adopting technology to assist with traditional tasks and adapting the technological changes to enrich their curriculum, and begin to see ways in which technology might be connected to the curriculum. Inquiry from the students tends to be teacher-directed.

At the fourth stage, or Implementation Stage, teachers move from adaptation to an appropriation stage where technology is viewed as a relevant tool for teaching and learning. They may begin to plan and devise learning experiences involving technology that will assist in achieving objectives and outcomes. A shift toward student-directed integration occurs at this stage. These shifts produce improvements in learning that allow students to master higher-order thinking skills, complex concepts, and other skills they may not have achieved without technology.

The final stage, or Confirmation Stage, is where teachers redefine the classroom environment and the ways in which technology is used. Students become involved in tasks involving the use of organisational skills, as well as mastering content and applying basic skills. Teachers not only begin to invent new applications for the use of technology, they also collaborate with other teachers to develop and use technology across the curriculum.

2. 5. 3. Education for the Future

The Australian Council of Deans of Education (2001) specifies three fundamental roles of education: to serve the needs of the economy by creating useful workers, to create fully participating citizens, and to shape persons at home in their identity. These expectations of education today, therefore, have three perspectives that reflect the needs of the economy: from the continuing changes in the economy and work, from the perspective of changing citizenship, and from the perspective of changing identities. These perspectives require new learning and new basics. These perspectives point out that, while the more traditional basics of reading, writing and mathematics are still important and necessary, a very different approach to knowledge is indicated. Mathematics, often termed ‘numeracy’, incorporates knowledge and also
is a method of reasoning. The term ‘literacy’ – which includes reading, writing, speaking, listening and viewing – indicates a way of communicating and incorporates different uses in different contexts as well as proper usage. Texts are now designed in a highly visual sense and meaning is carried as much visually as it is by words and sentences.

Communication underpins all learning. Communication skills are fundamental to the capacity to transfer learning and are the most basic of any set of generic skills. Communication skills require the development of a broad range of literacy and numeracy skills, complemented by speaking and listening, visual and ICT skills, and non-verbal and physical forms of communication. (VCAA, 2004, p. 8)

New perspectives and new tools can enhance the quality of education. Many researchers are investigating and writing about the ways in which we can harness new technologies and integrate them into meaningful and purposeful activities and learning for the classroom.

Global changes continue to impact on our world. Workers of the future will require skills and sensibilities that are significantly different from those of the past because the conditions of technology, commerce and culture are undergoing processes of radical transformation. The required learning will be more general in its focus, about creating a kind of person and interdisciplinary in its nature. New economies and situations have different requirements to those of the past. There is a need for people who can work flexibly with changing technologies; who can work effectively in the new relationship-focused commercial environment; and who are able to work within an open organisational culture and across diverse cultural settings.

Diverse communications media continue to emerge and call for the mastery of numerous and varied symbolic codes including ones classified as print, visual, aural, mathematical, technical and design elements. Learners need the skills to enable them to access, process, store, retrieve, transform and share ideas, images and information in a complex digital environment. As well as gaining control over basic skills such as word processing, web-page operation and intranet and Internet usage, learners must
also develop the capacity to combine, design and create using these elements together with the new literacy demands that are required.

Information technologies offer new possibilities for innovation and enterprise, with skilled users translating ideas into practice to meet particular needs and opportunities. The rapid pace of recent technological change is likely to continue exponentially in the future. It is imperative, for reasons of equity, that all learners have the skills to access the possibilities that information technologies offer to expand personal and vocational lifestyle choices. It is also important that consumers develop the critical skills to select and use emerging technologies wisely.

(Department of Education: Tasmania, Essential Learnings section, p. 15)

2. 5. 4. Engaged Learning

In Australia, schools such as the Navigator Schools in the Department of Education and Training: State of Victoria and LaTTiCE schools in the Catholic system have been set up in order to fully utilise these technologies. These technologies are incorporated with an approach to learning and teaching that enhances students’ opportunities for access and promotes independent learning. Students are challenged with complex, authentic tasks, with an emphasis on lengthy multidisciplinary projects, cooperative learning groups and flexible scheduling.

Jones et al. (1995) also tell us that us new times demand new ways of learning. They suggest these new ways should promote engaged, meaningful collaboration, involving challenging and real-life tasks, with technology incorporated as a tool for learning, communication and collaboration. Their engaged learning model uses indicators and goals, and includes aspects such as energised learning; authentic and multidisciplinary tasks; generative assessment; interactive models; collaborative learning contexts; heterogeneous, flexible groupings; teachers as facilitators and co-learners; and students as explorers and teachers.

2. 5. 5. eLearning

Questions immediately begin to arise as to how schools have addressed some of these aspects. The information technologies in existence today impinge on all aspects of
daily life – including those of schools. In fact, many students will have a greater awareness of these technologies and be more adept at using them than many teachers. How are schools adapting to these issues? Are these technologies being incorporated into teaching and learning situations? If so, how? Have teaching practices been modified to embrace these technologies?

New terminology evolves in response to predominant contexts in existence in popular culture. With the increased use of electronic devices for locating, gathering, using and communicating information, such as electronic mail (email), it seems a logical progression to give a title to the learning that takes place. eLearning refers to a broad range of activities that involve the use of ICT to support and enhance learning. It includes the effective use of digital resources and learning tools, collaboration with colleagues and mentors in other locations, the experience of a virtual environment, and access to online courses from home or within the community. It has the potential to provide learning content, allow connection with other learners in an interactive manner, and assist all learners to realise their full potential educationally and personally.

eLearning is also about innovation. It is about the tools we use today, but also the tools we cannot yet imagine – which we will be using tomorrow. Within a context of constant innovation and change, we have a responsibility to explore, research and extend the effective use of innovative ICT to support the development of authentic, new learning environments for all learners, at all stages of schooling.

eLearning:
- Allows for engaged, collaborative learning
- Enables learners to access environments, tools and resources – including other learners – at their own pace, in their own time and from wherever they might be
- Empowers learners with responsibility for their own learning experience
- Acts as a catalyst for authentic, meaningful learning experiences
- Offers powerful new possibilities for teacher professional development, student engagement and meaningful school/community integration

Future learners are citizens of a changing Australia. They are:

- Profoundly impacted by technology in most aspects of their lives
- Problem solvers, and educational risk takers
- Able to collaborate with other learners
- Critical and reflective thinkers
- Discriminating users of information
- Aware of belonging to a global community where the citizens of the world are their co-learners
- Independent, self-directed learners, who value learning and understand the learning process
- Engaged in authentic learning experiences applicable to their own lives and values
- Involved in learning – engaged and focused


Future learners will also be able to:

- Forge strong links with their local and national communities
- Have a social and ethical conscience, with a strong sense of responsibility for themselves and others
- Actively negotiate their own learning pathways as they progress through the stages of schooling
- In a changing world, future learners need to be flexible and adaptable. They will require high levels of technological fluency, which they are readily able to apply effectively in any situation. Their skills and understandings need to be easily transferable to new learning situations.

(Department of Education and Training, eLearning Planning Guide: The Future Learner: Future Learners will also be able to … section, 2004)

2. 5. 6. Further Issues

As previously stated, the Charter for New Learning published by the Australian Council of Deans of Education (2001), presents a charter for change, with eight propositions that will shape the future environment of learning. Technology will become central to all learning – to learn through, but also to learn about technology. Technology is not just a tool for learning. It should also be concerned with message it gives as well as the medium that provides it.
Research tells us that children in classrooms with computer exposure have significantly greater gains in self-esteem. Children exposed to open-ended software had significant gains on measures of intelligence, non-verbal skills, structural knowledge, long-term memory, and complex manual dexterity. When the computer was supplemented with hands-on activities that reinforced the major objectives of the software, children gained in all areas of these areas, as well as in verbal skills, problem solving, abstraction, and conceptual skills. Children exposed to open-ended programs displayed more wondering and hypothesizing, formulated and solved their own problems, collaborated with a partner, evaluated their own work more positively, were more motivated in learning settings, and had a more positive attitude toward learning (Clements & Nastasi, cited in Love & Sikorski, 2000, p. 7)

The message here is clear. Technologies that are integrated into the teaching and learning are vital and necessary tools; a thinking curriculum where learners are helped to develop and use higher-order thinking tools is essential; engaged learning situations, where learners are involved in their own learning and where teachers are guides and facilitators rather than being seen as all-knowing experts, should provide the setting for learning. Walters (1999) suggests that certain facts must be accepted if we are to deliver curriculum appropriate for developing the skills and competencies necessary for students to access available technology.

- Computers are the ‘children’s machines.’ Our students do not know a world without computers.
- Ready access to electronic information makes the information level outside our classroom far higher than the information level inside the classroom or school.
- New skill and competencies are required for our students to cope in the future.
- Keeping abreast of the latest technologies is always going to present schools with a major challenge.

Traditionally technologies have been used to deliver and communicate messages to students who will ultimately comprehend them and learn from them. The underlying assumption in this traditional view is that people learn from technology in much the same way as they can learn from listening to a lecture given by a teacher: that is, that students learn from watching instructional films, television programmes and videos, or by responding to programmed or computer-assisted instruction. This premise
means that students learn from technology in much the same way as they learn from a teacher. Learning from technology has its place, but for real learning to occur, technologies must be used for people to learn through it.

An emphasis on engaged learning does not mean that schools should totally abandon technologies that support acquisition of basic skills. These technologies still have value, especially if they deliver instruction to students who are in need of extra practice. What’s important is ensuring that all students also have opportunities to use technologies for in-depth learning projects so that they can participate in complex, authentic tasks within a collaborative context and develop higher-order thinking skills. Technologies that are used for engaged learning and that support a challenging curriculum result in improved teaching and learning, increased student motivation to learn, and higher levels of student achievement. (Gahala, 2001, Different Points of View section)

The message for educators today is quite clear and unlike many other ‘revolutions’ that have occurred in education over past decades, technologies – in both the wider community and educational institutions – are here to stay. Satellites, telecommunications and computer-related technologies have impacted on and re-shaped many aspects of society. Education too has been similarly affected and these new technologies are forcing schools and educators to think again about the nature and purpose of school practices. Smyth (1997) tells us that 85 per cent of children in Year 5 today will be entering a workforce for which the positions have not yet been designed and the technologies not yet created. It is no longer sufficient to focus on the passive delivery and receipt of a set body of content – the ‘empty vessel’ approach. Students need to learn how to learn.

Clark (2001) advocates an integrated and authentic approach based on teaching children how to learn, how to think and how to utilise computer technologies to enhance their learning. With a focus on teaching learners how to think and how to learn, through a holistic and authentic approach which infuses technologies seamlessly, teachers are empowered to prepare learners for their future. Olson (1985) suggests that as tools of the intellect, classroom computers alter the way students think. Scardamalia, Bereiter, McLean, Swallow and Woodruff, (1989) find it is possible to design a computer environment that provides the structure and tools to
enable students to maximise use of their thinking and knowledge. Hawisher and Selfe (1991) note that computers do not automatically create ideal learning situations but, when coupled with inquiry learning, technology becomes a tool that helps students create their own products. Throughout the inquiry process, computers may be authentically used by students to organise information, keep records and present findings to others (Padak & Peck 1991), as well as leading students to a clearer understanding of the place and significance of information in society (Lockard, Abrams & Many, 1994).

2.6 USING INQUIRY

A shared belief exists in education circles that learning is constructed through experience. Experience can initiate the learning process, and subsequent experiences lead to changes in understanding and action. Learning is an active process requiring the student’s engagement (Jones et al., 1994), and learning in the constructivist paradigm is always developmental and occurs when new experiences lead to changes in understanding as the learner constructs his or her own understanding. Constructivism clearly focuses on the important role that the teacher plays in supporting the learning process, but defines this role primarily as a facilitator who guides growth by focusing inquiry, engaging students, exploring and challenging ideas, providing resources, assessing student progress, and providing useful feedback.

In presenting ideas about thinking, Bonnett (1991) outlines the importance of poetic thinking as a balance for the type of thinking that has traditionally governed education: equating good thinking with rational thinking. An inquiry approach to learning allows for the incorporation of these different approaches to thinking. An inquiry approach is one in which a process or framework provides opportunities for students to explore, investigate, search for information, discover and seek solutions. Throughout this process the teacher is viewed as a facilitator to learning and is not seen as having sole responsibility for the learning. The learner is seen as capable and motivated, and as one who begins to use initiative and take more responsibility for learning. As the learner grows in confidence the teacher becomes a co-learner in the process. The nature of instruction is changing. At one time the teacher-centred approach was the norm. Under the constructivist approach, however, the teacher acts
as a guide and a facilitator of learning rather than as an authoritarian dispenser of knowledge (Keefer, 1998).

Otieno (1999) reports that the main purpose of inquiry is to teach pupils the process of investigating and seeking answers to questions or problems which they have now or will have in the future. This is reflective of the ideas of Toffler (1971) and his concept of ‘future shock’, in that we do not always know for what we have to prepare, so there is a need to educate children to be thinkers and develop a wide variety of skills that will enable them to adapt to what ensues. Beyer (1979) too describes the inquiry approach as one way of learning, of knowing and of making sense out of experience. The general goal of the inquiry approach is to help students develop the intellectual discipline and skills necessary to raise questions and search out answers stemming from their curiosity (Bruce & Weil, 1996). Inquiry learning is one vehicle by which students engage in challenging explorations and problem solving in areas of particular interest. Inquiry learning provides an instructional environment in which students of varying abilities can contribute to the success of the group (Padak, 1988).

Rogers (1994) tells us that inquiry can take two forms. Open inquiry is where the learners identify their own problems and carry out their investigations with little or no teacher assistance. Closed inquiry is where the teacher selects the problem, guides in the selection of materials and engages students in the inquiry process. Learning in the inquiry process incorporates what Rogers terms self-initiated learning. This involves the whole person of the learner, feelings as well as intellect, and is the most long-lasting learning because it is creative learning. Socially useful learning develops individuals’ ability to cope with change, where an individual uses past learning to incorporate new and challenging learning about ever-changing situations.

Inquiry approaches provide conditions which allow learners to take control of their learning, to build on their prior knowledge, to make and test predictions, to gather and organise information and to synthesise their findings. These conditions encourage risk-taking, approximation, the exploration of patterns and relationships, reflection on experience and an understanding of differing interests, points of view and value positions. (Pigdon & Woolley, 1992, p.16)
There seems to be a demand on teachers to accommodate seemingly endless additions to the school curriculum, and this calls for a more unified and integrated approach to planning. As our information bases continue to expand and our access to that information increases, there is a need to develop an effective integrated curriculum. A curriculum that is connected by unifying ideas allows teachers and students to work more efficiently. An effective integrated curriculum considers connections across learning areas as well as the ways in which students learn. Inquiry learning involves a strong emphasis on student-centred, active learning and on the process of investigating as much as the product. The approach encourages students, through active investigation, to unify ideas as they move from the acquisition of facts to the development of broader concepts and generalisations (Murdoch, 1992, 1997, 1998, 1999, 2004; Hamston & Murdoch, 1996)

Murdoch (1992, 1997, 1998, 1999, 2004) developed an inquiry model that provides a guide for teachers to use for an effective way to integrate curriculum. A summary of this model is presented and reflects the approach used with the student participants during this research project.

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<td>• engagement in the issue/topic</td>
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<td>• focus on prior knowledge and experience of the learner</td>
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<td>• begin to identify questions/problems</td>
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<td>• locating and gathering information from a range of sources</td>
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<th>Sorting Out</th>
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<tr>
<td>• making sense of experiences/data</td>
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<td>• organising information gathered in a range of ways</td>
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**Going Further**
- provide alternative experiences or avenues of inquiry in order to gain new insights into the topic
- provide opportunities for individual and small group pathways
- relevance/worth of the topic

**Drawing Conclusions**
- reflecting on the topic and on learning
- articulating new understandings
- answering and refining earlier questions/understandings

**Reflecting and Taking Action**
- making sense of experiences/data
- organising information gathered in a range of ways
- analysing information from a range of perspectives

*Figure 3*: Visual representation of Murdoch’s (1998) inquiry process
2. 7. SUMMARY: STUDY IN CONTEXT

The research involved in the current dissertation investigates how the adopting, adapting and integrating of ICT and the incorporation of explicit teaching of thinking skills across the curriculum impact on student learning. By establishing the study within the paradigm of constructivist inquiry (Lincoln & Guba, 1985) and utilising qualitative methods of data collection (Denzin & Lincoln, 2000), the study seeks to identify through positive, interpretative analysis the ways in which learners are empowered and learning is enhanced through the introduction and implementation of various ICT and thinking curriculum practices.

Action research (Lewin, 1946) – which is research that each of us can do on our own practice, with the aim of improving strategies, practices and knowledge of the environments within this practice and which uses a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding about the result of the action – will also inform this study. Through utilising the triangulation of data (Flick, 1992) arising from the collection of artefacts, participant researcher journal and planned observation by an independent observer, together with purposeful selection (Patton, 1990), the researcher anticipates being able to inductively identify the impact of ICT and the incorporation of explicit teaching of thinking skills on student learning.

The literature review provides a basis on which to establish the ways in which learners are empowered and learning is enhanced through the introduction and implementation of various ICT and thinking curriculum practices. The context provided by the researcher’s classroom consolidates and extends knowledge as observable patterns of behaviour emerge. The literature supports the belief in ICT and explicit thinking skills impacting in a positive way.

The following chapter outlines the research design and the methodology employed in this study, the context of which is situated in one junior primary classroom, in one school located in the northern metropolitan area of Melbourne.
CHAPTER 3

RESEARCH METHODOLOGY

3.1. RESEARCH DESIGN IN CONTEXT

This research investigates teaching and learning curricula occurring in schools that can impact on students’ learning. The study addresses the issues of how learners are being empowered and how learning is enhanced through the introduction and implementation of practices, which include the adopting, adapting and integrating of information and communication technology (ICT) and incorporating the explicit teaching of thinking skills across the curriculum. The research paradigm used needed to complement the context in which the study was set, the research participants who are part of this context and the subsequent understandings that are elicited. An integrated-inquiry approach to learning which provides meaningful, engaging and purposeful educational activities is used during the investigation.

This chapter deals with the research paradigm, the process of the inquiry and the methods used to collect the data. A paradigm or interpretative framework is a ‘basic set of beliefs that guide action’ (Guba, 1990, p. 17) and ‘the inquiry aims of this paradigm are oriented to the production of reconstructed understandings’ (Denzin & Lincoln, 1994, p. 100). This principle is important to this research, where an investigation will require reconstructed understandings to gain insights and draw conclusions. The field of inquiry is that of qualitative research which is multimethod in focus, involving an interpretive naturalistic approach to its subject matter: people studied in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 1994; Creswell, 1994). Investigations are undertaken through the use and collection of a variety of materials including case study (Flyvbjerg, 2006; Stake, 1995, Yin, 2002) personal experience (Creswell, 1994), interview (Mischler, 1986) and observational texts (Denzin & Lincoln, 1994). The natural setting of the research is the classroom the participants attend on a daily basis, and the opportunity exists for a collection of materials and artefacts, records of personal experience, interviews and focused observations. There are a number of epistemological (the nature of the relationship
between the knower or would-be knower and what can be known) and methodological
(how the inquirer goes about finding out whatever he or she believes can be known)
issues that are important in this research and are relevant to the qualitative methods
used in this investigation, and these are examined in later sections. The figure on the
following page shows a visual representation of the main research design features.
An investigation of the adopting, adapting and integrating of ICT and incorporating the explicit teaching of thinking skills across the curriculum.

How are learners being empowered and how is learning enhanced through the introduction and implementation of practices which include the adopting, adapting and integrating of ICT and incorporating the explicit teaching of thinking skills across the curriculum?

Constructivist Inquiry
- human beings construct or make knowledge
- concepts/models/schemes are invented to make sense of experience
- constructions are tested/modified in the light of new experience.
- multimethod in focus
- interpretive, naturalistic approach to subject matter
- things are studied in their natural settings
- phenomena is interpreted in terms of the meanings brought
- variety of empirical materials are collected and used

Case Study Approach
The choice of object to be studied may be complex or simple: a child or a classroom of children. Instrumental case study is utilised here as the particular case is examined mainly to provide insight into an issue or to redraw a generalisation (Stake, 2000).

Action Research Approach
- Cyclical process
- Data Gathering Techniques
- Embedded in classroom culture
- Ongoing teacher observation
- Data gathering: in-depth interviews; collection of artefacts; participant observation; reflective journal
- Member checking: involvement of independent observer

**Figure 4:** Diagram of the main research design features
3. 2. QUALITATIVE INQUIRY

Qualitative methods tend to be more commonly used when investigating human behaviour and collecting detailed data about individuals. The purpose of inquiry in qualitative research is in understanding the world from the point of view of those who live in it.

While the natural sciences have as their goal scientific explanation, the goal of qualitative research is the grasping of understanding, or the ‘meaning’ (Verstehen) of social phenomena. We seek not just to observe and describe, but to offer, in anthropologist Clifford Geertz’s (1973) term, a ‘thick description’ of how people as actors understand and ascribe meaning to their own actions. (Clark, 2004, Qualitative research section, para. 2)

The naturalistic paradigm was chosen as an appropriate investigatory orientation. ‘Rather than looking for an external reality the naturalist looks for internal realities – the sense making and belief structures that order human existence and that exist only inside individuals … Study must be pursued in a natural setting’ (Lincoln & Guba, 1989, p. 117). ‘Naturalistic inquiry’ is the term which originally stemmed from the seminal work of Lincoln and Guba (1985) who, in subsequent publications, use the term ‘constructivist inquiry’ (Guba & Lincoln, 1994) in response to the various meanings that were being attached to the term ‘naturalism’, which was often linked to the physical sciences.

Qualitative inquiry cultivates the most useful of human capacities: the capacity to learn (Patton, 2002, p.1). Qualitative conclusions grow out of three kinds of data collection: (1) in-depth, open-ended interviews which provide direct quotations from people about their experiences, opinions, feelings and knowledge; (2) direct observation of the data which consists of detailed descriptions of activities, behaviours, actions, interactions and processes that are part of visible human experience; and (3) written documents, the analysis of which includes studying excerpts and quotations, or entire passages from records, journals and open-ended written responses. The data for qualitative analysis in general come from fieldwork, during which the researcher spends time in the setting under study and makes first-hand observations of activities and interactions, sometimes engaging personally in those activities as a participant observer (Patton, 2002).
The constructivist or interpretivist believes that to understand this world of meaning one must interpret it. The inquirer must elucidate the process of meaning construction and clarify what and how meanings are embodied in the language and actions of social actor. To prepare an interpretation is itself to construct a reading of these meanings; it is to offer the inquirer’s construction of the constructions of the actors one studies (Schwandt, 1994, p. 118).

The purpose of research within constructivist (naturalistic) inquiry ‘is understanding and reconstructing the constructions that people (including the inquirer) initially hold, while remaining open to new interpretations as information and sophistications improve’ (Guba & Lincoln, 1994, p. 113). Over time it is anticipated that constructions will become more sophisticated, and that competing constructions will be critiqued and form the basis for further inquiry. Although researchers using naturalistic inquiry aim for ‘thick description’ (Geertz, 1973), the goal is to go beyond the ‘what’ questions and to ask more challenging questions, such as ‘why?’ ‘what for?’ and ‘in whose interests?’, in order to elicit a thick but critical description (Green, 2002).

Context in naturalistic inquiry is a culturally driven approach to social research involving elucidation of the social events and processes within a given setting. It is culturally driven in that the researcher focuses primarily on the cultural context or setting, which is ‘heavily implicated in meaning’ (Lincoln & Guba, 1985, p.187). According to Dey (1993), the context is the key to meaning, as it needs to be understood if meaning is to be gained. The context is a complex but engaging site for inquiry. It demands a human instrument that can adapt to a dynamic and complex context in order to seek understandings surrounding that context (Green, 2002). Social research seeks to scrutinise human actions which Hammersley (1990) tells us can only be achieved by first-hand contact with it, not by inferences from what people do in artificial settings like experiments.

The current study, which investigated the explicit teaching of thinking skills and the integration of ICT with Year 1/2 students, required prolonged engagement and in situ observations. In addition, the teacher who was the researcher, is the human-instrument.
3. 3. THE CONSTRUCTIVIST PARADIGM

Paradigms represent a distillation of what we think about the world (but cannot prove). The way we act in the world cannot occur without reference to those paradigms and this includes actions that we take as inquirers (Lincoln & Guba, 1985). ‘Paradigms deal first with principles, or ultimates. They are human constructions’ (Denzin & Lincoln, 1994, p. 99). This research, incorporated in a naturalistic paradigm, reflects the thoughts and opinions of the researcher and has led to the investigation that has taken place. Naturalistic inquiry consists of multiple constructed realities that can only be studied holistically. The inquirer and the participants in the inquiry interact and the knower and known cannot be separated. The aim is to develop a body of knowledge that describes the individual case, hence it is impossible to distinguish causes from effects as there is mutual simultaneous shaping (Lincoln & Guba, 1985). This would seem to be particularly so when the researcher and participants are closely bound in an ongoing relationship and interact together constantly in the classroom situation as part of an ongoing process. The values that govern decisions, along with the planning and implementation of daily processes, are closely intertwined and shape each other simultaneously. Lincoln (1993) states that:

Constructivism is one of a set of emergent paradigms which can be rightfully considered either postculturalist or postmodern, or both. It rejects modernism’s Grand Narratives, and focuses on the re-creation and representation of multiple, socially enacted realities, created by multiple stakeholders and participants. (p. iii)

Access and entry are sensitive components in qualitative research, and trust, rapport and authentic communication must all be established. As the researcher was a member of the school, as were the research participants, a naturalistic paradigm was appropriate. ‘Rather than looking for an external reality the naturalist looks for internal realities – the sense making and belief structures that order human existence and that exist only inside individuals … Study must be pursued in a natural setting’ (Lincoln & Guba, 1989, p. 117). The naturalistic inquiry paradigm presented by Lincoln and Guba has been termed constructivist inquiry in more recent publications.
3.4. THE CONSTRUCTIVIST PROCESS

Qualitative research approaches, such as action research, case study research and ethnography, were developed in the social sciences to enable researchers to study social and cultural phenomena. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher’s impressions and reactions. One thing that distinguishes humans from the natural world is our ability to talk, and qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live. Kaplan and Maxwell (1994) argue that the goal of understanding a phenomenon from the point of view of the participants, together with its particular social and institutional context, can be largely lost when textual data are quantified.

Qualitative inquiry typically focuses on relatively small samples, even single cases, which are selected purposefully to permit inquiry into and understanding of a phenomenon in depth (Patton, 2002). Qualitative researchers design a study with real individuals in mind, and with the intent of interacting in that social setting over time. A setting is studied to gain understanding of participants’ behaviours in the participants’ own terms, in relation to the setting and context. The primary school students whose learning is investigated during this research will be members of my own classroom. This enabled observation and the making of judgments about issues in a natural rather than contrived setting, and readily allowed revision and refinement. Qualitative research is used because ‘there is an emphasis on processes and meanings that are not rigorously examined or measured in terms of quantity, amount, intensity or frequency’ (Denzin & Lincoln, 1994, p. 61). There is interest in the perceptions and attitudes of the children involved in the research, and qualitative researchers are able to stress the socially constructed nature of reality and the relationship between the researcher and what is being studied.

Qualitative research involves the studied use and collection of a variety of empirical materials, so in order to gain understanding a variety of tools need to be employed: tools such as case study, personal experience, introspection, life story, interview, observation, historical data, interactional experiences, and visual texts that describe
routine and problematic moments and meanings in individuals’ lives (Denzin & Lincoln, 1994). The research design, which is a qualitative research methodology, includes action research and case study approaches, and utilises qualitative research methods and documentation and analysis of records of personal experience, teacher observation, interviews and artefacts. Green (2002) presents the following as key elements of Naturalistic/Constructivist inquiry: context, qualitative methods, purposive sampling, inductive data analysis and the case report.

**Context:** the context in which a statement is made is crucial to the validity of the statement, and social interactions within the learning environment are an essential part of this experience, contributing fundamentally to individual knowledge construction (Jaworski, 1996). In constructivist thinking, learning is also affected by the context and the beliefs and attitudes of the learner. Learners are encouraged to invent their own solutions and to try out ideas and hypotheses, and are given the opportunity to build on prior knowledge (van Schalkwyk, 1996).

**Qualitative methods:** in qualitative research, methods include the use of qualitative data, such as interviews, documents and participant observation data (Becker & Geer, 1970), to understand and explain social phenomena (Myers, 1997).

**Purposive sampling:** most sampling methods are purposive in nature because the sampling problem is usually approached with a specific plan in mind. Purposive sampling is useful for situations where a targeted sample needs to be reached quickly and where sampling for proportionality is not the primary concern. One might be concerned with getting the opinions of a target population; one might sample for specific groups or types of people; use expert or quota sampling; one might sample for diversity as in heterogeneity sampling; one might sample to capitalise on informal social networks and to identify specific respondents who might be hard to locate otherwise. This is sampling with a purpose.

**Inductive data analysis:** inductive reasoning uses the data to generate ideas (hypothesis generating). Qualitative research often takes the position that an interpretive understanding is the only possible way of uncovering or deconstructing the meanings of a phenomenon that has been investigated (Thorne, 2000).
The case report: this report helps the reader realise or make sense of the states of affairs that are believed by stakeholders to exist, as well as the underlying motives, feelings and rationales leading to those beliefs. The case report is the preferred mode and its purposes include providing thick description, giving vicarious experience, serving as a metaphoric springboard (a form of naturalistic generalisation), and challenging constructions of various stakeholders in ways that lead to reassessment and reconstruction (Guba & Lincoln, 2001).

Qualitative methods tend to be more commonplace in constructivist inquiry, although both qualitative and quantitative methods can be used. Qualitative methods allow for thick data to be collected that demonstrate their interrelationship with their context (Erlandson, Harris, Skipper & Allen, 1993).

In naturalistic inquiry, qualitative methods – such as interviewing, observation, writing journals as well as reviewing artifacts and documents – tend to be more appropriate than quantitative ones. Given that the methodology is located within the social sciences which deal with human behaviour that is not easily quantified but effectively described in detail, qualitative methods can yield relevant data. However, more and more it is accepted that quantitative methods may also be incorporated into research of this nature (Green, 1995; Green & Fehring, 2000; Guba, 1993; Guba & Lincoln, 1994; McNamara, 1994). (Green, 2002, p. 7)

Triangulation has risen as an important methodological issue in naturalistic and qualitative approaches to evaluation in order to control bias and establish valid propositions, because traditional scientific techniques are incompatible with this alternate epistemology (Mathison, 1988, p. 13). Qualitative research is more subjective than quantitative research, and assumes that the researcher must interact with the subjects of the study. It is less formal, and can be expressed as words, pictures and objects (Flick, 2002).

Qualitative researchers, initially led by Denzin (1978, 1989) and Jick (1979), and later by others such as Patton (1990), expanded on the conceptual development of triangulation. ‘By combining multiple observers, theories, methods, and data sources, [researchers] can hope to overcome the intrinsic bias that comes from single-methods,
single-observer, and single theory studies’ (Denzin, 1989, p. 307). Patton (2001) advocates the use of triangulation by stating that triangulation strengthens a study by combining methods. Engaging multiple methods, such as observation, interviews and recordings will lead to more valid, reliable and diverse construction of realities. Patton (2002) clarified the notion that the purpose of triangulation is to test for consistency rather than to achieve the same result using different data sources or inquiry approaches.

Researchers attempt to include multiple perspectives – their own, the participants’, other outsiders’ – as they triangulate the data they are gathering. The purpose of triangulation in specific contexts can be to obtain confirmation of findings through convergence of different perspectives, with the point at which the perspectives converge seen to represent reality. Flick (1992) notes that triangulation has generally been considered a process of using multiple perceptions to clarify meanings and verify the repeatability of an observation or interpretation but, acknowledging that no observations or interpretations are perfectly repeatable, triangulation serves to clarify meaning by identifying different ways in which the phenomenon is being seen.

Triangulation in this study uses multiple data collection: observation (researcher and independent observer), artefacts, recordings and participant interviews. The role of the independent observer was to assess the engaged learning of the students which can be identified when learners are responsible for and energised by their own learning. The independent observer interviewed and interacted with the students. The detailed journal from the independent observer is in Appendix F and excerpts from her analysis can be found in section 4.5.8.

3. 4. 1. Sampling

Purposive sampling refers to the purposeful selection of a given sample. As the constructivist inquirer requires intensity, rather than extensiveness, a sample may be small, even as small as a single case. Purposeful sampling generally endeavours to include as much information as possible and “to generate the information upon which the emergent design and grounded theory can be based” (Lincoln & Guba, 1985, p. 201). Qualitative inquiry typically focuses on relatively small samples which are selected to permit inquiry into and understanding of a phenomenon in depth.
Quantitative methods typically depend on larger samples selected randomly in order to generalise with confidence from the sample to the population it represents.

The logic and power of purposeful sampling derive from the emphasis on in-depth understanding. This leads to selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term purposeful sampling.

(Patton, 2002, p. 46)

Patton (2001) identified 16 types of sampling strategies with varied purposes, all with the underlying common principle being the selection of information-rich cases from which one can learn much about the phenomenon under investigation. For the purpose of this research, where the class of children taught by the participant researcher was not atypical, extreme, deviant or intensely unusual in any way, typical case sampling which illustrates or highlights what is typical, normal or average to those unfamiliar with the setting was employed.

3.5. THE QUALITATIVE RESEARCH FRAMEWORK

3.5.1. Case Study Approach

Case study can be a form of qualitative research which is grounded in the assumptions that features of the social environment are constructed as interpretations by individuals and that these interpretations tend to be transitory and situational (Winegardner, 2000). Researchers develop knowledge by collecting primarily verbal data through the intensive study of specific instances of a phenomenon – the cases – and subjecting these data to analytic induction (Gall, Borg & Gall, 1966). According to Denzin and Lincoln (1994), qualitative research is multimethod in its focus, involving an interpretive, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. Merriam (1998) characterises qualitative research as an umbrella concept covering several forms of inquiry that help to explain the meaning of social phenomena with as little disruption of the natural setting as possible, and in which the focus of the study is on interpretation and meaning.
Stake (1994) presented three types of case studies:

- Intrinsic case study – a study that is undertaken because one wants better understanding of one particular case.
- Instrumental case study – a particular case is examined to provide insight into an issue or refinement of a theory.
- Collective case study – researchers may study a number of cases jointly in order to inquire into the phenomenon, population or general condition.

(p. 237)

The instrumental case study is chosen for this research as ‘the particular case is examined mainly to provide insight into an issue or to redraw a generalisation. The case is of secondary interest, it plays a supportive role and it facilitates our understanding of something else’ (Stake, 2000, p. 437).

The case in this study is a class of Year 1/2 children in a particular school in an urban location in Victoria. This complex entity is impacted by the education system, the socio-economic status of the area, Commonwealth funding issues, the style of teaching and learning that is governed by curriculum set down by a central organisation and, where teaching guidelines are influenced by state and national benchmarks.

Case researchers seek out both what is common and what is particular about the case, but the end result regularly presents something unique which may extend to the nature of the case, its historical background, the physical setting, other contexts, other cases through which this case is recognised, and informants through whom the case can be known (Stouffer, cited in Denzin & Lincoln (1994)). There have been some valuable sources of information and guidance for case study methodologies (Tellis, 1997). Others, such as Hamel, Dufour and Fortin (1993), Stake (1995) and Yin (1984, 1989, 1994), have provided guidelines for the development and execution of a case study. Case study is a valuable method of research, with distinctive characteristics that make it ideal for many types of investigations. Tellis (1997) notes that it can also be used in combination with other methods.
The case study also provides a way for readers of the case study to use their tacit knowledge (Lincoln & Guba, 1985). It allows the researcher to use emic categories (insider’s perspective, the perspective of the participants in the research study), rather than etic categories (those which reflect the outsider’s view in that they are derived from theory). Furthermore, Guba and Lincoln (1994) note that the case studies provide a mechanism for the transfer of knowledge from one setting to another. Stake (1994) also makes this point.

The mode of representation of the research data in naturalistic inquiry is usually a case report, or a record, or a range of such. The case record includes all the major information that will be used in the final analysis and for writing the case study, and is presented at a level beyond that of the raw case data. The product of a qualitative study is richly descriptive and expressed in words rather than numbers or statistics, with descriptions of the context, the participants and the activities of interest, as well as the participants’ own words, generally included. Winegardner (2000) notes that characteristics which are more or less common to most forms of qualitative research mean that the design is emergent, flexible and responsive to changing conditions of the study in progress; the sample selection is usually non-random, purposeful, and small; and the researcher spends considerable time in the natural setting of the study, often in intense contact with the participants.

Stenhouse (1977) proposed the notion of the ‘case record’ as a practical means of conducting and using case studies, addressing the enduring methodological issues of interpretation and generalisation that are central to qualitative methods. Stenhouse’s view was not that each case represents a basis from which to build a comparative theoretical analysis. His concern was that educational case study should itself be educational. His primary concern was that case study should be seen, and used, as providing a point of reference for the development of educational practice.

A case record should make no concessions to the reader in terms of interest or communications. It is a condensation of the case data aspiring to the condition that no interpreter requires to appeal behind it to the raw data to sustain an interpretation. (p. 19)
A case study approach does not exclusively belong to experimental-type or naturalistic research. Rather, the approach is flexible; it can be conducted in either research tradition, or it can integrate both traditions. The purpose of a case study can be to describe phenomena, examine relationships or make predictions. The case study approach to qualitative analysis constitutes a specific way of collecting, organising and analysing data. The purpose is to gather comprehensive, systematic and in-depth information about each case of interest. The analysis process results in a product: a case study. The term ‘case study’ can refer to the process of analysis, or the product of analysis, or both.

One goal of qualitative research is to enhance understanding of phenomena. When a person reports or evaluates qualitative research, it is important to assess the findings for plausibility and believability. Although a specific methodology may have its own guidelines regarding evidence and verification, some common strategies are used by qualitative researchers to support the credibility of the findings. Although different terminology is used throughout the literature, the terms ‘credibility’, ‘trustworthiness’, ‘rigor’ and ‘truth–value’ have similar definitions that indicate plausibility of the methods and findings (Byrne, 2001; Denzin & Lincoln, 2000; Erlandson et al., 1993; Giacomini & Cook, 2000; Guba, 1990; Patton, 1990; Sandelowski, 1986).

In quantitative research, the concepts of reliability and validity are used to judge and evaluate statistical findings. In qualitative research, credibility and transferability are the preferred terms. An overview of common terms and strategies used by qualitative researchers to substantiate and evaluate research methods and findings are presented, although methodologists may define and interpret these terms differently within their paradigm of research.

Qualitative research is inherently an interpretive process. Establishing the credibility of a research method and subsequent findings can be achieved through numerous strategies built into data collection and analysis. Common types of data collection techniques for qualitative research include observation, interview and document analysis. In using observation or interview, prolonged engagement enhances the credibility of the findings. A further strategy for establishing credibility is that of triangulation, which involves using multiple methods or data sources in the study of
phenomena, including use of an independent observer. Referential adequacy is also used to enhance the credibility of findings and incorporates the collection of artefacts which are ‘context rich, holistic materials that provide background meaning to support data analysis, interpretations, and audits’ (Erlandson et al., 1993, p. 139).

Transferability is used to judge the extent to which research findings can be applied to other contexts. A common criterion used to judge quantitative research is the generalisability of the findings where quantitative researchers use large, random samples to enhance the generalisability of statistical findings. In qualitative studies the goal is never generalisability, but rather transferability is used to judge the extent to which the findings can be applied to other contexts. Congruent with the term ‘transferability’, the concepts of applicability and fittingness have also been used in the literature (Sandelowski, 1986). Specific strategies used to achieve transferability include thick descriptions and purposive sampling (Erlandson et al., 1993). Thick descriptions are richly described data that provide the research consumer with enough information to judge the themes, labels, categories or constructs of a study. They provide a research consumer with enough information to judge the appropriateness of applying the findings to other settings.

According to Merriam (1988), ‘Rigor in qualitative research derives from the researcher’s presence, the nature of the interaction between researcher and participants, the triangulation of data, the interpretation of perceptions, and rich, thick description’ (p. 120). Yin (1984) defines the case study research method as ‘an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used’ (p. 23).

Case studies are complex because they generally involve multiple sources of data, may include multiple cases within a study, and produce large amounts of data for analysis. Researchers from many disciplines use the case study method to build upon theory, to produce new theory, to dispute or challenge theory, to explain a situation, to provide a basis to apply solutions to situations, to explore, or to describe an object or phenomenon. The advantages of the case study method are its applicability to real-life, contemporary, human situations and its public accessibility through written
reports. Case study results relate directly to the common reader’s everyday experience and facilitate an understanding of complex real-life situations.

Just as there are various philosophical perspectives which can inform qualitative research, so there are various qualitative research approaches. A research approach is a strategy of inquiry which moves from the underlying philosophical assumptions to research design and data collection. The choice of research approach influences the way in which the researcher collects data, and specific research approaches also imply different skills, assumptions and research practices. Two research approaches that are employed in this study are action research and a case study approach. The term ‘case study’ has multiple meanings. It can be used to describe a unit of analysis (e.g. a case study of a particular organisation) or to describe a research method. The study here is concerned with the use of the case study as a research method, which is a common qualitative method used in investigating information systems (Orlikowski & Baroudi, 1991; Alavi & Carlson, 1992) and is particularly pertinent to the ICT component of the study.

There are various approaches to case study, with some researchers calling their work by alternative names. These names include ‘fieldwork’ (Simons, 1980), ‘case record’ (Stenhouse, 1984) and ‘empirical inquiry’ (Yin, 1984, 1989, 2002). Although there are numerous definitions, Yin (1984) defines the scope of a case study as follows. ‘A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident’ (p. 23). These approaches all share similar parameters and can be seen as an investigation of an existing phenomenon within its real-life context and where multiple sources of evidence are used.

In his discussion of case studies, Stake (1988) notes that the case study is not a specific technique but a way of organising social data so as to preserve the unitary character of the social object being studied. Case studies have been long used in research design. Stake (1994) tells us that some case studies are qualitative and some are not because a case study is not a methodological choice, but a choice of object to be studied: one chooses to study the case and it is defined by interest, not by the methods of inquiry used. Yin’s (1984) definition of the case study research method as an empirical inquiry follows similar lines.
Stake (1978) notes that case studies are about maximising what can be learned, leading to understandings, assertions and possible modifications of generalisations. Patience, reflectiveness and a willingness to see another point of view are frequently necessary, and the ordinary activity of the case is not interrupted as information is gained through discrete observation or examination of records. One endeavours to understand how the people being studied see things.

The strengths of case study research are twofold. The first lies within the triangulation of data collection and multiple analysis methods which contributes to the reliability and internal and construct validity (Yin 1994). Both qualitative and quantitative sources may be used – from primary documents, secondary documents, interviews, archival records, direct and participant observation and physical artefacts – all of which conform directly with Yin’s (1981) list of evidentiary sources.

The second advantage/strength of case study research is the ability of researchers and the target audience to gain real insights into the nature of practice by endeavouring to answer the how and why questions of a particular phenomenon or study. In this approach the study examines the investigation of the adopting, adaptation and integration of information technologies and thinking skills in a primary school in a Victorian urban context.

A number of authors have tried to categorise case studies. Shaw (1982) categorises them as descriptive case studies, analytical case studies and studies of deliberation. Yin (1981) uses a similar description of case studies, categorising them as descriptive, explanatory and exploratory. A descriptive case study would be one that documents a particular action or series of action. Endeavouring to explain or analyse the strategy that resulted in the particular action would classify a study as an analytical or explanatory study. Undertaking a case study to understand the thinking or vision behind the strategy would be classified as an exploratory study. Case studies can be bounded by a single action or a series of actions, a particular cycle or a number of cycles. Kemmis (1982) says that case study consists in the imagination of the case and the invention of the study. This study is limited by the very nature of the investigation: one person exploring an issue in a limited time frame. It is contextualised to a group of participants in particular classroom in a Victorian urban
school site which constitutes the boundaries of the study. The data is established within this setting which is the strength and the limitation of the constructivist inquiry approach, incorporating (naturalistic) inquiry, qualitative methods of data collection, case study method and action research.
3. 5. 1. The Action Research Approach

3. 5. 1. 1. Action Research

Action research is a deliberate, solution-oriented investigation that is group or personally owned and conducted. It is characterised by spiralling cycles of problem identification, systematic data collection, reflection, analysis, data-driven action taken, and, finally, problem redefinition. The linking of the terms ‘action’ and ‘research’ highlights the essential features of this method: trying out ideas in practice as a means of increasing knowledge about and/or improving curriculum, teaching and learning (Kemmis & McTaggart, 1982).

Teacher action research is concerned with the everyday practical problems experienced by teachers, rather than the ‘theoretical problems’ defined by pure researchers within a discipline of knowledge (Elliott, cited in Nixon, 1987). Research is designed, conducted and implemented by the teachers themselves to improve teaching in their own classrooms. The prevailing focus of teacher research is to expand the teacher’s role as inquirer about teaching and learning through systematic classroom research (Copper, 1990). The approach is naturalistic, using participant-observation techniques of ethnographic research, is generally collaborative, and includes characteristics of case study methodology (Belanger, cited in Johnson, 1993).

There is a growing body of evidence of the positive personal and professional effects that engaging in action research has on the practitioner (Goswami & Stillman, 1987; Lieberman, 1988). Action research provides teachers with the opportunity to gain knowledge and skill in research methods and applications, and to become more aware of the options and possibilities for change. Teachers participating in action research become more critical and reflective about their own practice (Oja & Pine, 1989; Street, 1986). Teachers engaging in action research attend more carefully to their methods, their perceptions and understandings, and their whole approach to the teaching process. Lawrence Stenhouse once said, ‘It is teachers who, in the end, will change the world of the school by understanding it’ (cited in Rudduck, 1988). As teachers engage in action research they are increasing the understanding of the
schooling process, their own practice, and the school programs that action research requires (Johnson, 1993).

There are many definitions for action research. McCutcheon and Jung (1990) describe it as a ‘systemic inquiry that is collective, collaborative, self-reflective, critical and undertaken by participants in the inquiry’ (p. 148). Rapoport (1970, cited in McKernan, 1991) notes that ‘action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework’ (p. 4.). According to Kemmis and McTaggart (1988) it is

A form of collective self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out. (p. 5)

Action research provides a way of working which links theory and practice into one whole. Action research, as presented by Kemmis and McTaggart, evolves from Lewin’s model (1946). Lewin, a social psychologist, developed the concept of action research and applied it over a number of years in a series of community experiments in the post-world-war USA in various diverse contexts. The value of this linking of action and understanding was recognised by others such as Corey (1949, 1953), and this approach has subsequently been used in a number of teacher-managed research projects in New York, the UK and Australia as a means of helping teachers to develop inquiry learning in their classrooms.

Within these definitions there are four basic themes: empowerment of participants; collaboration through participation; acquisition of knowledge; and social change. The process that the researcher goes through to achieve these themes is a spiral of action research cycles consisting of four major phases: planning, acting, observing and reflecting (Zuber-Skerritt, 1991).

There is some belief that action research originated with Kurt Lewin, a US psychologist (Kemmis & McTaggart, 1988; Zuber-Skerritt, 1992; Holter & Schwartz-
Barcott, 1993). Others consider that action research as a method of inquiry has evolved over the last century and is a root derivative of the scientific method reaching back to the Science in Education movement of the late 19th century (McKernan, 1991). McKernan (1991) considers that there is evidence of the use of action research by a number of social reformists prior to Lewin, such as Collier in 1945, Lippitt and Radke in 1946, and Corey in 1953. McTaggart (1992) discusses work using group participation in 1913 in a community development initiative with prostitutes in Vienna. Frideres (1992, cited in Masters, 2000) asserts that the concept of participatory research emerged in the 1970s from development work in low-income countries.

In spite of the unclear origins of action research, Lewin (1946) constructed a theory of action research which, as noted in Kemmis and McTaggart (1990), is presented as a process proceeding in a spiral of steps, each of which is composed of planning, action and the evaluation of the result of action. McKernan (1991) notes Lewin’s argument that, in order to understand and change certain social practices, social scientists have to include practitioners from the real social world in all phases of inquiry. This construction of action research theory by Lewin made action research a method of acceptable inquiry.

3.5.1.2. The Process of Action Research

One of the most widely quoted definitions of action research is included below.

Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework. (Rapoport, 1970, p. 499)

The process of action research is one which can be described as a cycle of planning, action and review of the action. This produces a cycle which results in other continuing and iterative cycles of planning, action and review. It is a process in which action is continually enriched by reflection, planning and the injection of ideas, and
one in which the action itself produces experiences which change thinking. Successful interventions and meanings in both knowledge and learning are created by the sustained interplay of activity and reflection (Cherry, 1998). Action research has as its central feature the use of changes in practice as a way of inducing improvement in the practice itself, the situation in which it occurs, the rationale for the work, and in the understanding of all of these. Action research uses strategic action as a probe for improvement and understanding (Brown, Henry, Henry & McTaggart 1988).

Dick (1993) noted that action research is a methodology which has two aims:

- an action aim (to bring about change in some community or organisation or programme or intervention) and
- a research aim (to increase knowledge and understanding on the part of the researcher or the client or both, or some other wider community.

(p. 3)

Prideaux (cited in Cherry, 1998, p. 3) has identified five potential outcomes of action research:

- a change in the situation, practice or behaviour of the client or ‘other’;
- improved understanding of the client’s situation or behaviour for both the client and the researcher/change agent;
- development in the competence and practice of the researcher/change agent;
- additions to the store of knowledge and theory available to the wider professional and general community;
- improved understanding of the processes through which individuals, groups, organisations or larger social systems change.

Action research, according to Kemmis and McTaggart (1982), is a method whereby groups of people or an individual can organise conditions so that they can learn from their own experience and subsequently make this experience accessible to others. This action research method is suitable for use in implementing and monitoring a thinking skills programme where one’s intention is precisely that of learning and passing on information.
Action research offers a way for teachers and administrators to foster interest in improvement and change in their schools. It assists by providing a way of thinking systematically about particular events; of implementing relevant action with regard to these events; of monitoring the process; and of evaluating the effects of the action with regards to continued improvement. The essential feature of the method is the trying out of ideas in practice as a means of improving that practice, leading to increased knowledge in the areas of curriculum, teaching and learning. The method provides a way of working that links theory and practice into a workable whole.

Two ideas which are crucial in Lewin’s (1946) work are those of group decision making and commitment to improvement. A distinctive feature of action research is that those affected by planned changes have the primary responsibility for deciding on courses of action that seem likely to lead to improvement, and for evaluating the results of strategies tried out in practice. To do action research is to plan, act, observe and reflect more carefully, more systematically and more rigorously than one does in everyday life. The action researcher will carry out these four activities collaboratively, involving others affected by the action where appropriate.

Action research can be seen as a method by which practitioners can live with the complexity of real experience while at the same time striving for concrete improvement. It is also a means of helping classroom teachers develop inquiry learning in their classrooms by providing a framework for recognising ideas in action and translating these ideas into action.

To do action research one undertakes:
- to develop a plan of action to improve what is already happening;
- to act to implement the plan;
- to observe the effects of action in the context in which it occurs;
- to reflect on a spiral of steps each of which is composed of planning, action and observation; and
- to evaluate the result of the action.

(Kemmis & McTaggart, 1982, p. 7)

While action research is a subjective study of one situation and the results may not be generalisable, many teachers and researchers now acknowledge that wisdom can be
found in the voices of individuals as they live their own experience, reflect on its meaning, and take action to change what they perceive to be in need of change (Borgia & Schuler, 1996). Gummesson (1991) notes that – within the process of action research – data collection, analysis, action, decision making, implementation and change often take place concurrently.

Action research is an approach to professional development and improved student learning in which teachers systematically reflect on their work and make changes in their practice. Organising for learning experiences usually occurs in a cyclical pattern: assessment of students’ needs, planning learning experiences, monitoring of student progress, assessment of progress, and evaluation of the success of the teaching and learning experiences. This cycle of action leads to the planning and development of new or refined learning experiences. Preferred methods include in-depth interviews, participant observation, case study, self-study and telling of stories (Borgia & Schuler, 1996), and typically it is helpful to have at least three different data sources, a method referred to as triangulation (Smith, 1979). Triangulation is not a tool or a strategy of validation, but an alternative to validation (Denzin, 1989a, 1989b; Fielding & Fielding, 1986; Flick, 1992).

Documentation of such a process is quite detailed, with goals, expected outcomes, learning experiences, assessment strategies and considerations for subsequent planning being carefully recorded. A study in which this style of teaching and learning is investigated will require a complementary approach or style. The documentation of the way a class of primary students participates in this approach to learning, and its perceived effect on their learning, is incorporated in an action research project. This methodology will best support this current study, as action research also consists of continuing and iterative cycles of planning, action and review (Cherry, 1998; Kemmis & McTaggart, 1982).

Clearly, observation by the teacher is essential to action research and Wassermann (1989) supports its accuracy. When commenting on teachers’ observations of student performance on thinking tasks, she said:
I believe that good teachers observe these things and that they know about thinking and behaviour, just as they know Billy is having difficulty with his consonant blends. A good teacher doesn’t need a test to figure this out. She sees it and hears it. She knows it is not a single-occasion error but a persistent dysfunction. When she makes that observation, it enables her to do the kind of teaching that specifically addresses the student’s need. The teacher operates as a reflective practitioner.

(p. 370)

Jaggar & Smith-Burke (1985) also recognise the importance of teacher observation, telling us that teachers can learn from the ideas and intuitions they derive from being skilled observers of children. In their discussions about children’s language learning, they state:

As patterns emerge, teachers can reflect on them, comparing the information to past observations and to their knowledge of language development … When combined with informed reflection observation becomes careful study which leads to sound judgements about children and to continual learning for the teacher.

(p. 5)

These statements from Wassermann (1989) and Jagger & Smith-Burke (1985) support the belief that research in action, including planned observation, is entirely appropriate for this study.

Action research has developed in Australia within two main areas: growth of school-based curriculum development and a growing awareness among teachers who seek alternative ways of working and developing understanding of this work. It offers teachers a flexible approach to the real, complex and often confusing circumstances and constraints of the modern school. It provides on the one hand a framework for recognising ideas in the reality of the work of the schools – ideas-in-action – and, on the other, a concrete procedure for translating evolving ideas into action and for increasing the harmony between ideas and action.

The action research approach is particularly suited to the school situation wherein the able teacher’s usual practice would already reflect a similar practice composed of planning, implementation/action, observation and reflection/evaluation when
determining future actions. While action research appears to have some limitations – in that the findings cannot be generalised to other situations and organisations, and are only relevant in the context of the organisation in which they occur – this is acceptable given that it is designed primarily for practitioners to improve their own practices. The relevance for others is the framework developed which can readily be adopted for action research in their own contexts. Consequently, the action research model – comprising a general plan of planning, action, observation and reflection, leading to a revised plan for the next cycle – is entirely appropriate. This is particularly suitable for classroom teachers, where the teaching and learning process is an ongoing cyclical one of planning, implementing, monitoring, assessing and evaluating.

The figure on the following page shows a visual representation of Cherry’s (1998) model of the cyclical nature of action research, together with the corresponding action in this current research which will be further explored in subsequent chapters.
**Figure 5:** The action research cycle (Cherry, 1998)
3.6. THE RESEARCH SETTING

The setting for this research is a junior primary class in a northern suburban area of Melbourne in Victoria. It is Preparatory–Year 6 non-government school. The first year of schooling in the state of Victoria is called the preparatory year. This first year is given different titles in other states and territories of Australia.

3.6.1. The School

Northern Metropolitan Primary School (NMPS) is a school typical for the area in which it is located, and in 2002 NMPS had a combination of straight and composite classes.

The school was established in 1965 and is located in a low socio-economic area. ‘Socio-economic status’ is a term used to describe a person’s overall social position or social standing and is determined by individual achievements, the most important of which are educational attainment, employment and occupational status, and income and wealth (Marks, 1995). Many different cultural groups were represented at the school, with the predominant cultural groups being Vietnamese, Middle Eastern (mainly Iranian, Iraqi and Lebanese), Australian and Australian-born language background other than English (LBOTE) children.

The school delivered the curriculum as determined by CSF 2 (BOS, 2000). This curriculum included eight key learning areas: The Arts, English, Health and PE (Physical Education), LOTE (Language other than English), Mathematics, Science, SOSE (Studies of Society and Environment) and Technology. The LOTE taught in 2002 was Italian. The school also delivered a further curriculum in the form of a Religious Education programme. This programme was planned at school level with regards to local needs and special events, following guidelines and units of work set down by the Catholic Education Office (2000).

Teaching and learning experiences were planned and implemented from school-based curriculum documents developed in line with CSF II Frameworks (Board of Studies,
The school-based policies that were in place included policy statements of Vision and Mission, Teaching and Learning, Assessment and Reporting, English, Mathematics, Integrated Curriculum (including scope and sequence charts specific to SOSE (Studies of Society and Environment) and Science), Pastoral Care and Information Technology (including a scope and sequence chart of skills). The First Steps (Western Australia) (Rees, 1994) English language resource, which consisted of four resource books and four developmental continua (First Steps, 1994), was used for documenting student progress in English.

NMPS endeavoured to provide its students with a wide variety of experiences on which to build understandings, and catered for a range of needs. The following programmes were also in place: Music (classroom-based music, extra curricula music lessons and the school band); Library information centre; LOTE (Italian); (PE) Physical Education; P–6 Outdoor Education and Camp Programme; Swimming; Pastoral Care Group; Integration; Student Pastoral Care Group; and Student School Council. There were opportunities for students to join the school choir, participate in school productions, be part of the student representative council, have private music lessons, and join the Mary MacKillop group, a group involved in charitable work and companionship. The choir competed at Eisteddfod music festivals and competitions. There were tennis courts adjacent to the school and related skills were taught in PE lessons; classes also had the opportunity to book use of the courts. Senior students were involved in interschool sports competing against neighbouring schools, and an intensive swimming programme was held at a local pool for all levels in the school.

There was a strong sense of community and inclusiveness in the school and parish, with many cultural and liturgical celebrations being held. The school buildings were well used after hours – cultural groups in the parish utilised them for activities such as singing and worship, as well as various ethnic schools, tutoring groups, Scouts Australia and various rites of the Catholic church for religious instruction. A small but hard-working Parents and Friends’ Association was active in the school and parish and was involved in social and fundraising activities, support in classrooms and operating the uniform shop.
3. 6. 1. 1. School Class Structures in 2002

2 x Preparatory classes
3 x 1/2 Multi-age classes
1 x 2/3 Multi-age class
2 x 3/4 Multi-age classes
2 x 4/5 Multi-age classes
3 x 5/6 Multi-age classes

3. 6. 1. 2. School Policies

Teaching and learning experiences were planned and implemented from school-based curriculum documents developed in line with CSF II Frameworks (BOS, 2000) as outlined previously.

Schools have various practices in place for developing school-based policies and generally have major and minor areas on which to focus, in keeping with areas that have been identified and prioritised for focused investigation through the school review process. This information, together with any external initiatives, is included in the annual management plan. Schools are usually in various stages of curriculum and policy development cycles, involving the development, implementation, evaluation, review and revision of areas of curriculum, policy or programmes. The policy documents, once ratified, are then disseminated and become available for planning at classroom level.

3. 6. 1. 3. The 2002 Class

This group of 31 students was in a junior primary Years 1/2 multi-age class. The students came into the 2002 classroom with wide-ranging abilities and varying proficiency with the English language. Six students had English as their first language and three of these were native speakers of English. Twenty-four children spoke a LOTE, with the majority of this group only speaking English in the school setting. Three students were receiving integration funding and two other students were assessed and qualified for subsequent funding.
The children participated in four specialist programmes: PE, Music, Library and LOTE (Italian). CLaSS (Children’s Literacy Success Strategy, Crevola & Hill, 1998) was in its second year of implementation in the junior primary classes, and information provided in Chapter 4 will illustrate the range of abilities in literacy.

While the students came into the 2002 classroom with a variety of experiences and abilities, a sense of community and a working environment reflecting the students’ eagerness and willingness to learn were soon established. Integration aides and parent helpers worked diligently in the classroom on a daily basis to support student learning and the development of a positive classroom climate.
CHAPTER 4

DATA AND CASE STUDIES

4. 1. INTRODUCTION

4. 1. 1. ICT and Thinking skills in the classroom

The importance of teaching explicit thinking skills and incorporating information communication technology (ICT) into classroom practice has been identified and explicated in Chapter 2. Chapter 3 explained the theoretical and methodological paradigm with which the inquiry was concerned for this thesis.

This chapter describes the context of the Northern Metropolitan Primary School (NMPS) and the classroom within that school setting, and also presents data from case studies of various individuals who were participants in the research. These case studies included data from participant interviews (PI) of the student participants (SP), the collection of artefacts (CA), the observations of an independent observer (IO) and the observations and reflections of the participant researcher (PR). The data were analysed in the process of coming to an understanding of how adopting, adapting and integrating ICT, and incorporating the explicit teaching of thinking skills across the curriculum, impact on learning.

4. 2. THE CLASSROOM CONTEXT

The classroom that was the setting for the research was a junior primary composite class with 31 students from Years 1 and 2 (students aged between six and eight years). The school in which the classroom was located has been described in the previous chapter. Important factors in the selection of the sample were those of access, rapport and building knowledge in a partnership. As the PR, I was able to build a rapport with the students on a daily basis and was able to foster an atmosphere in which the participants felt comfortable and secure. The cycles of action research that were implemented could be woven into classroom practice, and access to artefacts, interview opportunities and data collection were more readily managed through the PR being in situ. Building knowledge together was extremely important and the
opportunities to observe this were not confined to set time frames, but could be observed and recorded anecdotally as they occurred.

As discussed in Chapter 3, purposive sampling was utilised in this study as it generally endeavours to include and generate as much information as possible (Lincoln & Guba, 1985). Patton (2002) refers to the purposeful selection of a given sample. Typical case sampling – which illustrates or highlights what is typical, normal or average to those unfamiliar with the setting – was the criterion employed to select the site of the study. The class of children who were members of the selected site and were taught by the PR was specifically selected as it was ‘not in any major way atypical, extreme, deviant, or intensely unusual’ (Patton, 1990, p. 173).

4. 3. THE SCHOOL CONTEXT: ICT

4. 3. 1. Brief History of ICT at Northern Metropolitan Primary School 1990–2000

NMPS purchased the first computers, Apple 11e, in 1990. In the following years this purchase was supplemented through the acquisition of machines obtained through an incentive programme operated by Coles supermarkets, and also through fundraising by the Parents and Friends’ Association. These computers were located in various classrooms and were used to varying degrees.

In 1994 the computer program was evaluated and a decision was subsequently made to obtain Macintosh computers for future purchases. Four Macintosh 575 computers were purchased and shared among the Years 3–6 classes. Two further purchases were made in 1995, with these computers being shared by the Years 1 and 2 classes.

In 1996 a Macintosh 6360 computer, together with an Averkey 3 display unit, was purchased to facilitate group instruction.

In 1997, four Power Mac 5260 computers were purchased. After staff discussion, a decision was made to move all Macintosh computers to an available classroom and set
up a computer laboratory, so as to enable regular, whole-class access to computing resources.

By 1998, the computer laboratory had 18 computers.

In 1999 with the introduction of the TCS (Technology in Catholic Schools) project, NMPS received funding for technology. Thirteen IBM-compatible computers, cabling, a server to operate the network and a CD-ROM tower were purchased, and 2x386 and 2x486 computers were upgraded. These computers were networked for sharing of resources, and had Internet access. Each classroom was allocated one computer, with one senior class having four such computers to serve as a model for information technology in classrooms. The server had a larger hard drive installed in 2000. Also in 2000 a new computer was purchased and added to the network, and this computer was located in the staffroom for general and Internet access. The main resources used by students included access to the Internet with Internet Explorer, a word processing and spreadsheets package called ClarisWorks, Microsoft Office and published software: Bailey’s Book House, Gizmos and Gadgets, Hyperstudio, Kid Pix and Sammy’s Snake House.

4. 3. 2. ICT at Northern Metropolitan Primary School 2001

A brief audit of ICT in the school revealed mixed blessings. At the beginning of 2001, there had been a Macintosh laboratory in operation in the school. The machines all had the same platform, but there were vast differences in the ages, operating systems, capacities, capabilities, ease of use and the ability to gain access to the network for shared resources. In 2001 the school administration had allocated a sizeable amount of money for the purchase of ICT equipment. This equipment was to be predominantly desktop personal computers, together with the relevant cabling and hubs required for these to be added to the school bank of networked computers. The decision was made to change to a Microsoft platform for various reasons, with the main one being initial and ongoing hardware costs. Two scenarios were put to the staff about best practice for utilising ICT for teaching and learning.
**Scenario one** was for each classroom to have a minimum of three networked computers. The middle and senior areas of the school would have the newer IBM-compatible machines, while each junior class would have the three ageing Macintosh machines and one IBM-compatible machine, with the plan being to replace the Macintosh machines as budgets permitted. This scenario was seen to be in keeping with the philosophy of integrating ICT and was also compatible with the philosophy put forward by the TCS project.

**Scenario two** was for the newly purchased IBM-compatible machines to be put into the laboratory in place of the Macintosh machines, with each class having a set weekly block of one hour’s timetabled use. Non-allocated blocks of time could be booked for further use. Each class would also have one networked IBM-compatible machine. This scenario was less compatible with the idea of integrating ICT.

Scenario two, however, became the preferred choice and the purchase of 16 IBM-compatible machines, together with other necessary hardware and cabling, was made. These machines were set up in the laboratory and varying opinions regarding having a laboratory compared to having banks of computers located in classrooms can be found.

Computer laboratories can be excellent resources. A computer laboratory can provide an ideal situation in which to learn how a computer works, learn about software application skills, and develop keyboarding skills, all in a large group setting. The teacher is able to present and demonstrate the skills to be worked on, and students are provided with time to practise and develop their skills, making ongoing access to ICT much easier. In the context of integrating ICT with a laboratory providing the base for technology, it is important that the specific teaching and learning needs have been identified through planning units of work that can then extend and integrate into the learning done in the laboratory. This can be achieved by viewing working at the laboratory in a completely different manner than the typical traditional setting. Students do not have to be all working on the same activity in the computer laboratory, but each student could be actively engaged in an activity to enhance or support the learning that has happened in the classroom, with flexible groupings of students working on small-group or personal inquiry. The teacher during this scenario
is spending time with each group, facilitating their learning on a needs basis. Each student is actively involved with a purpose, making decisions that will guide them to the next step toward achieving the designated goals and objectives.

While there are many positive aspects to having a computer laboratory, there is another view which puts forward the notion that the ideal way for students to learn about and through ICT, and for ICT to be integrated, is for students to have ready access to ICT equipment beyond that of a weekly booking, with the opportunity for an extra visit to the laboratory when possible.

Antifaiff (2000) raises the question of whether students should be learning about computers, or whether students should learn with computers as they learn content related to curriculum objectives. She notes that the integration of technology should contribute to the teaching and learning in the classroom, with the computer being a means of achieving the educational objectives. When integrating technology the curriculum should be the starting point, not the machine, and the teacher and the curriculum should guide the process.

Curriculum integration with the use of technology involves the infusion of technology as a tool to enhance the learning in a content area or multidisciplinary setting. Technology enables students to learn in ways not previously possible.

Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it professionally. The technology should become an integral part of how the classroom functions – as accessible as all other classroom tools.

(Wheeler, Renchier, Conley & Summerlight, 2000, p. 6)

For some, however, the practice of using a laboratory to deliver ICT has undermined the most valuable aspect of the computer – that of its ability to cut across traditional subject boundaries as a practical and useful tool. Papert (1993) compares the isolation of computers in laboratories to the body’s immune response to a foreign intruder: by removing computers from the classroom and relegating them to an isolated laboratory, schools have effectively minimised the potential impact computers can have on
children’s learning by turning the technology into a separate, unrelated subject area he refers to as computer literacy. In this laboratory approach, Papert further argues that students have access to about one-fiftieth of a computer in school, far from the critical level needed for this technology to have a major impact on educational practices or learning experiences of children. The fatal flaw in taking computers out of the classroom is that any information learned about the computers today will be obsolete by tomorrow (Papert, 1993). Only when computers are integrated into the curriculum as a vital element for instruction, and are applied to real problems for a real purpose, will children gain the most valuable computer skill – the ability to use computers as natural tools for learning (Shade & Watson, 1990).

4.3.3. Implications for Research Project

Integrating ICT provides a tool for powerful learning (Hawkins, 1997; Jonassen, 1996; Jones et al., 1995; Papert, 1993) and this belief is integral to this research project. The physical location of computers, and the way in which integrating technology was viewed, therefore needed consideration. It is the opinion of the PR that one’s personal philosophy of how children learn impacts greatly on the way in which teaching and learning is fostered and nourished. If one believes in an inquiry-rich/big picture, holistic approach to teaching and learning, then that will be reflected in the learning experiences and resources that are provided, the grouping structures that are used and the ways in which the curriculum is delivered. The learning that occurs in any classroom is not limited to the students’ physical positioning within four walls, but grows from and is enhanced by the philosophical approach adopted and the atmosphere is which it is delivered. This differentiation is pertinent to this study where the integration of ICT takes place in two physical locations – the classroom/homeroom allocated for the students’ use for the calendar year and the computer laboratory where the most recently acquired machines were established.

The computer laboratory was set up with banks of networked computers, a networked printer and an Averkey for teaching or presenting to a group. The situation in the classrooms at this time was a different matter. There was still only one networked computer, and while there are resources and websites providing valuable ideas and suggestions for best practice in such a situation (Ashmus, retrieved 2006; Roberts,
1998; Peebles, 1996; Jefferson County Schools, 2003), it was the opinion of the PR that the students needed to have access to a bank of computers throughout each learning day. A scenario was developed that would provide a solution to this and would also be of benefit to other teachers in the junior school. This scenario was only considered with regards to junior teachers, as the teachers in the middle and senior areas of the school were those who were particularly in favour of having one networked machine in the classroom and timetabled access to the computer laboratory.

There had previously been 18 networked Macintosh machines in the computer laboratory. The notion that evolved is as follows. The server in the school was capable of running machines over two different platforms, Microsoft and Macintosh, and the purchase of extra hubs and cabling meant that the Macintosh machines could be put into use in the junior classrooms. The Macintosh machines were grouped into small banks of those with similar capabilities and located as follows. Three machines were placed in each of the Preparatory and 1/2 classrooms, with two machines in the 2/3 classroom. This approach was met with approval, as the teachers in the junior school were provided with access to machines for learning centres across all curriculum areas, and the software that had been acquired for these machines could still be utilised. The IBM-compatible networked machine would also remain in each room, thus giving each classroom access to a printer by way of the network. This was considered satisfactory for the implementation of this project. The physical set-up was important for the SP to have ongoing computer access. In this way, the students had access throughout the day to banks of networked computers, both in the classroom/homeroom and in the closely located computer laboratory. Data collection in the area of the integration and adaptation of ICT was enabled.

4.4. SETTING THE SCENE FOR ACTION RESEARCH

Physical practicalities relating to the use of ICT for the implementation of this study were satisfactorily navigated, and while there are ongoing constraints and issues with school life – such as timetabling conflicts with extraneous school activities, network failure and unexpected interruptions to daily programmes – the situation was
satisfactory. Aspects relating to areas apart from ICT hardware required further consideration.

The literature clearly reveals the recognition of ICT and is reflected in the Victorian Essential Learning Standards (VCAA, 2005), which describe what is essential for students to achieve from Years Prep–10 in Victorian schools. The Essential Learning Standards are developed within three core, interrelated strands: Physical, Personal and Social Learning; Discipline-based Learning; and Interdisciplinary Learning. These standards place equal importance on the three strands and recognise that the skills and behaviours implicit in interdisciplinary learning is as essential to learning as the content in the discipline-based areas.

ICT is clearly viewed as a valuable learning tool.

Information and Communications Technology, as an interdisciplinary domain, focuses on providing students with the tools to transform their learning and to enrich their learning environment. (VCAA, 2005, Interdisciplinary Learning: Information and Communication Technology: Introduction section, para. 2)

The teaching of explicit thinking skills, too, is as essential to learning as the content in the discipline-based areas.

An explicit focus on thinking and the teaching of thinking skills aims to develop students’ thinking to a qualitatively higher level. Students need to be supported to move beyond the lower-order cognitive skills of recall and comprehension to the development of higher-order processes required for creative problem solving, decision making and conceptualising. In addition, they need to develop the capacity for metacognition – the capacity to reflect on and manage their own thinking. (VCAA, 2005, Interdisciplinary Learning: Thinking Processes: Introduction section, para. 3)

The importance of both ICT and thinking skills was clearly established and it was the view of the PR that there were two considerations involved in going further: learning about and learning through technology. Computers are clearly recognised as valuable tools. However students must, as with any tools, use the machines and be given the
opportunity to do so. Similarly, students must also be using their thinking processes. If students are to learn through ICT, there needs to be some understanding of how to use it. If students are to learn through explicit thinking, they need some direction in channelling their thoughts. Good practitioners always endeavour to find out what is known/unknown and scaffold the students’ learning opportunities accordingly.

Vygotsky (1986/1934) views teaching as leading development instead of responding to it, while Brown, Collins and DuGuid (1989) note that a meaningful learning context is crucial and that learning should be purposeful and situated. Scaffolding in early literacy forms the basis of the beliefs that underpin current approaches to teaching literacy. In the learning-centred teaching process, the teacher first models a new strategy and then talks through what the strategy is, when the strategy should be used, and how to go about using it. Following this, the teacher engages in the task with the students helping out. This leads to the students taking over the task using the strategy, with the teacher helping and intervening as needed. The final outcome is for the students to use the strategy independently (Wilhem, Baker & Dube, 2001).

Another aspect that was important to establish was how much the SP had been involved in the use of ICT and the explicit teaching of thinking. Previous teachers were contacted in order to determine what sorts of things they might have covered in these areas. They were approachable and honest about what had or had not been done. Anecdotal notes were made about ICT as we chatted. Thinking skills were not explicitly taught but were considered to be implicit in daily practice.

The following extracts illustrate the difficulty the Prep teachers experienced in endeavouring to introduce ICT.

With the Preps I was so busy trying to teach them how to follow daily routines … you know, put their bags away by themselves … get their play lunches out … how to eat … how to play … how to communicate in English … just talking to each other. Then I was flat out getting them to read, write and do Maths. I just gave up on using computers because I don’t know much myself … and the effort of getting these kids to the lab and trying to get them to use computers with so little English behind them … too hard … I just couldn’t do it.
(Prep Teacher M, February 2002)
We didn’t go much [to the lab] in the beginning … just trying to get organised … later in the year we went once a week to use things like Bailey’s [Bailey’s Book House] and Alphaboat and Kid Pix … the kids loved Kid Pix … it was hard … the Macs were old … the kids didn’t understand …
(Prep Teacher J, February 2002)

I was in the senior school last year so I can’t really say much … I think T took them to the lab most weeks and used Bailey’s and Sammy’s [Sammy’s Science House] and Kid Pix … some of the 2s I’ve got seem to be able to use those … because I’ve just come down here I’m just trying to get organised … some of the kids use them in free time…
(1/2 Teacher J1, February 2002)

I took them to the lab and we used what we could – Bailey’s and Sammy’s [Sammy’s Science House] and Kid Pix – I don’t know how much they learned about computers … they worked in buddies … they had exposure …
(1/2 Teacher J2, February 2002)

In the first few days of the 2002 school year, the PR allocated time for the SP to access computers and engage in a free choice of tasks. It soon became apparent that there was a range of abilities and attitudes and that no assumptions could be made about the SP’s understandings of using computers. Some knew how to turn on computers and access simple programs, but these students were small in number. Others knew how to access some of the programs if the machines were already turned on and the relevant shortcut icons were on the desktops. Even those who indicated that they had computers at home rarely accessed them unaided but were assisted each time by a parent or sibling. These informal observations provided direction for initial cycles in the action research.

Action research is a non-traditional form of research which ‘is often community-based and carried out by a practitioner in the field’ (Stringer, 1996, p. 9). The linking of the terms ‘action’ and ‘research’ highlights the essential feature of this approach, which involves the testing out of ideas in practice as a means of improvement in social conditions and increasing knowledge (Kemmis & McTaggart, 1988, p. 6). A commonly known cycle – that of Kemmis and McTaggart (1988) and mentioned earlier – is to plan, act, observe and reflect; then, in the light of this, plan for the next cycle. This model, which was to be used for the purpose of this study, was in fact equivalent to the process used by good teaching practitioners in delivering the
curriculum – plan, implement, monitor, assess, evaluate. It was apparent that in investigating the research questions multiple cycles would be used.


The inquiry approach to learning and teaching supports contemporary learning theory. This approach is built upon the idea that students are actively involved in learning and continually reconstruct understandings in the light of experience. It encourages students to participate in active investigation, and to integrate, rather than separate knowledge, as they move from acquisition of facts to the development of deep understanding (Dept of Education, Tasmania (2004), Planning: Integrated Inquiry section, para. 1)

The inquiry approach, which was utilised within the classroom/homeroom and in the school in delivering the integrated curriculum units of work, reflects the cycles of action research: Tuning In (beginning to identify questions/problems); Finding Out/Investigating (further clarifying/extending questions); Sorting Out (organising information gathered in a range of ways); Going Further (providing alternative experiences or avenues of inquiry in order to gain new insights into the topic); Drawing Conclusions (articulating new understandings/answering and refining earlier questions/understandings); Reflecting and Taking Action (making sense of experiences/data and analysing information from a range of perspectives).

The SP in this classroom were well used to having a range of teachers, integration aides and parent helpers working in various ways. Parent helpers assisted daily during the literacy block in both Reading and Writing Workshops. One parent helper in particular assisted in the literacy block and during any learning sessions that were held in the computer laboratory. In addition to this, three parent helpers came on a weekly basis to assist in visual arts sessions, and there were always several volunteers to come on excursions and walks to various events in the community. The contribution of parent helpers assisting in the classroom is beyond estimation and is highly valued and appreciated by the PR.
4. 5. RESEARCH IN ACTION

A constructivist approach (Denzin & Lincoln, 1994; Geertz, 1973; Guba & Lincoln, 1994) to investigating students’ learning promotes using curricula that acknowledges students’ prior knowledge and has an emphasis on problem solving, and where educators focus on making connections between known information and fostering new understandings. It was important for the PR to ascertain certain aspects regarding the SP, such as linguistic backgrounds and literacy levels. It was important that literacy levels were assessed using tools utilised across the sector and administered according to common guidelines.

4. 5. 1. Language and Learning Information

The following information is included to give an indication of the language backgrounds of the SP and to provide the reader with additional insight as to the other factors that might impact on the students’ abilities to process and internalise information. The SP language backgrounds include Vietnamese, Arabic, Lebanese, Assyrian, Chaldean, Polish, Spanish, Singhalese, Sri Lankan, Maltese, Tagalog and English, and are reflective of the language backgrounds of students at NMPS. Three students in the class were not of a language background other than English (LBOTE) and six students did not speak a language other than English (LOTE).

The information is presented in two tables, with the first table providing information about the Year 2 SP and the second table providing information about the Year 1 SP. This information describes the students through the use of a numeral – either 2 or 1, depending on the student’s year level, and a letter of the alphabet related to the students’ order in that level, according to alphabetical order by surname. The remainder of the information identifies aspects that may impact on student learning. This information includes whether the student was born in Australia; whether the student has a LBOTE; whether a LOTE is spoken at home; and whether the student is in receipt of government funding for the purposes of integration into the mainstream classroom (integrated). Integration funding provides the services of integration aides to support students with physical or intellectual disabilities and severe language disorders.
In these tables Y represents the word Yes and N represents the word No.

Table 1: Overview of language/integration backgrounds for Year 2 students N=13

<table>
<thead>
<tr>
<th>Individual Students</th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
<th>2D</th>
<th>2E</th>
<th>2F</th>
<th>2G</th>
<th>2H</th>
<th>2I</th>
<th>2J</th>
<th>2K</th>
<th>2L</th>
<th>2M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in Australia</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>LBOTE</td>
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<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>N</td>
</tr>
<tr>
<td>LOTE spoken</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Integrated</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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</tr>
</tbody>
</table>

Table 2: Overview of language/integration backgrounds for Year 1 students N=18

<table>
<thead>
<tr>
<th>Individual Students</th>
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<th>1B</th>
<th>1C</th>
<th>1D</th>
<th>1E</th>
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<th>1M</th>
<th>1N</th>
<th>1O</th>
<th>1P</th>
<th>1Q</th>
<th>1R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in Australia</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>LBOTE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>LOTE spoken</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Integrated</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
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<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

4.5.2. Literacy Levels Information

The Literacy scores for the SP at NPMS for Literacy Pre and Post Testing for the 2002 school year are included here. Also included are the scores for the Literacy Post Testing for the end of the 2001 school year, which provide insight as to SP literacy starting points. The test items for the Literacy Pre and Post Testing are administered as part of the Literacy Advance ongoing collection and analysis of sector literacy data and literacy provision. The assessment tools for the administration of the Literacy Advance Strategy include the following items. Clay’s (2002) ‘An Observation Survey of Early Literacy Achievement’ assessment items are incorporated into the assessment process. This observation survey includes the following aspects: letter identification (Letter ID), concepts about print (CAP), word test, writing vocabulary, and hearing and recording sounds in words (HRSW). As well as the assessment tools in the Observation Survey, these additional tests are administered: Burt Word Reading Test (Gilmore, Croft & Reid, 1981) (which is an individually administered measure of an aspect of a student’s word recognition skills); Running Records of Reading Behaviour (Text Level) (Catholic Education Office, 2004); Record of Oral Language (ROL) (Clay, 1983) (a test of the structures of oral English); Spelling in Context (Peters & Smith, 1993) (a test for spelling given to Year 2 students reading at Text level 16 and above). In the following test scores, the PR administered all the test items except for Peters’ Spelling in Context and Record of Oral Language, which were administered.
by another member of staff as decided by the school administration. This decision was in place for the years 2001–03.

The information in Tables 3-6 is included to show the improvements in the students’ literacy and provides some evidence that the thinking skills/ICT Action Research project was impacting positively on the students’ literacy skills in addition to students’ achievements in ICT and thinking skills.

Table 3: Literacy post-test scores for 2002 Year 2 students as at the end of 2001 and prior to entry into 2002 classroom N=13

<table>
<thead>
<tr>
<th>Individual Students</th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
<th>2D</th>
<th>2E</th>
<th>2F</th>
<th>2G</th>
<th>2H</th>
<th>2I</th>
<th>2J</th>
<th>2K</th>
<th>2L</th>
<th>2M</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROL (0-42)*</td>
<td>9</td>
<td>21</td>
<td>17</td>
<td>19</td>
<td>7</td>
<td>29</td>
<td>27</td>
<td>8</td>
<td>12</td>
<td>9</td>
<td>22</td>
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<tr>
<td>BURT</td>
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<td>23</td>
<td>28</td>
<td>38</td>
<td>25</td>
<td>27</td>
<td>33</td>
<td>30</td>
<td>29</td>
<td>29</td>
<td>30</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>Text Level (0-28)*</td>
<td>7</td>
<td>28</td>
<td>13</td>
<td>22</td>
<td>14</td>
<td>16</td>
<td>14</td>
<td>14</td>
<td>13</td>
<td>14</td>
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<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Letter ID (0-54)*</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>CAP (0-24)*</td>
<td>18</td>
<td>24</td>
<td>21</td>
<td>24</td>
<td>14</td>
<td>20</td>
<td>23</td>
<td>21</td>
<td>24</td>
<td>22</td>
<td>24</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Word Test (0-15)*</td>
<td>12</td>
<td>15</td>
<td>13</td>
<td>15</td>
<td>13</td>
<td>10</td>
<td>15</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>15</td>
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<td>15</td>
</tr>
<tr>
<td>Writing Vocabulary</td>
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<td>29</td>
<td>56</td>
<td>42</td>
<td>45</td>
<td>19</td>
<td>46</td>
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<td>30</td>
<td>24</td>
<td>23</td>
<td>42</td>
<td>38</td>
</tr>
<tr>
<td>HRSW (0-37)*</td>
<td>35</td>
<td>37</td>
<td>37</td>
<td>36</td>
<td>35</td>
<td>35</td>
<td>37</td>
<td>35</td>
<td>35</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>

* The score range for various test items is shown next to the item if relevant.

Table 4: Literacy pre and post-test scores for 2002 Year 2 students N=18

<table>
<thead>
<tr>
<th>Individual Students</th>
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<th>2B</th>
<th>2C</th>
<th>2D</th>
<th>2E</th>
<th>2F</th>
<th>2G</th>
<th>2H</th>
<th>2I</th>
<th>2J</th>
<th>2K</th>
<th>2L</th>
<th>2M</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROL (0-42)*</td>
<td>13</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>15</td>
<td>n/a</td>
<td>Abs</td>
<td>Abs</td>
<td>Abs</td>
<td>Abs</td>
<td>Abs</td>
<td>Abs</td>
<td>Abs</td>
</tr>
<tr>
<td>ROL (0-42)*</td>
<td>16</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
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<td>13</td>
</tr>
<tr>
<td>BURT</td>
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<td>n/a</td>
<td>n/a</td>
<td>29</td>
<td>45</td>
<td>26</td>
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<td>38</td>
<td>32</td>
<td>28</td>
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<td>25</td>
<td>37</td>
</tr>
<tr>
<td>BURT</td>
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<td>69</td>
<td>38</td>
<td>49</td>
<td>35</td>
<td>36</td>
<td>42</td>
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<td>35</td>
<td>28</td>
<td>26</td>
<td>37</td>
<td>47</td>
</tr>
<tr>
<td>Text Level (0-28)*</td>
<td>13</td>
<td>28</td>
<td>16</td>
<td>28</td>
<td>14</td>
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<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Text Level (0-28)*</td>
<td>28</td>
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<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
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<td>25</td>
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<td>Letter ID (0-54)*</td>
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<td>51</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>CAP (0-24)*</td>
<td>16</td>
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<td>20</td>
<td>n/a</td>
<td>20</td>
<td>20</td>
<td>n/a</td>
<td>19</td>
<td>20</td>
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<td>23</td>
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<tr>
<td>CAP (0-24)*</td>
<td>12</td>
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<td>13</td>
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<td>n/a</td>
</tr>
<tr>
<td>Word Test (0-15)*</td>
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<td>75</td>
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<tr>
<td>Writing Vocabulary</td>
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<td>n/a</td>
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<td>28</td>
<td>n/a</td>
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<td>31</td>
<td>34</td>
<td>n/a</td>
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<td>n/a</td>
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<td>81</td>
<td>58</td>
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<td>58</td>
<td>53</td>
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<td>67</td>
<td>49</td>
<td>54</td>
<td>65</td>
<td>90</td>
<td>74</td>
</tr>
</tbody>
</table>

Note: The pre-test score is on the first line for each item and the post-test score is on the second line for each item. The score range for various test items is shown next to the item if relevant. Some items are not administered in the pre-test. If Year 2 students score text level 16 and above, they are tested with BURT and Peter’s Spelling unless they are absent from school. Students who score text levels below level 16 are tested on all items except Peter’s Spelling unless they achieved a perfect score at the end of Year 1 or were absent from school.

*The score range for various test items is shown next to the item if relevant.

**SP 2A and 2J had scored below 13 on the pre-test and needed to be assessed on this item in post-test.
Table 5: Literacy post-test scores for 2002 Year 1 students as at the end of 2001 and prior to entry into 2002 classroom N=18

<table>
<thead>
<tr>
<th>Individual</th>
<th>Students</th>
<th>1A</th>
<th>1B</th>
<th>1C</th>
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Note: *The score range for various test items is shown next to the item if relevant.

Table 6: Literacy pre and post-test scores for 2002 Year 1 students N=18

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</table>

Note: The pre-test score is on the first line for each item and the post-test score is on the second line for each item. The score range for various test items is shown next to the item if relevant.

**Parental permission was not given for the inclusion of information regarding Year 1 students designated as 1L and 1R.

4.5.3. Iterative Cycles of Implementation

Murdoch’s (Murdoch, 1992, 1997, 1998, 1999, 2004; Hamston & Murdoch, 1996) previously mentioned inquiry model was the strategy utilised for teaching and learning the integrated curriculum units of work. This model is reflective of the way in which this research also evolved. Term 1 of the school year 2002 was very much
one of ‘Tuning In’, where the PR was involved in beginning to identify questions/problems to be answered, and also those that arose. Terms 2 and 3 became those of ‘Finding Out/Sorting Out’, where the PR was involved in investigating, further clarifying and extending questions, while sorting out and organising the information gathered in a range of ways. Term 4 was very much one of going further and observing the culmination of the work of the previous terms and the ways in which the SP applied thinking and ICT skills. The cycles of research in action – plan, act, observe, reflect – occurred simultaneously. In essence the research project itself was a large cycle, with smaller cycles occurring in response to observations.

Data collection is crucial in research and a journal was maintained to document the iterative cycles that occurred, together with PR reflections for Terms 1, 2 and 3, with the addition of observations from the IO in Term 4. Journal entries – represented visually and showing samples of various cycles – are included in this chapter. The complete journal can be viewed in Appendix G. The following data schedule provides an overview of what occurred in 2002.

Table 7: Data schedule overview

<table>
<thead>
<tr>
<th>Term 1</th>
<th>Contexts</th>
<th>ICT</th>
<th>Thinking Skills</th>
<th>Data Collection Approach</th>
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<td>Establishing prior knowledge</td>
<td>Introduction</td>
<td>Pre-Testing</td>
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<td>Immersion</td>
<td>Exposure</td>
<td>Teacher Observation</td>
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<td>Experimentation</td>
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<td>PR Journal</td>
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<td></td>
<td>Literacy Assessment</td>
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<td></td>
<td>Artefacts</td>
</tr>
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<td>Throughout school day in literacy, numeracy or integrated inquiry workshops</td>
<td>Introduce routines</td>
<td>Commence use of ‘Six Thinking Hats’ Programme</td>
<td>Teacher Observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Introduction of ICT skills</td>
<td>Introduce graphic organisers</td>
<td>PR Journal</td>
</tr>
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<td>Introduction of Internet access</td>
<td>Integration of thinking skills into all curriculum areas</td>
<td>Artefacts</td>
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<td>Experimentation</td>
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<td>Familiarisation</td>
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<td>Use of ICT into all curriculum areas</td>
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</tr>
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<td>Term 3</td>
<td>Throughout school day in literacy, numeracy or integrated inquiry workshops</td>
<td>Build ICT skills</td>
<td>Continued use of ‘Six Thinking Hats’ Programme</td>
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<td>Build Internet skills</td>
<td>Integration of thinking skills into all areas</td>
<td>PR Journal</td>
</tr>
<tr>
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<td>Consolidation &amp; practice of skills</td>
<td>Increased use of graphic organisers</td>
<td>Artefacts</td>
</tr>
<tr>
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<td></td>
<td>Use of ICT into all curriculum areas</td>
<td></td>
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</tr>
<tr>
<td>Term 4</td>
<td>Throughout school day in literacy, numeracy or integrated inquiry workshops</td>
<td>Integration of ICT in all curriculum areas</td>
<td>Integration of thinking skills into all areas</td>
<td>Independent Observer</td>
</tr>
<tr>
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<td>Using ICT to support own learning</td>
<td>Using thinking skills to support own learning</td>
<td>‘Engaged Learning’ instrument</td>
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<td>Informal interviews with SP</td>
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<td>Teacher Observation</td>
</tr>
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</tr>
<tr>
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<td>Artefacts</td>
</tr>
</tbody>
</table>

The following data schedule provides an overview of what occurred in 2002.
4. 5. 4. Tuning In: Early Cycles – Term 1 2002

Establishing routines in first few weeks of this junior primary classroom was challenging due to the administration of literacy pre-testing procedures. Literacy testing involves one-to-one assessments of student literacy in Years 1 and 2 using tools such as Running Records of Reading Behaviour (Catholic Education Office, 2004); Letter Identification; Concepts About Print; Clay Word Test; Writing Vocabulary; Hearing and Recording Sounds (Clay, 2002); BURT Word Reading Test (Gilmore, Croft & Reid, 1981); Record of Oral Language (Clay, 1983); Spelling in Context (Peters & Smith, 1993). In the first six to seven weeks of school in 2002, the PR was released to administer these literacy assessment tasks at varying times. This meant that the students had at least eight different teachers as well as the classroom teacher and four specialist teachers during that time. This situation made it quite difficult to set up and establish general classroom routines and collect the usual socio-linguistic information one gathers in endeavouring to establish class dynamics and cooperative working groups.

As well as establishing classroom practices, a considerable amount of extra-curricular time needed to be spent ensuring the machines in the classroom and the laboratory were operating smoothly. It was important for many reasons and especially for this research that the students were not confronted with machines or programs that were difficult to access. Observations and data collection in the area of ICT needed to be reflective of the students’ learning experiences and stable infrastructure was crucial. In Term 1, which the PR considered to be one of tuning the SP in to both thinking and ICT, many small iterative cycles occurred with a focus on the introduction and familiarisation of ICT and explicit thinking. The journal entry included shows some simple steps involved in introducing ICT.
Session largely successful with most students being able to complete task, although it is a challenge when 31 students need support at similar times. A small group who had limited access to computers during previous year and who do not have a computer at home need further support. These students also have low oral language and will need more time to process instructions.

**Figure 6:** Sample of one Term 1 2002 cycle – for further cycles, refer to Appendix G
4.5.5. Finding Out/Sorting Out: Continuing Cycles – Term 2 2002

‘Life is what happens to you while you’re busy making other plans’ (Lennon, 1980). This quotation, which is often credited to the late John Lennon, is relevant for many occasions and can be quite reflective of life in schools for both teaching practitioners and researchers alike.

During the early weeks of school, initial plans had included the formal introduction of explicit thinking skills; however other factors greatly affected this implementation. The literacy pre-testing, an intensive swimming programme and establishing class structures and routines greatly impacted on the time available to do this. In addition to this, ensuring that the computers were operating properly and allowing students familiarisation opportunities were also time intensive. Thus the early focus for thinking skills was for the PR to verbalise and reinforce the notion of ‘being thinkers’. Making comments such as ‘when you have finished a task, be a thinker and work out what you have to do next’, or ‘if you are stuck with something, be a thinker, look around the room and try to find a solution’, and ‘well done – that’s what good thinkers do’ became recurring themes.

In Term 2, when structures and routines were established and there were fewer interruptions to daily procedures, class discussions about thinking became more focused and explicit, and statements and questions such as ‘what are we doing when we think?’ ‘what helps us to think?’ ‘what is in your mind when you think?’ ‘write and draw about what thinking means to you’ came into frequent use. These comments guided students in articulating their thinking, as some of them experienced difficulty in expressing ideas and at times it was important to alter the direction in which one intended to go in order to accommodate this. Some of the explicit teaching was yet to occur; however with organisational processes having been planned and implemented students were using computers regularly and as part of everyday practice and a thinking community was emerging. As student 2M said, ‘I think about … sometimes, I think about school and I think in pictures’ (PR Journal, 30 April 2002). The following journal entries are illustrative of continuing cycles (Refer: Figures 7 and 8).
De Bono (1992) advocates teaching thinking skills in a separate session if possible to ensure that students can clearly differentiate between the different types of thinking and get a good grasp of it. There were initial reservations about this segregation, as there is strong evidence to suggest that students make connections if ideas are integrated. Previous experience with the six thinking hats has shown that some students have a clearer understanding of thinking if introduced to it separately. In this research project, this was done initially and thinking skills were later integrated naturally into units of work, with students free to make their own constructions.

The current integrated curriculum unit of work taking place is related to water and its uses. A particular video titled ‘Waterworks’ (year of production: 1999; duration: 4 x 30 mins; © ABC Educational TV) was used as a starting-off point for thinking. Students had developed questions for investigation and had been thinking deeply about issues. This provided an ideal way to introduce the six thinking hats and provide direction for thinking. ‘Six Thinking Hats for Schools’ assists students with differentiating between positive, negative, emotional, factual, creative and organisational thinking, and making the thinking involved explicit and clear.

*Figure 7:* Sample of one Term 2 2002 cycle – for further cycles, refer to Appendix G
Over the terms the students have been using the computers in a variety of ways in order to build computer skills. They are able log on to the network and the Internet with usernames and passwords, access online information and games, print, save and some of them can even bookmark. They can start new Word documents, insert pictures, save, print, retrieve and have fun! Simple tasks can provide insight into a student’s ability to open a document, move the cursor to the appropriate section, key in information, save and print. The PR is able to access the relevant folder, check for saved files and record appropriate information on the checklist.

These tasks are all completed – not necessarily in one session – in the computer laboratory. The main reason for this is the efficiency of the machines. These tasks, while appearing brief, require students to begin with a machine that is not turned on. This ensures that each student is learning how to turn machines on and shut down correctly, as well as logging on to each aspect as required. This is important for independent usage and building better understandings.

**Figure 8:** Sample of one Term 3 2002 cycle – for further cycles, refer to Appendix G
Journal entries document the series of actions and practices utilised to explicitly teach thinking and ICT skills which were occurring simultaneously throughout 2002. As well as these planned deliberate learning experiences, there were opportunities for the SP to practise and use ICT and thinking in their daily lessons. Independent learning centres were used on a daily basis in literacy, numeracy and integrated inquiry blocks, with the daily inclusion of an ICT learning centre, and tasks related to thinking hats or similar thinking tools would form the basis of another learning centre.

An independent thinking learning centre in the literacy block might require the SP to analyse a text using different hats, such as white hat: list five main things that the text was trying to tell us; yellow hat: what were three good or positive things you learned in this text; black hat: what is something you think could be done better since reading this text.

An ICT learning centre can be incorporated into literacy and numeracy blocks. The SP might access a program such as ‘Computer Classroom’, which comes in seven levels (a software series with English and Maths interactive activities: Nightingale Press). Students can practise word or sentence knowledge with tasks such as ‘fill the gap’, sentence building, do simple writing tasks for literacy and play number games to build numeracy skills. ‘Maths Invaders’ (a space attack Maths game that drills number facts and tables: New Horizons Educational software) is also available for the SP to access in the numeracy block. As well as these and other published programs, the SP could access the Internet and utilise links relevant to the independent learning centres.

As the explicit teaching of ICT was taking place, the implementation of de Bono’s (1992) ‘Six Thinking Hats for Schools: Book 1’ programme also occurred using the following process: Overview and Introduction; Introduction of Black Hat thinking; Consolidation of Black Hat thinking; Introduction of Yellow Hat thinking; Consolidation of Yellow Hat thinking; Introduction of White Hat thinking; Consolidation of White Hat thinking; Introduction of Green Hat thinking; Consolidation of Green Hat thinking; Introduction of Red Hat thinking; Consolidation of Red Hat thinking; Introduction of Blue Hat thinking and Consolidation of Blue Hat thinking. The beliefs underlying de Bono’s (1992) ‘Six Thinking Hats for Schools: Book 1’ have been fully explained in Chapter 2.
The SP developed understandings of the different types of thinking as the hats are introduced in a way that makes it easier for students to understand the different types of thinking and relate it to something they are all familiar with – hats. The different types of thinking – bad points, good points, facts, new ideas, feelings and thinking about thinking – are presented in a way that means that the students can readily build understandings. The SP showed understandings in designated sessions and utilised them in circumstances related to behavioural issues. Instead of telling tales if another student interfered with them in any way, the SP began to deal with various situations by raising issues, either during discussion time or at the point in time. Statements such as, ‘I feel angry when person x pushes in line’ SP 1D (19 June 2002) and ‘I reckon it’s bad when person x calls out because it interrupts me when I’m working’ SP 1E (19 June 2002) were being used and were directly related to specific thinking hats – red hat and black hat.

Explicit teaching concerned with teaching relevant skills in thinking and ICT was implemented in conjunction with the continuous use of correct and appropriate terminology. As SP understandings of both thinking skills and ICT grew, they began to display use of them in diverse settings. When completing computer tasks there would be comments made such as, ‘when you’re using “Kid Pix” use your green hat because you want to have new ideas’ SP 1K (June 2002) and, ‘you are writing about yourself – that’s white hat’ SP 2K (June 2002) and, ‘you’re getting mixed up – use your blue hat and work out what you have to do’ SP 2C (27 June 2002).

4. 5. 7. Going Further – Focused Project Reflective Cycles Term 4 2002

As discussed previously, the intent of this research is to implement the explicit teaching of thinking skills and the integration of ICT and document the effects that this implementation had on student learning in various ways. Those involved at this stage include student participants (SP) an independent observer (IO) and the participant researcher (PR).

The SP had experienced de Bono’s (1992, 1986) ideas about the teaching of explicit thinking skills to students in which he recommends that, if possible, thinking skills be taught in their own right as stand-alone lessons. If this is not possible given time constraints, then they may be integrated into other curriculum areas. Throughout the
preceding school terms, the PR utilised both stand-alone lessons and the integration of thinking skills for the purpose of explicit teaching. This was done initially by using the examples and methods outlined by de Bono (1992, 1986).

In the final term of the 2002 school year, the PR expected to observe the SP working independently, demonstrating engaged learning, reflecting on their learning and incorporating the thinking tools that had been taught into other learning experiences. The host Key Learning Area for the integrated inquiry unit of work was The Arts and in particular, Visual Arts. The earlier part of the term was spent investigating and inquiring into ‘Media in the Arts – Fairy Tales’, moving to investigating and inquiring into ‘Media in the Arts – Christmas’; units that were appropriate to the SP’s level of development and interests, including culturally inclusive fairy tales. Christmas customs from other lands were investigated and were familiar in many ways but with plenty of opportunities for new discovery.

In addition to the usual expectations of a final term in the school year an IO, who was not known to the SP, observed designated sessions for the purposes of triangulation for this study. In order to assist the SP become accustomed to changes in routine from the onset, a learning experience was implemented by a casual replacement teacher who worked on a regular basis with the SP in varying capacities. This occurred on the second day of Term 4. A second purpose for using the casual replacement teacher in this instance was to provide the PR with the opportunity to observe and videotape the SP engaging in a learning experience without having the responsibility of the mechanics of its implementation. This was soon followed with the twice-weekly planned observations of the IO, which commenced in the second week of the term and continued until the ninth week, two weeks before the official end of the school year. Subsequent cycles of research in action occurred in this context and, while some cycles were contrived in that time frames were manipulated in order to accommodate the inclusion of IO, they include practices that would have been implemented at any rate. The skills and strategies that were a focus for the planned observation sessions were also incorporated into daily classroom practice.

The following journal entry (Refer: Figure 9) illustrates a reflective cycle.
The SP displayed competence and confidence in logging on to the LAN, locating and opening appropriate programs and then retrieving and opening specific files. The SP moved to carry out established routines before moving to the next tasks, which built on previous skills. The SP were able to move readily through the known routines and then keep going through the subsequent tasks, transferring knowledge to do so. Those not involved in ‘hands-on’ computer-related tasks moved immediately to cooperative groups where they focused on completing activities based on learning about technology. The SP read instructions, used various thinking strategies to make a response to open-ended questions and documented these responses. The SP were engaged in their learning experiences and were working both independently and cooperatively as the demands of the tasks required.

Figure 9: Sample of one Term 4 2002 cycle – for further cycles, refer to Appendix G
In the final weeks of the school term it became increasingly more difficult to set aside time for planned observation sessions. The usual demands of school life – such as Literacy post-testing, report writing, class reorganisation, end-of-year school events such as mass and other special events – were all competing for space in the timetable. The planned observation sessions had already provided a challenge for authenticity in the context of being integrated into the class curriculum, in that some contrivance in regard to the content and timing of the sessions had occurred. The planned cycles of implementation and observation for the purpose of the study needed to be wound up, however the integrating of thinking skills and ICT would continue to be part of the class environment.

4. 5. 8. Observations of Independent Observer – Term 4 2002

During the ‘Going Further – Focused Project Reflective Cycles’ component of the research, an independent observer had been an ongoing presence in the classroom during the fourth term of the year, recording observations of planned, specific sessions in which the SP were engaged. These specific sessions were located in the homeroom/classroom or in the computer laboratory, and had a particular focus on specific thinking skills or ICT skills and their integration. The IO had interacted with the students, chatted to them, questioned them about their work and observed teacher practice.

As well as the observations recorded for each session, a summary that revealed the IO’s insights and opinion as to the overall picture presented was sought. The IO presented these insights as an evaluation tool in the form of a grid under various headings related to the goals and indicators of engaged learning (Jones et al., 1995, 1994). Researchers have formed a strong consensus on the importance of engaged learning in schools and classrooms. This consensus, together with recognition of the changing needs of the 21st century, has stimulated the development of specific indicators of engaged learning (Jones et al., 1994). These can act as a guide for educational activity, and provide a vision of engaged learning and what it looks like in the classroom and community (and the classroom of the SP in this instance). Included are descriptions of each indicator together with sample statements gathered from the IO’s observations, with further documentation included in Appendix F.
The first indicator, Vision of Learning, discusses what engaged learning looks like. Successful, engaged learners are responsible for their own learning. These students are self-regulated, able to define their own learning goals and evaluate their own achievement. They are also enlivened by their learning, leading to excitement when solving problems, understanding, and taking the next step in their thinking. Learners become strategic in knowing how to learn and how to transfer knowledge to solve problems creatively. Engaged learning also involves being collaborative – having the skills to work with others and valuing this.

<table>
<thead>
<tr>
<th>Transcriptions IO Engaged Learning Summary</th>
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<tbody>
<tr>
<td><strong>Indicators of Engaged Learning</strong></td>
</tr>
<tr>
<td><strong>Indicator One: VISION OF LEARNING</strong></td>
</tr>
<tr>
<td>- learners frequently drew on past learning and experiences to assist in the development of new knowledge and expressed the connection between the past learning and present task</td>
</tr>
<tr>
<td>- learners used a variety of problem solving strategies involving:</td>
</tr>
<tr>
<td>- soliciting help from peers and their classroom teacher</td>
</tr>
<tr>
<td>- trial and error approach</td>
</tr>
<tr>
<td>- drawing on past knowledge/learning and experience to assist task completion</td>
</tr>
<tr>
<td>- adopting strategies that had been successfully applied before</td>
</tr>
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<td>(IO Journal, Term 4 2002)</td>
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</tbody>
</table>

**Figure 10:** Vision of Learning: selected transcripts from journal of independent observer

The second indicator, Tasks for Engaged Learning, discusses requirements for engaged learning. In order for engaged learning to occur, tasks need to be challenging, authentic and multidisciplinary, are typically complex and involve sustained amounts of time. They are authentic and often require integrated instruction that incorporates problem-based learning and curriculum by project.

<table>
<thead>
<tr>
<th>Transcriptions IO Engaged Learning Summary</th>
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</thead>
<tbody>
<tr>
<td><strong>Indicators of Engaged Learning</strong></td>
</tr>
<tr>
<td><strong>Indicator Two: TASKS FOR ENGAGED LEARNING</strong></td>
</tr>
<tr>
<td>- many of the set tasks related directly or very closely to issues from the real world, e.g. students had to consider and assess elements relating to:</td>
</tr>
<tr>
<td>- thoughts and feelings (the student’s own and those of others)</td>
</tr>
<tr>
<td>- the impact of choices on themselves and others</td>
</tr>
<tr>
<td>- how making different choices can impact on the outcome of something (e.g. a task solution)</td>
</tr>
<tr>
<td>- current real-life issues and beliefs</td>
</tr>
<tr>
<td>(IO Journal, Term 4 2002)</td>
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</tbody>
</table>

**Figure 11:** Tasks for Engaged Learning: selected transcripts from journal of independent observer
The third indicator, Assessment of Engaged Learning, involves presenting students with an authentic task, project or investigation, and then observing, interviewing and examining their presentations and artefacts to assess what they actually know and can do.

<table>
<thead>
<tr>
<th>Transcriptions IO Engaged Learning Summary</th>
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<tbody>
<tr>
<td>Indicators of Engaged Learning</td>
</tr>
<tr>
<td>Indicator Three: <strong>Assessment of Engaged Learning</strong></td>
</tr>
<tr>
<td>- assessment techniques were applied which required a demonstration for an audience in order to assess and validate the completed task. For example:</td>
</tr>
<tr>
<td>- learners regularly partook in whole-class presentations, indicating an aspect of their work that was positive (e.g. a strength); this required reasoning and justifying</td>
</tr>
<tr>
<td>- all tasks required an outcome, whether it be a list of ideas or thoughts, or to have followed a set of instructions in order to prove the task was completed successfully</td>
</tr>
<tr>
<td>- learners orally reported to the teacher to explain their thinking, the approach and steps used to successfully complete a task</td>
</tr>
<tr>
<td>(IO Journal, Term 4 2002)</td>
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</tbody>
</table>

**Figure 12:** Assessment of Engaged Learning: selected transcripts from journal of independent observer

The fourth indicator, Instructional Models and Strategies for Engaged Learning, presents the notion that the most powerful models of instruction are interactive, where education tasks actively engage the learner, are generative and encourage the learner to construct and produce knowledge in meaningful ways. Students teach others interactively and interact generatively with their teacher and peers, which allow for co-construction of knowledge. Some common strategies are individual and group summarising, exploring multiple perspectives, building upon prior knowledge, brainstorming and problem solving processes.

<table>
<thead>
<tr>
<th>Transcriptions IO Engaged Learning Summary</th>
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<tbody>
<tr>
<td>Indicators of Engaged Learning</td>
</tr>
<tr>
<td>Indicator Four: <strong>Instructional Models and Strategies for Engaged Learning</strong></td>
</tr>
<tr>
<td>- learners were encouraged to try and solve problems on their own, drawing on prior experience, knowledge and thinking to help them, as well as to ‘have a go’; then, if the problem persisted, to approach a peer, next a classroom helper and lastly the teacher</td>
</tr>
<tr>
<td>(IO Journal, Term 4 2002)</td>
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</tbody>
</table>

**Figure 13:** Instructional Models and Strategies for Engaged Learning: selected transcripts from journal of independent observer

The fifth indicator, Learning Context of Engaged Learning, is concerned with the learning environment. The classroom must be conceived of as a knowledge-building learning community, where shared understandings are developed collaboratively and
diversity and multiple perspectives are valued. These learning communities seek strategies to build on the strengths of all of their members and where questions, conversations and goal setting are definitive.

**Transcriptions IO Engaged Learning Summary**

**Indicators of Engaged Learning**

**Indicator Five: LEARNING CONTEXT OF ENGAGED LEARNING**

- Students/learners and the teacher truly listened to and valued each contribution made to group/individual discussions, as well as through task outcome; many of these ‘strengths’ were shared among the rest of the class as a demonstration of diverse perspectives and to acknowledge contributions to the learning of others by the teacher!

* (IO Journal, Term 4 2002)

**Figure 14:** Learning Context of Engaged Learning: selected transcripts from journal of independent observer

The sixth indicator, Grouping for Engaged Learning, is about the importance of collaborative work that is learning-centred. Heterogeneous groupings offer a wealth of background knowledge and perspectives to different tasks and flexible groupings, which allow teachers to reorganise small groups according to the purposes of instruction, which is considered to be one of the most equitable means of grouping and ensuring increased learning opportunities.

**Transcriptions IO Engaged Learning Summary**

**Indicator Six: GROUPING FOR ENGAGED LEARNING**

- tasks were completed in a vast mix of different groupings, e.g:
  - male/female groupings/pairs
  - mixed ability groupings
  - similar ability groupings
  - small, medium, larger groupings
    - these groupings extended to a variety of abilities – oral skills; written skills; thinking skills; problem solving skills; confidence in self and within a group environment; confidence in speaking English – communication
  - friendship groupings (or at least a ‘friend’ within a larger group)
  - pairs
  - mixed-race and -ethnic background groups
  - mixed-interest levels
  - mixed-prior-experience levels

* (IO Journal, Term 4, 2002)

**Figure 15:** Grouping for Engaged Learning: selected transcripts from journal of independent observer

The seventh indicator, Teacher Roles for Engaged Learning, is concerned with the role of the teacher and the shift from the role of information-giver to that of facilitator,
guide and learner. As a facilitator, the teacher provides the rich environments and learning experiences needed for collaborative study. The teacher is also required to act as a guide, incorporating mediation, modelling and coaching; and very often the teacher also is a co-learner and co-investigator with the students.

<table>
<thead>
<tr>
<th>Table: Transcriptions IO Engaged Learning Summary</th>
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<tbody>
<tr>
<td>Indicator Seven: <strong>TEACHER ROLES FOR ENGAGED LEARNING</strong></td>
</tr>
<tr>
<td>- it was clearly evident that the teacher considered herself a learner amongst the other learners and showed/conveyed this to her students through verbal discussions/explanations. She continually commented out loud when she had learned something from her students, indicating that her students had become her teacher</td>
</tr>
<tr>
<td>(IO Journal, Term 4, 2002)</td>
</tr>
</tbody>
</table>

**Figure 16**: Teacher Roles for Engaged Learning: selected transcripts from journal of independent observer

The eight indicator, Student Roles for Engaged Learning discusses one important student role - that of explorer. Interaction with the world and with other people allows students to discover concepts and apply skills. Students are encouraged to reflect upon their discoveries and observe and apply the thinking processes. Students also become teachers themselves by integrating what they’ve learned and become producers of knowledge contributing to the knowledge of others.

<table>
<thead>
<tr>
<th>Table: Transcriptions IO Engaged Learning Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator Eight: <strong>STUDENT ROLES FOR ENGAGED LEARNING</strong></td>
</tr>
<tr>
<td>- learners were continually exposed to and encouraged to explore new ideas through task content, including looking at ideas from another point of view, listening and valuing the contributions of peers</td>
</tr>
<tr>
<td>(IO Journal, Term 4 2002)</td>
</tr>
</tbody>
</table>

**Figure 17**: Student Roles for Engaged Learning: selected transcripts from journal of independent observer

### 4.6. STAGES OF PROGRESS

During the implementation of this research, patterns of behaviour displayed by the SP began to emerge. Graphic representation of the iterative cycles, as presented earlier, serve to clearly indicate the engaged learning tasks that were utilised in this process, and student responses to those tasks illuminate phases or stages through which the SP progressed in their journey of discovery. These major and observable changes are
identified here as stages of progress: Discovering and Engaging, Demonstrating, Analysing, and Synthesising and signify the behaviours the SP displayed. Information and artefacts in subsequent sections are illustrative of these phases.

**Discovering and Engaging:** students knew very little about thinking or ICT, but they were interested in both and began to participate and engage in related activities. All the SP went through this stage and beyond.

**Demonstrating:** students were beginning to use both thinking skills and ICT in their daily routines, but were still in the stage of trial and error and consolidating their understandings. All the SP went through this stage and beyond.

**Analysing:** students were using both thinking skills and ICT continuously. These had become intrinsic to their daily practices and were used as a matter of course. Most of the SP were working within this stage by the end of 2002.

**Synthesising:** students had established skills and were using them to explore and go further. Some of the SP were operating within this stage by the end of 2002.

To illustrate each of these stages of progress, the next section introduces six of the SP and provides a profile of each one. This profile presents information regarding cultural backgrounds, early literacy achievements and samples of writing completed in the first weeks of the 2002 school year. These SP are included as being representative of the first three stages through which all the SP progressed over the 2002 school year. Two of these students are among those who were operating in the synthesising stage by the end of the 2002 school year.
4. 7. **CASE STUDIES**

Observable patterns of behaviour emerged during the research, and illustrative examples of several participating students’ artefacts are presented here as reflecting these. The group of students is gender inclusive and includes students from Year 1 and Year 2. Language background data and literacy testing results for the year are included for each student. The literacy results are included as they provide additional information – the data is gained from standardised, scripted assessment strategies and assists in presenting an image of each student. These students are known as SP 1E, SP 1H, SP 1Q, SP 2B, SP 2K and SP 2L.

The artefacts in the first section are samples of writing in the early part of the school year, when teachers and students are involved in establishing relationships and a positive classroom climate. It is also a time of finding out what students know and already have in place, as well as implementing formal literacy-testing procedures, as determined by systemic authorities, to establish literacy gains and determine starting points for future practice. These artefacts also reflect the starting points in writing of the students, which can provide additional insight to that gained from the viewing of raw scores.

Later sections have artefacts that are common to the students, or are similar in nature, and illustrate the types of work in which they are engaged, showing development in relevant areas. Writing workshop samples at various stages of the writing process (planning, composing/recording, revising and publishing), thinking and learning journal responses, learning experiences related to thinking skills, and learning opportunities related to ICT skills are included. These sections will have artefacts produced by the students identified above, together with relevant samples from other students that are reflective of the appropriate stage of development.
4. 7. 1. Student SP 1Q

Student SP 1Q is a male student who was born in Australia, has an English-speaking background and who came into Year 1 with a high oral language. SP 1Q has been successful in achieving minimum targets on three test items – Record of Oral Language, Letter Identification and Concepts About Print, but has not reached minimum targets in BURT Word Test, Text Level, Clay Word Test, Writing Vocab, and Hearing and Recording sounds according to the basic indicators used in the Children’s Literacy Success Strategy (CLaSS) implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). By the end of 2002, SP 1Q achieved minimum targets in six test items and displayed considerable added value in the other two areas.

![2002 Literacy Testing](image)

<table>
<thead>
<tr>
<th>Items</th>
<th>ROL (0-42)</th>
<th>BURT (0-110)</th>
<th>TEXT (0-28)</th>
<th>LETTER ID (0-54)</th>
<th>CAP (0-24)</th>
<th>WORD (0-15)</th>
<th>WRITING</th>
<th>HRSW (0-37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Targets</td>
<td>13+</td>
<td>20+</td>
<td>1+</td>
<td>20+</td>
<td>12+</td>
<td>10+</td>
<td>20+</td>
<td>20+</td>
</tr>
<tr>
<td>Pre-test</td>
<td>38</td>
<td>6</td>
<td>0</td>
<td>43</td>
<td>16</td>
<td>2</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Minimum Targets</td>
<td>28+</td>
<td>40+</td>
<td>15</td>
<td>54</td>
<td>20+</td>
<td>15</td>
<td>40+</td>
<td>32+</td>
</tr>
<tr>
<td>Post-test</td>
<td>42</td>
<td>32</td>
<td>28</td>
<td>54</td>
<td>20</td>
<td>15</td>
<td>38</td>
<td>32</td>
</tr>
</tbody>
</table>

**Figure 18**: Pre and Post-test Scores for Literacy Advance Testing for SP 1Q

Despite high oral language, SP 1Q is reluctant to join in class or small-group discussions. He sees himself as ‘dumb’, and as someone who cannot read or write, even though he has some elements under control. His early writing shows laboured efforts. He relies on copying interest sentences and words from charts displayed around the room or working with the teacher/helper interactively. He became part of the Reading Recovery programme soon after the initial literacy-testing period finished.
Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 1Q was displaying in writing.

30/1/02 Independent Writing: ‘Today is Wednesday Janu’

31/1/02 Independent Writing: ‘On the olidays (holidays). I w’

Writing Workshops Book 20/2/02
Language Experience Writing: child wrote known and teacher/helper scribed unknown – ‘My Brother my was teasing me.’

24/3/02 Independent Writing: ‘My b’ – child is endeavouring to use familiar structures

Writing Workshops Book 7/3/02
Independent Writing: ‘On Etser JeLs deid on the cross.’
(On Easter Jesus died on the cross.)

Figure 19: Early writing samples of SP 1Q
4. 7. 2. Student SP 1H

Student SP 1H is a LOTE female student who was born in Australia and speaks two languages fluently. She came into Year 1 having been successful in achieving above-minimum targets in all test items according to the basic indicators used within CLaSS programme implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). By the end of 2002, SP 1H again achieved above-minimum targets in all test items and displayed considerable added value in her BURT score and writing vocabulary.

![2002 Literacy Testing](image)

**Figure 20**: Pre and Post-test Scores for Literacy Advance Testing for SP 1H

<table>
<thead>
<tr>
<th>Items</th>
<th>ROL (0-42)</th>
<th>BURT (0-110)</th>
<th>TEXT (0-28)</th>
<th>LETTER ID (0-54)</th>
<th>CAP (0-24)</th>
<th>WORD (0-15)</th>
<th>WRITING</th>
<th>HRSW (0-37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Targets</td>
<td>13+</td>
<td>20+</td>
<td>1+</td>
<td>20+</td>
<td>12+</td>
<td>10+</td>
<td>20+</td>
<td>20+</td>
</tr>
<tr>
<td>Pre-test</td>
<td>42</td>
<td>37</td>
<td>28</td>
<td>54</td>
<td>23</td>
<td>14</td>
<td>20</td>
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<tr>
<td>Minimum Targets</td>
<td>28+</td>
<td>40+</td>
<td>15</td>
<td>54</td>
<td>20+</td>
<td>15</td>
<td>40+</td>
<td>32+</td>
</tr>
<tr>
<td>Post-test</td>
<td>42</td>
<td>75</td>
<td>28</td>
<td>54</td>
<td>24</td>
<td>15</td>
<td>73</td>
<td>37</td>
</tr>
</tbody>
</table>

Early in the 2002 school year, SP 1H is an articulate yet shy student who has many of the basics in reading and writing under control. She decodes accurately at Level 28, which is the target for the end of Year 2, and her oral reading is phrased and fluent. She displays comprehension of much of what she reads. SP 1H’s writing shows an understanding of simple sentence structures, subject–verb agreement and consistent use of tense. Her spelling is accurate or a close approximation, with most related sounds represented in the attempt. Her vocabulary is well developed.
Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 1H was displaying in writing.

‘On the weekend i went to a paty (party). And ther (there) was a jumpig cusal (jumping castle) And a trapolen (trampoline). it was fun. And a cuby (cubby) house And a slide And a swing And it was time for the Birthday cake.’

15/2/02 Independent Writing: self-selected topic

‘Last scary, stomy (stormy) the stormy night. floody (flooded) steets. (streets) trees fell. Lightnig (lightning) flashing rain tambs (tumbles) lights went off. On the ground wind blows And blows blows. thunder clapt (clapped) and then I fell asleep’

28/2/02 Independent Writing: self-selected topic

‘Jesus (Jesus) loves me and evryone (everyone) he is teling (telling) us to be helping others. he is giving us thigs (things) like familys (families) frends (friends) we love them for ever. And ever. he dies on the cros (cros) but on easter he coms (comes) back to life wich (which) is good.’

Writing Workshops Book 07/3/02 Independent Writing: self-selected topic

‘Yesterday We caught the Bus to the leisure Centre. We Changed into our swimming clothes and had a shower. We went into the pool.’

Writing Workshops Book 11/3/02 Independent Writing: self-selected topic

Figure 21: Early writing samples of SP 1H
4. 7. 3. Student SP 2K

Student SP 2K is a LOTE male student who was born in Australia and speaks two languages, although he only speaks English in the school context and attends an ethnic school on the weekend. He came into Year 2 having been successful in achieving above-minimum targets in test items Concepts About Print and Hearing and Recording sounds in words, but has not reached minimum targets in BURT Word Test, Text Level, Clay Word Test and Writing Vocabulary according to the basic indicators used within CLaSS programme implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). By the end of 2002, SP 2K had achieved minimum target in Peter’s Spelling in context and displayed added value in the other two areas.

![2002 Literacy Testing](image)

<table>
<thead>
<tr>
<th>Items</th>
<th>BURT (0-110)</th>
<th>TEXT (0-28)</th>
<th>LETTER ID (0-54)</th>
<th>CAP (0-24)</th>
<th>WORD (0-15)</th>
<th>WRITING</th>
<th>DICT (0-37)</th>
<th>PETERS (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Targets</td>
<td>40+</td>
<td>15-20</td>
<td>54</td>
<td>20+</td>
<td>15</td>
<td>40-60</td>
<td>32+</td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>25</td>
<td>14</td>
<td>51</td>
<td>23</td>
<td>14</td>
<td>28</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Minimum Targets</td>
<td>50+</td>
<td>26-28</td>
<td>54</td>
<td>24</td>
<td>15</td>
<td>60+</td>
<td>37</td>
<td>50+</td>
</tr>
<tr>
<td>Post-test</td>
<td>37</td>
<td>25</td>
<td>54</td>
<td>24</td>
<td>15</td>
<td>60+</td>
<td>37</td>
<td>65</td>
</tr>
</tbody>
</table>

Figure 22: Pre and Post-test Scores for Literacy Advance Testing for SP 2K

SP 2K comes into Year 2 having a score of 22 out of a possible 42 in ROL in the 2001 post-test. The ROL test was not administered for student 2K in the beginning of the 2002. The reason for this item not being tested is unknown, as it was a test item administered by a person other than the class teacher. His writing shows an understanding of simple sentence structures and consistent use of past tense. SP 2K is able to spell high-frequency words accurately and most attempts are recognisable, with some related sounds represented in the attempts. He refers to interest sentences...
and words from charts displayed around the room and utilises other resources available in the room.

Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 2K was displaying in writing.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>31/1/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘On the holidays I went to Suni (Sunshine) beach ther (there) wer (were) hyo (hire) mugs (mokes) I Jupt (jumped) wen (when) the big big waves (waves) caem (came), we hab (had) lots fo (of) fun’</td>
</tr>
<tr>
<td>25/2/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘On the weekend I went to a restauront (restaurant). I ate mash (mashed) ptato (potato) spacedi (spaghetti) and we went to buy a gun for me and my cousins and we plaed (played) and we had fun.’</td>
</tr>
<tr>
<td>7/3/02</td>
<td>Independent Writing: Jesus</td>
<td>‘Jesus love evreone (everyone) he tacks (takes) ker (care) Of as (us) and tals (tells) pepl (people) storis (stories) and hugs them’</td>
</tr>
<tr>
<td>11/3/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘On the weekend I went to Moomba and me and my sistr (sister) sor (saw) the fiyuwox (fireworks).’</td>
</tr>
</tbody>
</table>

Figure 23: Early writing samples of SP 2K
4. 7. 4. Student SP 2B

Student SP 2B is a LOTE female student who was born in Australia and speaks two languages although she speaks English in many situations. She came into Year 2 having been successful in achieving above minimum targets in all test items according to the basic indicators used within CLaSS programme implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). However, for reasons of ill health, the only test item administered in the 2002 pre-test period was that of running records to establish text level. SP 2B’s oral language score of 21 and her writing vocabulary score of 29 at the end of 2001 are above minimum benchmarks but slightly low in comparison to her ability to decode. By the end of 2002, SP 2B achieved appropriate benchmarks.

![figure24](image)

Figure 24: Pre and Post-test Scores for Literacy Advance Testing for SP 2B

Early in the 2002 school year SP 2B is a student who has many of the basics in reading and writing under control and is quite articulate, although some of her oral sentence structures need refining. She decodes accurately at Level 28, which is the target for the end of Year 2, and her oral reading is phrased and fluent. She displays comprehension of much of what she reads. SP 2B’s writing shows an understanding of simple sentence structures, subject–verb agreement and consistent use of tense. Her
spelling is accurate or a close approximation, with most related sounds represented in the attempt. Her vocabulary is well developed.

Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 2B was displaying in writing.

![Writing Sample]

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Sample Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/1/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘Today is Wednesday January 30th. This is our first day in 1/2 Walters. I like to go swimming (swimming)’</td>
</tr>
<tr>
<td>31/1/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘On the holidays I went to the Letia (Leisure) center (Centre) with ____ and _____. I had a fun time practising how to swim. After we went we found a shall (shell) and inside it your can hear the sea. We kept the shall (shell).’</td>
</tr>
<tr>
<td>25/2/02</td>
<td>Independent Writing: self-selected topic</td>
<td>‘Yesterday I went to the pool and my dad said you better run or I will tickle (tickle) you. I ran a little bit because he could (could) not catch me. After that my dad and me went walking in the oval and we walked ten laps which (which) is one hour. Before we went home we saw the rainbow we sat down and look at it.’</td>
</tr>
</tbody>
</table>

Figure 25: Early writing samples of SP 2B
4. 7. 5. Student SP 1E

Student SP 1E is an ESB male student who was born in Australia and is an articulate speaker. He came into Year 1 having been successful in achieving above-minimum targets in all test items, according to the basic indicators used within CLaSS programme implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). By the end of 2002, SP 1E again achieved above-minimum targets in most test items.

![2002 Literacy Testing](image)

<table>
<thead>
<tr>
<th>Items</th>
<th>ROL (0-42)</th>
<th>BURT (0-110)</th>
<th>TEXT (0-28)</th>
<th>LETTER ID (0-54)</th>
<th>CAP (0-24)</th>
<th>WORD (0-15)</th>
<th>WRITING</th>
<th>HRSW (0-37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Targets</td>
<td>13+</td>
<td>20+</td>
<td>1+</td>
<td>20+</td>
<td>12+</td>
<td>10+</td>
<td>20+</td>
<td>20+</td>
</tr>
<tr>
<td>Pre-test</td>
<td>33</td>
<td>27</td>
<td>14</td>
<td>54</td>
<td>23</td>
<td>15</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Minimum Targets</td>
<td>28+</td>
<td>40+</td>
<td>15</td>
<td>54</td>
<td>20+</td>
<td>15</td>
<td>40+</td>
<td>32+</td>
</tr>
<tr>
<td>Post-test</td>
<td>36</td>
<td>39</td>
<td>28</td>
<td>54</td>
<td>23</td>
<td>15</td>
<td>49</td>
<td>36</td>
</tr>
</tbody>
</table>

**Figure 26:** Pre and Post-test Scores for Literacy Advance Testing for SP 1E

Early in the 2002 school year SP 1E is an articulate student and has many of the basics in reading and writing under control. He decodes accurately at Level 14, which is above the target for the end of Year Prep. His oral reading is phrased and fluent and he comprehends what he reads. SP 1E’s writing shows an understanding of simple sentence structures, subject–verb agreement and consistent use of tense. His spelling is accurate or a close approximation, with most related sounds represented in the attempt. His vocabulary is well developed.
Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 1E was displaying in writing.

**30/1/02 and 31/1/02  Independent Writing: self-selected topics**

- 30/1/02
  ‘Today is Wednesday January 30th. This is our first day in 12 Wal.

- 31/1/02
  ‘On the holidays I made a house (made) on my computer (computer) and I put furniture (furniture) and I saved (saved) it.’

- 26/2/02  Independent Writing: self-selected topic
  ‘The Storm. Last night there was a Storm. At my house and the lights went off and on. When I was in the bath (bath), and I heard (heard) the rain (rain) from the window (windo) and my Mum and I had a hat (hat) to shut the windows (windows).’

- **Figure 27**: Early writing samples of SP 1E

- 2/3/02  Independent Writing: self-selected topic
  ‘The Storm. Last night there was a Storm. In my house and the lights went off and on. When I was in the bath, and I heard the rain from the window and my Mum and I had a hat to shut the windows.’

- **Writing Workshops Book 07/3/02**: Independent Writing: self-selected topic
  ‘I know that Jesus Loves me. Jesus had a Last supper (supper) supper with his friends (friends). Then Jesus went out to pray. Then Jesus died on the cross (cross).’

- **Writing Workshops Book 19/3/02**: Independent Writing: self-selected topic
  ‘We caught the bus to the leisure center (centre). We changed into our swimming clothes and had a shower. We went into our groups and played in the water and were tested.’
4. 7. 6. Student SP 2L

Student SP 2L is a LOTE male student who was born in Australia and speaks two languages. He only speaks English in the school context and attends an ethnic school on the weekends. He came into Year 2 having been successful in achieving at or above-minimum targets in test items except for BURT Word Test and ROL according to the basic indicators used within CLaSS programme implemented in most Victorian Catholic Primary Parish Schools (see Appendix I). By the end of 2002, SP 2L had achieved above minimum targets in Text Level and Peter’s Spelling in context and displayed added value BURT Word Test.

Figure 28: Pre and Post-test Scores for Literacy Advance Testing for SP 2L

SP 2L comes into Year 2 having a score of 19 out of a possible 42 in ROL in the 2001 post-test. The ROL test was not administered for SP 2K in the beginning of 2002. The reason for this item not being tested is unknown, as it was a test item administered by a person other than the class teacher. SP 2L’s writing shows an understanding of simple sentence structures and consistent use of past tense. SP 2L is able to spell high-frequency words accurately and most attempts are recognisable, with some related
sounds represented in the attempt. He refers to interest sentences and words from charts displayed around the room and utilises other resources available in the room.

Included here are writing samples taken from early in the school year illustrating some of the behaviours SP 2L was displaying in writing.

30/1/02
‘Today is Wednesday January 30th. This is our first day in 12 Walters. I like to do my Best work.’

31/1/02
‘On the Hoilydays (holidays) I went to my friends (friend’s) house. Then I went to Mcdonod’s (McDonald’s) and I went home and I brash (brushed) my teeth and I Watch TV and then I went to bed. Then wen (when) it was morning we went to the beach. And Then we had icecream’

30/1/02 and 31/1/02 Independent Writing: self-selected topics
‘The Storm.
Last night there was a storm. At my house trees fell on the top of my house.’

26/2/02 Independent Writing: self-selected topic
‘On Good Friday Jesus carries (carries) the cross on the hill (hill) and the soldches (soldiers) came and took him up and naild (nailed) him and Jesuse (Jesus) dies. I know Jesus loves me.’

Writing Workshops Book 07/3/02 Independent Writing: self-selected topic

Figure 29: Early writing samples of SP 2L
4. 8. EFFECTIVE LEARNING: STAGES OF PROGRESS IN THINKING AND ICT

There are many aspects to be considered for effective student learning to occur, and one that is crucial is the provision of adequate and appropriate resources. It is essential too that these resources support a range of learning and learning styles and are relevant to the realms in which we want observable growth and development to occur. In junior primary classes generally, these realms are especially in English and Mathematics. For this particular classroom and this year, these realms also include the integration and use of ICT and thinking in students’ daily practice.

The SP commenced the school year with little experience or engagement with ICT, at least at the school level, and without having had real exposure to learning experiences with explicit thinking skills. This is not stated as a criticism of previous teachers. The teaching and learning frameworks that existed in 2002 determined what students should know and be able to do in eight key areas of knowledge-based learning, and did not specifically include the areas of ICT and thinking skills. ICT and thinking skills do not have a body of knowledge that can be learned, but include a range of knowledge, skills and behaviours which cross disciplinary boundaries and assist in ensuring that students are prepared as active learners and problem solvers for ongoing success at school and beyond. In what is often considered a crowded curriculum, teachers have not practised focused planning and teaching of these areas on a regular basis.

In the early part of the year it was important to ‘review and organise learning environment in relation to creating an environment conducive to positive learning’, as noted in the journal of the PR dated 11 February 2002. Part of this process included setting up practical resources such as charts, displays, varied pro formas and equipment that would promote and enable independence in the SP, as well as establishing supportive routines and strategies that ensured the SP’s quick familiarisation with classroom operations. Establishing class protocols allows the teacher to perform focused teaching free from interruption to do with incidental
organisational issues. It also means that students can readily immerse themselves in positive learning experiences.

4. 8. 1. Discovering and Engaging

This phase or stage, through which all the SP went, is essentially part of the establishment of general routines, resources, equipment and strategies, together with the introduction and inclusion of routines, resources, equipment and strategies specific to building the integration and use of ICT and thinking in the SP’s daily practice. Figure 30 shows samples of resources used to support class routines.

This stage commenced simply with modelling the use of equipment. If a student is unable to use a piece of equipment or experiences frustration with an inability to do so, its use and integration will simply not happen. An averkey (see Appendix H) allows one to connect to a television screen and use this to ensure that groups can easily view something occurring on a computer screen. This piece of equipment is located in the computer laboratory and, through its use, the PR was able to model aspects of computer use, such as turning on machines; logging onto the LAN (local area network); accessing, using and exiting programs; and logging off and shutting down.

The PR also modelled a similar process for the machines that were located in the classroom but were using a different platform/operating system. This was done in small groups and with the assistance of parent helpers who assisted with consolidation of understandings.

It is important at this early stage for students to see ICT as part of everyday life, and so the SP were quickly introduced to published software packages such as ‘Fitzroy Readers’, which are valuable in supporting the reading process and so were incorporated into an independent learning centre during the two-hour literacy block. In the computer laboratory, the SP practised accessing both the LAN and simple programs, and experimented with mouse and keyboarding skills, as well as accessing the Internet with usernames and passwords and locating a simple site located on the school’s intranet.
Alongside establishing protocols and processes for the classroom, the PR made continuous comments about thinking and related these to practical situations. A student making a request about something that could easily be solved by the student would be urged to do so by responses from the PR such as, ‘What do you think you could do about that?’ Other responses used regularly included, ‘That’s what a thinker would do!’ ‘If you’re stuck on something, look around the room and see what can help your thinking.’ ‘When you’ve finished a task, be a thinker and work out what you could do next.’ Such responses were used to create the notion of the SP as thinkers and doers.

A thinking and learning journal was introduced to the SP for ongoing responses to their learning and thinking. It was to be used over the year and in this initial usage was for the SP merely to express their thinking, using either words, pictures or both of these things. Figure 31 provides sample pages from thinking and learning journals.

As SP 2M said, ‘I think about … sometimes I think about school and I think in pictures.’ (PR journal, 28 March 2002)
In planning for the implementation of this project it was initially expected that the SP would move quickly through this discovering and engaging stage. In reality, setting the scene and establishing the practices that would support consolidated and effective learning required a lengthy allocation of time, a concerted effort and great deal of practice and reinforcement.

As the second term commenced the SP were confidently using several published computer programs in independent learning centres and a recent software purchase ‘Computer Classroom 1, 2 & 3’ was introduced. This commercial program can be used for independent learning centres in both the English and Mathematics blocks, and promotes keyboarding, arrow and mouse skills in ICT, as well as various literacy and numeracy skills. The SP were discovering and engaging several aspects of ICT.

As with ICT, a published thinking programme – de Bono’s (1992) ‘Six Thinking Hats for Schools: Book 1’ – was utilised for further discovering and engaging in thinking, and provided teachers with clear guidelines for teaching thinking skills. The SP were initially introduced to explicit thinking by relating it to something familiar to them – a hat. This subsequently introduced them to the notion of coloured hats being associated with a particular type of thinking, thus helping the SPs to develop clear thinking. Figure 32 illustrates the images of hats used. This type of thinking and de Bono’s (1992) programme are explicated in Chapter 2.

Various discussions and activities then occurred to reinforce the general understandings of the thinking behind each hat, and a video relating to the integrated inquiry unit of work was viewed. This too was discussed, using the hats as guidelines for classifying information in various ways. The SP then looked at each hat in greater depth, and various artefacts showing this examination are included (Refer: Figures 22,34,35).
### SP 1E’s introduction to six thinking hats

**Figure 33:** Artefacts showing introductory activities for ‘Six Thinking Hats’

<table>
<thead>
<tr>
<th>SP 2K’s response to what would be wrong with having school drinking taps having fizzy drinks in them</th>
<th>SP 2B’s response to what would be the good points of having another face on the back of your head</th>
<th>SP 2K’s response to what questions he would ask to learn facts about the pet in the box</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘wen (when) you are woshing (washing) your faes (face) it will get stici (sticky) your teth (teeth) will be rinkled (wrinkled)’</td>
<td>‘I learn things that are interesting and things that are not interesting but it does not matter at all. What I find interesting is hard work. And what I don’t find interesting is easy;’</td>
<td>‘Is it a dog what colr (colour) is it dos (does) it have fry (furry) skin what does it eat does it fly’</td>
</tr>
</tbody>
</table>
Students identified what they like/do not like/no feeling from the creatures/objects listed on the left.

Students were asked to use their green hat and think about the many possible things this shape could become.

‘It’s a puppet!’

Step 1: Think of ways to catch a frog
Step 2: Pick one plan and try it
Step 3: Think about what you did
Did your plan work?
Did you catch the frog?

**Figure 34:** Artefacts showing further introductory activities for ‘Six Thinking Hats’

The artefacts presented below are included as indicators that the SP were discovering and engaging in thinking skills.

**SP 2L’s Thinking and Learning Journal response**

Red Hat: I feel …

‘I feel happy when I have a friend. I feel scared when I hear dogs bark. I fell excited when I have my birthday. I feel angry when my sister smacks me. I like it when it is sunny. I don’t like it when it’s rainy.’
‘I feel happy when it rains.
I feel scared (scared) in the night.
I fell excited when I am on holidays.
I feel angry when I don’t get it my way.
I like it when it is winter.
I don’t like it when it is summer.’
(repeated)

Figure 35: Artefacts showing further introductory activities for ‘Six Thinking Hats’

As the SP were consolidating their understandings with thinking, they were also engaging in a series of short focused ICT tasks created to assist in familiarising students with keyboarding and mouse skills: tasks such as copying text that requires the use of the shift key/caps lock, space bar and arrow keys; keying in text, saving it, retrieving it and making alterations related to size and font; and accessing the Internet and experimenting with visiting various sites which require students to use these skills.
4.8.2. Demonstrating

The students were beginning to use both thinking skills and ICT in their daily routines and, although they were still in the trial-and-error stage, they were consolidating their understandings as they demonstrated the use of the tools in a variety of situations. The SP assumed a routine: when they were about to do any task on the computer, they logged on to the LAN in preparation and revisited a previous task, taking any opportunity to investigate and practise skills before commencing a new task or doing further work on an existing one. They continued to visit favourite websites if an opportunity presented, and enjoyed accessing interactive sites – manipulating puzzles; learning sliding, ‘drop and drag’ and inserting skills; and taking part in word and sentence games – where they created and consolidated spelling and reading skills. Visual literacy, using words and icons as they navigated sites, was developing.

In writing workshops, the SP were using graphic organisers and planners to assist in thinking about and planning writing with the integrated inquiry units of work providing the context. The SP walked around the local community, read various texts – books, pamphlets and information guides – had discussions in small cooperative groups and visited relevant websites. This information was used in a thinking tool: a concept map, described as a simple web which is used to brainstorm ideas for writing. The information in the simple web is incorporated into another graphic organiser as a writing plan (Refer: Figures 37, 38, 39, 40).
Figure 37: Thinking and planning for writing about water
Figure 38: Artefacts showing SP 1A’s simple web (thinking tool) and writing planner utilised in writing about the community.
Figure 39: Artefacts showing SP 1D’s simple web (thinking tool) and writing planner utilised in writing about the community
There was a small transition between the discovery and engaging stage, and the demonstrating stage. The approximate time frame for the first stage was lengthier than that of the demonstrating stage. What evolved was that the students spent time playing, experimenting and trialling skills, and beginning to experiment with thinking strategies in contexts other than focused teaching sessions; then one became aware that the reliance on the teacher decreased and the students began to display more independence in their practice. During independent learning tasks one observed that students did not hesitate to engage in the task and sought little help to access relevant programs or the Internet, and they were using vocabulary and terminology related to previous thinking experiences more routinely.

4.8.3. Analysing

When we analyse, we are discovering the essential features of an issue, and this is what students are doing when they are using both thinking skills and ICT in their daily practices – hence the title of this stage.

The integrated inquiry unit of work ‘Light and Sound’ is in the key learning area of science. Students are engaged in inquiring and discovering across all key learning areas, including religious education. The SP engaged in informal conversations and

**Figure 40**: Artefacts showing SP 2K’s writing planners utilised in writing about water
both small- and large-group discussions about light, and readily related aspects of their learning to various thinking hats. They used white hat thinking to investigate facts and information, yellow hat thinking to determine the good points or positive aspects, green hat thinking in their experiments with prisms (light) and creating sound makers (sound), and blue hat thinking to plan steps to take in implementing these (Refer: Figure 41).

<table>
<thead>
<tr>
<th>Thinking Responses</th>
<th>White hat: facts or information</th>
<th>White hat: facts or information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make a facts chart</td>
<td>“The sun is the main source of light”</td>
<td>“The sun is the main source of light”</td>
</tr>
<tr>
<td>Make a facts chart</td>
<td>“there are seven colours (colours) of the spectrum. light comes from the sun.”</td>
<td>“there are seven colours (colours) of the spectrum. light comes from the sun.”</td>
</tr>
<tr>
<td>Make a facts chart</td>
<td>“fire flames give us light light can be reflected and refracted”</td>
<td>“fire flames give us light light can be reflected and refracted”</td>
</tr>
<tr>
<td>Make a facts chart</td>
<td>“the sun is a luminous object”</td>
<td>“the sun is a luminous object”</td>
</tr>
<tr>
<td>Make a facts chart</td>
<td>“We could not see without light a light bulb can catch on fire/ light gives us light”</td>
<td>“We could not see without light a light bulb can catch on fire/ light gives us light”</td>
</tr>
<tr>
<td>Make a facts chart</td>
<td>“long ago there was not light candles give us light a lamp gives us light we could not live without light”</td>
<td>“long ago there was not light candles give us light a lamp gives us light we could not live without light”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thinking Responses</th>
<th>Green hat: new ideas</th>
<th>Green hat: new ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you think would happen if …</td>
<td>What do you think would happen if …</td>
<td>What do you think would happen if …</td>
</tr>
<tr>
<td>…there was no light</td>
<td>…there was no light</td>
<td>…there was no light</td>
</tr>
<tr>
<td>‘it would be dark and scary’</td>
<td>‘it would be dark and scary’</td>
<td>‘it would be dark and scary’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thinking Responses</th>
<th>Yellow hat: positive ideas</th>
<th>Yellow hat: positive ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you think are the five most important things about light?</td>
<td>“We could not see”</td>
<td>“We could not see”</td>
</tr>
<tr>
<td>What do you think are the five most important things about light?</td>
<td>“We would not live”</td>
<td>“We would not live”</td>
</tr>
<tr>
<td>What do you think are the five most important things about light?</td>
<td>“We would not have light it would be dark”</td>
<td>“We would not have light it would be dark”</td>
</tr>
<tr>
<td>What do you think are the five most important things about light?</td>
<td>“We could get sun Affect”</td>
<td>“We could get sun Affect”</td>
</tr>
</tbody>
</table>

Figure 41: Artefacts showing thinking hat work related to ‘Light’ (SP 1H’s work)
In a Writing Workshop, students are engaged in various aspects of the writing process, and this is a teacher-directed task in that the SP are expected to produce a piece of writing in a particular text type – in this case, in the form of a report. Included below is a sample of a student’s work. The first sample, as well as being an example of the process the SP go through in producing this text, also displays the progress this student is making in his personal writing. The following samples included in Figure 42 feature work samples from SP 1Q.

<table>
<thead>
<tr>
<th>Writing Workshops Book (undated)</th>
<th>Report planner for ‘Light’</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key Words</strong></td>
<td></td>
</tr>
<tr>
<td>Classification</td>
<td>‘a form of energy</td>
</tr>
<tr>
<td></td>
<td>it helps us to see</td>
</tr>
<tr>
<td></td>
<td>sun is main source of</td>
</tr>
<tr>
<td></td>
<td>light’</td>
</tr>
<tr>
<td>Description</td>
<td>‘shadows’</td>
</tr>
<tr>
<td>Place/Time</td>
<td>‘Day – sun</td>
</tr>
<tr>
<td></td>
<td>lightbobe (lightglobe)</td>
</tr>
<tr>
<td></td>
<td>night – torchlight</td>
</tr>
<tr>
<td></td>
<td>(torchlite)</td>
</tr>
<tr>
<td></td>
<td>fresed light (fluorescent</td>
</tr>
<tr>
<td></td>
<td>light)</td>
</tr>
<tr>
<td>What does it do</td>
<td>‘it hlpes (helps) us see’</td>
</tr>
<tr>
<td>Summarising comments</td>
<td>‘I like to be arbw see (I</td>
</tr>
<tr>
<td></td>
<td>like to be able to see shadows’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Writing Workshops Book 9/8/02</th>
<th>Early draft – Report on ‘Light’</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Writing Workshops Book 27/8/02</th>
<th>Composing, recording and using key words</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Writing Workshops Book 29/8/02</th>
<th>Revised draft</th>
</tr>
</thead>
</table>
Writing Workshops (undated)
Computer-generated draft

Light
The sun is the main source of light. It helps us to see. Light is a form of energy.

We get light from other things like electricity, fires, candles and torches.

It travels in straight lines.

I like to be able to see shadows.

Figure 42: Artefacts showing thinking hat work related to ‘Light’ (SP 1Q’s work)

Final draft (undated)
Independent writing and publishing
Participation in
• Small-group conferencing for authorial content
• Student–child editing conference

Writing Workshops Book (09/9/02)
Narrative Plan
Title: Three little pigs
Beginning: Characters and Setting
‘Three little pigs Mum pig Wolf Country’
Middle: Plot/Problem/Complication
‘very very bad wolf blew straw and stick house down’
Ending: Conclusion/Resolution
‘3rd pig tricked (tricked) wolf by inadvertently (accidentally) tripping (tripping) wolf over with a rolling (boiling) pot’

Figure 43: Artefacts showing graphic organiser and first draft for narrative text type (SP 1H’s work)
The work samples above (Figure 43) of SP 1H and below (Figure 44) of SP 1E reflect the use of a graphic organiser (thinking tool) to plan for writing, the connection between the thinking hats work to inform for writing, and the place of ICT in composing and publishing.

**Figure 44:** Artefacts showing graphic organiser and planner for report text type (SP 1E’s work)

The artefacts in Figure 45 are those of SP 1H and show use of a graphic organiser, a first draft and published draft using word processing.
The SP are using thinking and learning journals and the six thinking hats to reflect on learning and to make observations about various experiences, as indicated by the artefacts included in the next section. (Refer: Figures 46-51)

Figure 45: Artefacts showing graphic organiser, first draft and published piece for report text type (SP 1H’s work)

The sun is the main source of light. Light also helps us to see. Light is a form of energy, travels in straight lines and can be reflected.

There are other sources of light like light bulbs, torches, fluorescent light and flash lights.

One Indian story tells us that light came from buffaloes. A group of buffaloes were running down the dusty roads. Sparks came from the ground from the buffaloes’ hooves and made fire. They used the flames for light.

Final draft (undated).
Independent writing and publishing
Participation in
- Small-group conferencing for authorial content
- Student–child editing conference

Figure 46: Artefacts showing responses from thinking and learning journal (SP 1H’s work)

‘My sister use to learn me to say “Goli Goo”’
‘My parents learns me to draw’
‘My mum learns me to draw’

‘My dad use to learn me to do the monkey bars’
‘On the computer I learned a word’
**Figure 47:** Artefacts showing responses from thinking and learning journal (SP IH’s work)

Learning Journal Record 6/8/02

> ‘I learn by the computer centre and library corner because it’s help me learn some new words.’

Learning Journal Record 13/8/02

> ‘I learn with the computer word big word! I learn that teachers help’s me to much stufe (stuff). I learn plus (addition) tims (times - multiplication) taked (take away subtraction)’
### Learning Journal Record 11/10/02

`Learning`  
*I learned that water come from dams.  
I learned all 2x 10x.  
I learn (learned) about Jesus dieing (dying) on the cross.  
I learn (learned) true happiness is Happy.  
I learnt (learned) that pipes carrys (carry) water everywhere in town.*

---

#### Figure 48: Artefacts showing responses from thinking and learning journal (SP 2L’s work)

---

#### Computer Task: Following directions – accessing network and word processing

<table>
<thead>
<tr>
<th>Type your name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type your favourite word</td>
</tr>
<tr>
<td>Type your favourite noun (learning word)</td>
</tr>
<tr>
<td>Type your favourite verb (action word)</td>
</tr>
<tr>
<td>Type your favourite adjective (describing word)</td>
</tr>
</tbody>
</table>

Put these three words together in a sentence.  

Now type three more sentences: Make sure you use capital letters and full stops if you need them. Make the sentences as interesting as possible.

| The  |
| Door  |
| Dog  |
| Raning  |

The dog ran.  
The door slammed.  
I ran far away.  
My dog Maths ouf Tiffsen.

---

#### Figure 49: Artefacts showing responses from computer tasks and thinking and learning journal (SP 2K’s work)

| ‘I have a big smile  
I am standing straight  
I am happy  
I am opening my eyes  
I am wearing a school uniform  
My hair is black  
I have blue eyes  
I am tall  
I like to play games  
I am 9 years old’ |

| ‘I learnt how to log on – someone helped me  
I now know how to be more concentrated learning activity  
I learnt how to read – someone helped me  
I learnt how to experiment – I worked them out’ |

---

*Use the form to add more information.*
19/9/02 Thinking task in Thinking and Learning Journal

<table>
<thead>
<tr>
<th>Put on your White Hat</th>
<th>Put on your Yellow Hat</th>
<th>Put on your Black Hat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write 8 things you have learned</td>
<td>Write the things that helped you to learn</td>
<td>Write things that sometimes make it hard to learn</td>
</tr>
</tbody>
</table>

- “I learn if your (you’re) not stretched or tucked you can hurt (hurt) your self (Physical Education comment)
- “I learn that you can improve anything that is important (important)
- “I learnt if you take your time and even that you do not finish it you know you did a good job
- “I learnt that you can make your life better
- “I learnt if you have strength that you can build your way up and learn it
- “I learnt that every one can acheave (achieve) some things
- “I learn that you can do any thing you want
- “I learn’

‘Teacher (Mrs Walters) Brane (brain) Dicktioneys (dictionaries) Algherbet (alphabet) ’

‘vises (voices) ’

**Figure 50**: Artefacts showing responses from thinking and learning journal (SP 2B’s work)

**Computer task**: following directions – accessing network, word processing, saving, printing

**Insert image task draft**

**Figure 51**: Artefacts showing responses from computer tasks (SP 2B’s work)
The SP used the thinking hats to innovate a familiar text.

<table>
<thead>
<tr>
<th>SP 1E’s work showing thinking on different hats to innovate text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
</tr>
<tr>
<td>‘She doesn’t sher (share) her food. She toock (took) a long long time. She pick (picked) roosers (roses) instead (instead) of going to her grandmas (grandma’s) house. She was smlling (smelling) rosers (roses). She is a lightning bolt that women (woman). She is a spider women (woman). ’</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>‘The wolf stays aliv (alive) and grandma and wolf and the ax (axe) cutter (cutter) shifts (shift) into little red riding Hood’s House.’</td>
</tr>
</tbody>
</table>

Figure 52: Artefacts showing thinking skills activities (SP 1E’s work)

Figure 53: Artefacts showing responses from thinking and learning journal (SP 1E’s work)
The SP used the computers in a variety of ways in order to build computer skills: logging on to the network and the Internet with usernames and passwords; accessing online information and games; printing, saving and even bookmarking in some cases. They could start new Word documents, insert pictures, save, print, retrieve and have fun! They displayed the ability to open a document, move the cursor to the appropriate section, key in information, save and print. The PR was able to access the relevant folder, check for saved files and record the appropriate information on the checklist.

A strategy found to be effective with the SP was to call these monitoring tasks ‘tests’, as the SP greatly enjoyed doing ‘tests’ to prove their computer expertise (Refer: Figure 54). Consequently, practice tasks such as the one below usually have the word ‘test’ as part of the file name. In fact many of the SPs did not wait for the PR to check the main folder to see whose work was there, but developed the ability to locate the folder on the network, look to see if they had saved their own work properly and mark the relevant recording checklist. The SP were always honest about the success of the work. If anyone had not been successful, the task was retrieved and re-saved if not in the correct location.

**Figure 54:** Artefacts showing computer skills activities (SP 1E’s and SP 2F’s work)
Transcripts from the journal of the independent observer also serve to illustrate the behaviours the student participants were exhibiting in this stage (Refer: Figure 55).

- Students listened to explanation of concepts to be considered and used today in correcting final work drafts – this was specifically fixing up work to include single spaces between words and commas and two spaces after full stops; changing the style and size of fonts using the highlighting function and letting the computer move the text to a new line when it has run out of space on the current line
- SP 2G showed competence in: used keyboard functions; highlighted parts of text and deleted; used enter key to form new line in text; inserted single spaces between words and double space after full stop consistently; inserted capital letters into text
- SP 1A was unsure of how to insert border. Discussed using the options under ‘features’ in the tool bar and then decided that ‘borders and shading’ would be the most useful option – he then investigated this option, found a selection of borders, made his choice, successfully inserted the border, saved his work and exited the program to go on to another task
- SP 1Q competent in using backspace and arrow keys to insert words and spaces and self correct mistakes
- SP 2J competently used mouse to scroll down list of font styles, used left and right mouse buttons; able to highlight text and select new fonts until he made a final selection
- SP 1H was not consistent in understanding about the different spaces but able to insert single spaces where necessary and also used this function to move text to a new line
- SP 1J able to insert single spaces between words and also checked the number of spaces between words, self correcting any inconsistencies
- SP 1D on opening file discovered photo was missing – used arrow keys to scroll up and down and used highlight function to see if the photo box was still there; she then relocated photo
- SP 10 inserted single and double spaces; delete and backspace function; inserted capitals

**Figure 55**: Transcripts from the journal of independent observer, 30 October 2002 (see Appendix F)

The data presented in this section, in relation to the ‘Light and Sound’ integrated inquiry unit, indicates that all six case study students were in the Analysis stage by the end of Term 3.

**4. 8. 4. Synthesising**

The stage of synthesising describes when students have established skills and are using them to explore and go further. Several of the students were starting to display this feature and were moving into this phase. The SP were using thinking skills to guide many of the activities in which they were involved and seemed to find them particularly helpful in group discussions An example of this is seen in the observations the IO made during a focused teaching session, which was held in the context of the ‘Media in Art’ integrated inquiry unit.
• SP 1F displayed blue hat thinking by reinforcing task orally and ensuring others in the group understood the task
• Once decisions were made on the setting, background etc students set about sketching out a draft – this involved discussing ideas as they were added to the sketch – making comments about the appropriateness of inclusions to the sketch
• SP 2J – looked through tasks required and checked off what had been completed eg we’ve done the information facts and the background …
• SP 2K – very dominant in group discussion – ‘I’m going to …’ ‘the background is going to be …’ Group needed to work through this in order to continue – used turn-taking strategy to make sure everyone was heard
• SP 1P – very focused on how group would order ideas to make mural
• SP 1D – tool on role of ordering individual contributions; often expressing own feelings/thoughts on group work – ‘yeah I like that idea …’ ‘Xxx’s idea is good – we could help make it work …’

Another example of this is seen in the observations the IO made during a session where the SP were transferring ICT skills to new tasks – Internet Sites – which was also held in the context of the ‘Media in Art’ integrated inquiry unit.

• SP 2I confidently logged onto the network, then top primary sites home page in preparation to complete his work. Discussed the process he will use to fix his mistakes from last and talked about the steps he will follow to complete the tasks.
• SP 2I: The mistakes I have to fix is to get stuff, the person related to the picture.
• IO: Okay so what do you actually need to do to make sure that you get the correct artist?
• SP 2I: You have to login to pictures and then you find a picture that you like the best and then you write down the artist name.
• During the completion of task 3 SP 2I explained the process of how he was going to complete the task – explaining step by step, his choices and what he selected.

The behaviour of the students and the ways in which they internalised the ICT and thinking skills, and utilised them spontaneously as part of their daily practice, was indicative of this stage of development. Artefacts specific to this stage were not apparent as these skills were in use across all learning tasks and activities in which the SP were involved – they used them as naturally as they did other tools at their disposal to assist their learning. Thinking, learning and ICT processes apply across all
content areas and life skills. Students working in this stage have a tool chest for the ongoing discovery and construction of meaning.

4.9. SUMMARY: DATA AND CASE STUDIES

The purpose of this chapter was to describe the learning context in which the student participants were situated. The context is described in terms of the physical equipment and resources broadly available to support the students’ learning, the school setting in which teaching and learning occurred, and the curriculum documents which governed them. The literacy and language backgrounds of the students provide further insight into the experiences with which the students entered the research classroom. The research in action – showing the iterative cycles of planning, action, observation and reflection – is articulated to inform about classroom routine and the subsequent teaching and learning experiences of the students.

Observable patterns of behaviour are identified in this study and are apparent in the behaviour of the students. The data and case studies in this chapter are exemplars of these patterns of behaviour and are identified as clear stages and presented here. Data and samples of artefacts presented lay the foundation for understanding the conclusions drawn from the discussion of main research findings.
CHAPTER 5

DISCUSSION OF MAIN RESEARCH FINDINGS

5.1. INTRODUCTION

There has been and continues to be an important shift in approach and emphasis in the place of ICT in schools. There is increasing recognition that the end result of computer literacy is not only knowing how to operate computers, but also to use technology as a tool for organisation, communication, research and problem solving. Educational associations are advocating a more meaningful use of technology in schools. Students need to acquire skills and tools together with the ability to use computers and other technologies flexibly, creatively and purposefully. Individual computer skills take on a new meaning when they are integrated within this type of information problem solving process, and students develop true information technology literacy because they have genuinely applied various information technology skills as part of the learning process (ISTE, 2000).

Kizlik (1996) reminds us of the importance of thinking and its connection with technology. He defines thinking as a structured series of connective transactions where one is involved in making connections between items of information. Thinking is purposeful, must be connective, and is necessary for learning. The role of technology in this process is in facilitating the identification and development of information. Technology is not an end, but a means. Technology gives us a tool to help develop criteria to know whether answers to our questions make sense, and to assist thinking processes in creating information.

This thesis explored the effects of integrating ICT through incorporating the explicit teaching of thinking skills across the curriculum in a Catholic primary school setting located in metropolitan Melbourne in Victoria, Australia. The graphic representation of iterative cycles, data and case studies presented in the previous chapter elucidate ways in which that occurred and provide substantiation of the explicit and implicit influences on the learning of the students in this primary classroom. The iterative cycles serve to clearly indicate the engaged learning tasks that were utilised in this process. Students’ responses to those tasks, artefacts relevant to those tasks and planned observations
from the independent observer illuminate phases or stages through which students progressed, and reflect the positive student learning outcomes which resulted.

This chapter draws from the case studies, collection of artefacts, observations of the independent observer and the researcher journal, and provides a discussion of the main findings. An analysis of the content of the data was undertaken and several themes emerged. The participating students clearly developed the features of engaged learners. These characteristics, outlined in the work by Jones et al. (1995) presented in earlier chapters, encapsulate the features of engaged learning and explicate observable growth and development in student learning, as can be seen in the collection of artefacts and the observations of both the participant researcher and the independent observer. The independent observer (see Appendix F) details the ways in which engaged learning – incorporating both thinking skills and ICT skills – was clearly evident in the research classroom, with both of these aspects being integrated and adapted, and impacting positively on student learning.

Also emerging from the data analysis were four observable stages showing patterns of behaviour exhibited by the student participants. These stages – identified here as Discovering and Engaging stage, Demonstrating stage, Analysing stage, and Synthesising stage – are explicated and discussed in detail in section 5.3.1. Together with an explanatory analysis of engaged learning and the four observable stages of behaviour, this chapter links with literature reviewed in Chapter 2 pertaining to ICT, thinking skills and engaged learning, and the key stages identified in this study.

5. 2. ADOPTING, ADAPTING AND INTEGRATING ICT AND THINKING SKILLS

The anticipated outcome of this research was to discover that the explicit teaching of ICT and thinking skills would lead to these skills being adopted, adapted and integrated across the curriculum, and the evidence presented in the previous chapter clearly shows that this is the case. Computer technology supports learning and is useful in developing the higher-order skills of critical thinking, analysis and inquiry by engaging students in authentic, complex tasks within collaborative learning contexts.
The technology, together with thinking skills, allows students to work at their own pace and encourages them to take initiative and learn independently.

Wegerif (2002), in reviewing use of new technologies and the link to the development of thinking skills, suggests that using technology does not, by itself, lead to transferable thinking skills, but that these depend on how the technology is used and on the role of the teacher. Learners need to know what the thinking skills are that they are learning, and these need to be explicitly modelled, drawn out and re-applied in different contexts. Weberif notes that evidence also suggests that collaborative learning improves the effectiveness of most activities. The positive effect of collaborative learning is increased substantially if learners are taught to reason about alternatives and to articulate thoughts and strategies as they work together. Technology is therefore best thought of as a support and a resource for dialogues in which thinking skills are taught, applied and learned.

The student participants moved through stages in their learning that clearly reflect that they did in fact adopt, adapt and integrate ICT and thinking skills into their learning and daily practice. Student participants moved through the Discovering and Engaging stage, Demonstrating stage and Analysing stage over the course of the year. Several students were clearly displaying the attributes of the Synthesising stage as others were beginning to operate within that stage.

5. 2. 1. ICT

ICT has become an integral part of life in the 21st century, with technology being incorporated into all aspects of daily life and becoming faster, more advanced and more refined each day. Being technologically skilled and computer literate is becoming more essential for people, particularly those living in developed nations. Schools need to be part of the process that educates citizens of the future, and children from an early age can learn to be discerning users of technology. Papert (cited in Casey, 2000) notes that children can learn to use computers in a masterful way and that learning to use computers can change the way they learn everything else. Duffy and Cunningham (1996) recognise the importance of computer technology and view it as an integral part of cognitive activity, clearly linking it with thinking.
The students’ use of technology across all curriculum areas increased over the year. In the early stage of discovering and engaging, the students often used technology as something they went to after they had completed set tasks, rather than as part of completing that set task. They had limited knowledge of computer programs and the possibilities that computers offered, so they relied on simple published software for access. This was an important aspect to discovering and engaging as these published programs offered development of the simple skills – opening and accessing programs, mouse and keyboarding skills, saving and exiting programs – necessary for general computer usage. These programs were visually engaging and provided success for learners in that early stage, by consolidating learning from the language arts and helping build confidence. However, it was important for student learning and for the purposes of this study that the students were moved on from this view of computer usage and became aware of the increased level of technology use that was both desirable and clearly possible.

Means and Olsen (1994) opine that early attempts to incorporate ICT into schools were not successful and the reasons for this were related to the fact that wrong models of teaching were employed and the programs used had limited skills applications. Means (1997) notes that traditionally schools have not focused on technology as a means to support engaged learning. In fact informal observations of many of my colleagues with whom I have interacted indicate that this may well have still been the case in 2002, were it not for the efforts of educational authorities developing the various technology initiatives discussed in Chapter 2. Many well-intentioned teachers were relying on published programs to provide computer technology education, and in fact many early programs had limitations with regards to teaching students transferable computer skills. Means et al. (1993) notes that teachers can draw on technology applications to simulate real-world environments and create actual environments for experimentation, so that students can carry out authentic tasks as real workers would, explore new terrains, meet people of different cultures, and use a variety of tools to gather information and solve problems. This view of ICT presented by Means et al. is reflective of the way in which ICT was both perceived and implemented by the participant researcher.
Subsequent work from a range of researchers (Barnett, 2003; Goddard, 2002; Gahala, 2001; Blocher, Sujo de Montes, Tucker & Willis, 2000; Walters, 1999; Goldman, Cole & Syer, 1999; Means, 1997; Smyth, 1997; Jonassen, 1994) sought to reinforce the necessity and importance of ICT, and its success in promoting student learning if utilised in a way that provides opportunities for full involvement of students. The current study sought to add further knowledge to this field. By combining ICT and scaffolding the learning with thinking skills, this study investigated the resulting learning environment.

In recent years in the state of Victoria, educational authorities from the Victorian Government sector, the Catholic sector and the Independent schools sector have put into place a wide range of initiatives – and in many cases funding – to support the use and integration of ICT into primary and secondary curriculum documents. Educational authorities in other parts of Australia are putting forward similar beliefs, such as the Department of Education, Tasmania (2004). Authorities in Tasmania consider it imperative that all learners have the skills to access the possibilities that information technologies offer in order to expand personal and vocational lifestyle choices. The tools of ICT are very much part of daily life, facilitating learning and personal interactions in innumerable ways. These ways can be readily observed as people in the workforce perform their designated duties and students go about their learning each day in Victorian schools: using technology as people years ago used pencil and paper (a form of technology still used regularly today).

Clements and Nastasi (cited in Love & Sikorski, 2000) also emphasise the importance of ICT in students’ lives, resilience and learning, and note that research tells us that children in classrooms with computer exposure have significantly greater gains in self-esteem. This was clearly observable in the research classroom, as student success with ICT impacted positively when the students perceived themselves as successful technology users. The impact of ICT has implications far beyond that of being a useful tool.
5. 2. 2. Thinking Skills

The development of thinking skills teaching in schools has been strongly influenced by the work of certain leading individuals. These people have pioneered different approaches to teaching thinking, and their ideas have then influenced the development of other programmes (Johnson, 1984; Lipman, Sharp & Oscanyan, 1980; de Bono, 1970). Successful thinking skills programmes promote a variety of apparently quite different kinds of things, including strategies, habits, attitudes, emotions, motivations, aspects of character or self-identity, and also engagement in dialogue and in a community of inquiry (Wegerif, 2002).

The Victorian Curriculum Assessment Authority (VCAA) (2004), in its consultation paper for reform, noted that the proposed meta-cognitive skills in particular need to be much more explicitly valued and developed across the curriculum than had currently been the case. This government body reflects what others (Atkin, 1999; Buzan, 1995; Clark, 2001; de Bono, 1969, 1976, 1983, 1984, 1986, 1992; Gardner, 1983) have been saying for some time: how important the explicit teaching of thinking skills is, and also that the thinking process and learning how to think are as important as the traditional imparting of knowledge. This is supported by the work of Black and McClintock (cited in Nanjappa & Grant, 2003), whose results show that students have the capacity to acquire thinking skills as well as learning specific content, and suggest that these skills are central to cognition and learning. The current study investigated this connection through incorporating the explicit teaching of thinking skills into the regular class programme.

Students are able to learn about and use thinking skills and become reflective about their learning. They articulate ways in which explicit thinking skills have assisted them in their learning and independently transfer these skills to new situations – they are learning how to be learners; they are learning how to be thinkers; and they are active participants not passive recipients in their learning journey.

Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime.
Proverb (n. d.) original section
Learning was enhanced by the explicit teaching of thinking in conjunction with the explicit teaching of ICT in the research classroom. This opinion is supported by the work of researchers conducting studies in the constructivist paradigm who consider that thinking skills, learning and technology are closely related (Wegerif, 2002; Swain & Pearson, 2001; Jonassen, 1994), together with an emerging consensus that new technology is bringing about a new kind of economy, where the main products are information and knowledge requiring workers to possess transferable thinking skills, rather than content knowledge or task-specific skills (NESTA, 2002). The learners in this study developed transferable skills and became active and engaged learners who were able to utilise skills and knowledge in new situations.

5.3. KEY STAGES IN ICT/THINKING LEARNING PROCESS

As a result of combining the explicit teaching of ICT and thinking skills, clear observable changes occurred in the students’ learning behaviours. First, key stages of behaviours through which the students progressed were identified. The stages that have been identified are designated as: Discovering and Engaging stage, Demonstrating stage, Analysing stage and Synthesising stage. These stages relate to the behaviours displayed by student participants during the research and are exemplified by the data, information and artefacts in later sections of Chapter 4. In addition to this, the students became part of a real learning community where engaged learning was clearly happening.

5.3.1. Key Stages

5.3.1.1. Discovering and Engaging with Learning
This stage occurs early, when the students know very little about thinking or ICT. They show curiosity and are interested in both. They are beginning to participate and engage in related activities, and their knowledge constructions are emerging.

5.3.1.2. Demonstrating
The students are beginning to use both thinking skills and ICT in their daily routines, but their learning still requires scaffolding. Students are in a trial-and-error phase as they consolidate understandings in attempting and trying out new learning experiences.
5. 3. 1. 3. Analysing
The students are now using both thinking skills and ICT continuously and seamlessly. These skills have become intrinsic to the students’ daily practices and are used as a matter of course in numerous situations and across a range of curriculum areas.

5. 3. 1. 4. Synthesising
The students have established thinking and ICT skills and are using them to explore and go further in creating their own understandings. Extrinsic support required to do so is virtually non-existent.

![Visual representation of observable stages of progress in the ICT and the Thinking Curriculum](image)

**Figure 56:** Visual representation of observable stages of progress in the ICT and the Thinking Curriculum

5. 3. 2. Engaged Learning

The research in this study involving young Year 1/2 learners extends work already published. Jones et al. (1995) present a vision of learning, concerned with what engaged learning looks like and how successful, engaged learners are responsible for their own learning – a necessary characteristic. Learning proceeds from the known to the new, and good teaching will recognise and build on this connection. This is known
as ‘scaffolding’, and the teacher has to provide this scaffold to support the construction. The scaffold is the environment the teacher creates, the instructional support, and the processes and language that are presented to the student in the context of approaching a task and developing the abilities to meet it (Wilhelm, Baker & Dube, 2001). During this research the students became engaged learners. They frequently drew on past learning and experiences to assist in the development of new knowledge, and expressed the connection between the past learning and the task at hand utilising a variety of problem solving strategies. They became practised at using the six thinking hats to guide or scaffold these problem solving strategies across all curriculum areas as they read, wrote, word-processed, calculated and reflected in their daily learning activities.

One aspect integral to engaged learning is the selection of appropriate tasks or learning experiences. In the 21st century these need to be relevant, challenging, authentic and multidisciplinary. The students in this study demonstrated how they had taken on board the thinking tools – six thinking hats and graphic organisers are two examples – in literacy blocks, integrated-inquiry learning tasks, and in thinking and learning journals, and were making connections to other learning. In writing workshops the students were using graphic organisers to guide their planning, and when composing and recording students utilised pen and paper as well as word-processing equipment to facilitate their writing as they worked through the stages of writing. Many students were doing this through to the publishing stage with many of their written pieces.

Assessment of engaged learning involves presenting students with an authentic task, project or investigation, and then observing, interviewing and examining their presentations and artefacts. This process was clearly in evidence during the iterative cycles that occurred, and where the work of students was assessed not only in its own right to provide information about the learning of the individual (summative assessment), but also to inform future practice (formative assessment). Self assessment is also a feature of this process as students reflect on their own learning, as evidenced by reflections in the thinking and learning journals.

most powerful instructional models and strategies for engaged learning are interactive, explore multiple perspectives, build upon prior knowledge, and use brainstorming and problem solving processes. From early in the school year, learners in the current study were encouraged to try and solve problems on their own, drawing on prior experience and knowledge and thinking to help them, as well as to ‘have a go’. If a problem or issue persisted, students were encouraged to approach a peer, a classroom helper and then, if required, the teacher. Students were immersed in learning opportunities based on explicit thinking skills designed to develop independence and problem solving. The independent observer commented on this learning environment, noting that tasks frequently required learners to explore ideas in a different light or to consider ideas that were the opposite to prior experience. Learners were constantly reminded of prior learning and given support to assist them in selecting problem solving strategies (Independent Observer Journal, Term 4 2002).

Literature reviewed in this study opines that a conducive learning environment is essential for engaged learning, with the classroom being a knowledge-building learning community where shared understandings are developed and where many tasks involve learners working together (Brown et al., 1996; Jones et al., 1994; Collins, Brown & Newman, 1989; Rogoff, 1990; Vygotsky, 1978). Often students in this study were paired with another student to complete specific aspects of tasks, and then moved to complete the remainder alone. This worked well, and students who often found that they encountered difficulties while working on their own, benefited from the initial support and sharing of knowledge with their peers. In addition, small cooperative group structures combining students of mixed ability, expert groups and support from parent helpers all worked towards building a learning community. This teaching and learning environment obviously supported the development of ICT skills in these young learners.

Students/learners and the teacher truly listened to and valued each contribution made to group/individual discussions as well as through task outcome. Many of these ‘strengths’ are shared among the rest of the class as a demonstration of diverse perspectives and to acknowledge contributions to the learning of others by the teacher.
(Independent Observer Journal, Term 4 2002)
Grouping for engaged learning is concerned with the importance of collaborative learning-centred work, and the wealth of background knowledge and perspectives to different tasks that flexible groupings bring. Use of varied groupings was essential to students developing skills in all areas of the curriculum. Skills such as oral communication, working cooperatively, developing shared understandings and team building were necessary, not just for the time in one classroom, but for all the classrooms yet to follow. Students had computer partners, cooperative groups that shared work space, mixed-ability groups for independent learning tasks, and ability groups for focused and needs-based teaching. These groups sometimes had adult supervisors, team leaders or shared leadership. The groupings extended to a variety of abilities – oral skills, written skills, thinking skills, problem solving skills, confidence in self and within a group environment, and confidence in speaking English (Independent Observer Journal, Term 4 2002). Interactions with a variety of people increased the opportunities to build on understandings and learning.

Teacher roles for engaged learning shifted from the role of information giver to that of facilitator, guide and learner. It was essential that the researcher presented herself as an ongoing learner and as a model for learning. Students, as young as they were in this study, brought a wealth of knowledge and abilities with them, and it was important for each and every one of them to see themselves as successful learners and as experts in some way. The cultural attaché, the sporting expert, the origami creator, the pop-culture specialist all have an important place in the learning classroom, as do the spelling wizard, the number genius and the memoriser of interesting facts. All must be given an opportunity to share these gifts and talents. The Kid Pix expert in this study knew features of the programme long before any other learner in the classroom, and with the teacher as facilitator this encouraged others to learn from someone better informed in this regard.

It was clearly evident that the teacher considered herself a learner amongst the other learners and showed/conveyed this to her students through verbal discussions/explanations. She continually commented out loud when she had learned something from her students, indicating that her students had become her teacher. (Independent Observer Journal, Term 4 2002)
Another important student role for engaged learning is that of explorer. This is well documented in the literature (Elmore, Peterson & McCarthy, 1996; Scardamalia & Bereiter, 1991; Piaget, 1978;). Interaction with the world and with other people allows students to discover concepts and apply skills as they are encouraged to reflect upon their discoveries and observe and apply the thinking processes. The students in the current study demonstrated this discovering and exploring stage of learning.

Learners were given ample amounts of sustained time to explore ideas and tasks through observing the progression and task completion of others, then given the opportunity to explore it themselves, applying the new knowledge they had gained from observing the success of their peers. (Independent Observer Journal, Term 4, 2002)

The excerpt (Refer: Figure 57) below showing snippets of conversations between a student and the assistant interviewer too are illustrative of engaged learning practices.

<table>
<thead>
<tr>
<th>AI:</th>
<th>Does using the computer make things easier for you at all?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1E:</td>
<td>Um because I need help with something I will go look on the site, it comes up with all the information I need, I copy it off there and I paste and I print it out.</td>
</tr>
</tbody>
</table>

Figure 57: Transcript of conversation between the assistant interviewer and SP 1E

5.4. VICTORIAN ESSENTIAL LEARNING STANDARDS (VELS)

In November 2003, as part of the Blueprint for Government Schools, the Victorian Minister for Education and Training (the Department of Education and Training, Victoria as it was known in 2002 became known as the Department of Education, Victoria in 2006) asked the Victorian Curriculum and Assessment Authority (VCAA) to develop a new curriculum for all Victorian schools in both government and non-government sectors. The Victorian Minister of Education further requested that the new curriculum contain standards of achievement at significant points within the stages of learning that clearly specified what students should know and be able to do. Information about the background, development and publication of the Standards can be found in relevant sections on this site: 


The Standards were developed in three stages and the Victorian Essential Learning Standards (VELS) were validated during 2005. A curriculum reform was conducted to
develop a new framework of ‘essential learning’ for all Victorian schools in both
government and non-government sectors and, throughout the writing process, many
practising teachers, academics and other educators were involved in reference groups
or acted as critical friends as VELS were developed. VELS were to replace CSF II
curriculum frameworks (BOS, 2000).

This research – with its embryonic stage in 1999 and its practical implementation in
2002 – finds correlation in VELS (VCAA, 2005) which in their overview give clear
instruction as to the essential nature of the place of thinking and ICT in the school
curriculum.

There are three components of any curriculum which are necessary to enable
students to meet the demands of a modern, globalised world. These
components are:
• the processes of physical, personal and social development and growth
• the branches of learning reflected in the traditional disciplines;
• the interdisciplinary capacities needed for effective functioning within and
beyond school.
VCAA (2005) VELS: Overview section, p. 1

A graphic representation of this material is included in Appendix K and is an extract
from VELS by the VCAA, Australia. For more information visit

The three components of VELS, in graphic representation, are presented in a triple
helix – of equal status and inextricably interwoven. This presents a paradigm shift from
the emphasis presented in CSF II (BOS, 2000) where considerable weighting was
given to the body of knowledge a student needed to achieve in P–10 school years.
Thinking and ICT were presented more implicitly almost as an adjuncts to the learning,
rather than as essential components as explicated in VELS.

The VCAA (2004) describes learners at this stage as where they ‘begin to organise
ideas, use language to work with peers and master basic literacy and numeracy skills.
They begin to develop an awareness of other groups, cultures and times (Introducing
the Victorian Essential Learning Standards section, p. 5). This describes learners at
Level 2 stage in VELS, which is the level equivalent to where the student participants
were in 2002 and reflects the learning of the students evident in the artefacts presented in Chapter 4, together with the post-testing literacy results also included there. The difference here is that the importance placed on the explicit teaching of thinking skills and ICT was not mandated by curriculum documentation at that time, but rather by the personal and professional opinion of the researcher.

The VCAA (2004) reform consultation paper presents the concept of a framework of essential learning which clearly indicates the importance of thinking and its explicit teaching. These meta-cognitive skills – inquiring, processing information, creative thinking, reasoning, problem solving and evaluation – are considered essential to ongoing learning across the curriculum and beyond formal schooling. The paper also presents the importance of ICT and includes specific skills such as word processing, databases, presentation graphics, web authoring, active management of electronic information (including file management and data protection) and the application of information literacy skills (including the accessing and sourcing of Internet material) – skills clearly emerging and being demonstrated by students in the current research study. The following artefacts from student SP 1E’s artefacts reflect these specific skills (Refer: Figures 58 – 61).

<table>
<thead>
<tr>
<th>ICT skills</th>
<th>Using ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI: What about school when you do your computer work, what are you good at then?</td>
<td>---</td>
</tr>
<tr>
<td>SP 1E: Oh practising to be directions and doing my work when we get the computer sheets and I learned more off those.</td>
<td>---</td>
</tr>
<tr>
<td>AI: What about things like the graphics?</td>
<td>---</td>
</tr>
<tr>
<td>SP 1E: Oh the graphics yeah, I like the graphics too because they’ve got heaps, I like the graphics because it shows more parts … the computers, if you don’t have graphics um there would be no games because you won’t be able to play the games because you need graphics.</td>
<td>---</td>
</tr>
<tr>
<td>AI: And what sort of things have you learned to do on the computer?</td>
<td>---</td>
</tr>
<tr>
<td>SP 1E: I’ve learned to go to different sites and I’ve learned to type in things, like I’ve learned actually a password of all our things. I didn’t know, I thought all we do is press on it and it comes up, on this and it comes up, it has it already in there and we just click it and just click okay, and I’ve learned how to type in Richmond and 12wal. Transcript of conversation between the assistant interviewer and SP 1E (12 December 2002)</td>
<td>---</td>
</tr>
</tbody>
</table>

Figure 58: ICT artefacts from SP 1E

__________ is happy.
__________ has a red top on.
__________’s teeth are shining.
__________ has a beautiful smile.
My name is ___________. I have brown hair and brown eyes. I am 7 years old and I like playing on my scooter.
Thinking Skills

AI: So since you did this picture about your thinking. In what ways have the thinking hats helped you this year?

SP 1E: Well they helped me a lot because on Little Red Riding Hood I didn’t know what to write, I didn’t even know we’d be doing those and then I came up with it and they helped me a lot.

AI: Do you find some of the hats more helpful?

SP 1E: Um … I actually find all of the hats helpful.

Transcript of conversation between the assistant interviewer and SP 1E (12 December 2002)

Put on your White Hat

Write 8 things you have learned
‘in the computer lab I learnt on Kid Pix3 – there was a transformer.’
‘in the library I learnt how to make a pirate (pirate) hat.’
‘at listening post it helps me to learn new words.’
‘in reading time on the computer it helps me to learn.’
‘homework helps me learn stuff (stuff).’
‘my teacher (teacher) Miss Walters helps me learn (learn).’
‘in the computer lab I learnt words from tests’

Put on your Yellow Hat

Write the things that have helped you learn
‘the computer helps me to learn stuff (learn stuff)’
‘the beautiful teacher Miss Walters’

Figure 59: Thinking artefacts from SP 1E

Word Processing

The Three Little Pigs

Once upon a time there were three little pigs and their mother sent the three little pigs to build their new houses. A wolf was watching them and he was really hungry.

Meanwhile the three little pigs were working really hard. The first little pig made his house out of sticks. The second little pig made his house out of straw. The third little pig made his house out of brick. It had a gap in it.

Then the Wolf said, ‘Meet me at the tree at 10 o’clock.’

The first little pig woke up at 2 o’clock in the morning and he picked all the apples off the tree.

He had sixteen apples all together.

The wolf woke up at 2 o’clock in the afternoon. He forgot to meet the first little pig at the tree. He ran so fast that he got there in seconds.

He didn’t see the first little pig so he went to the first little pig’s house.

He said, ‘Open the door otherwise I will blow your house down.’

So he huffed and he puffed and he blew his house down.

Then the wolf said, ‘I will meet you little pig at the shopping centre at 10 o’clock.’

In the afternoon the wolf met the second little pig at the shopping centre and ate the second little pig.

Then the wolf went to the third little pig’s house and knocked on the door.

Open up, he said but when the little pig wouldn’t let him in he went through the chimney and he landed in hot water.

Figure 60: Word processing artefacts from SP 1E
### Accessing the Internet

**SP 1E: Self-selected Internet sites**

- **Educache/Education Channel:** key word search and exploring site  

- **Yahooligans:** key word searches  
  [http://yahooligans.com](http://yahooligans.com)

- **Wacky Tales:** Interactive story  

- **Puzzle Mania:** online jigsaws  

- **PBS:** various games  

- **Funbrain:** Word and Maths games  

### Accessing the Internet: sample tasks

<table>
<thead>
<tr>
<th>SP 1E completed set tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A teacher-developed checklist was used for monitoring tasks.</td>
</tr>
</tbody>
</table>

**Figure 61:** Accessing the Internet: sample tasks

The belief that thinking skills and ICT skills being integrated, adapted and adopted would impact positively on student learning is clearly supported by the intensive and recent research conducted in the state of Victoria and the implementation of VELS.

VELS are a key initiative in the Victorian Government’s education reform agenda (VCAA, 2005) and describe what is essential for students to achieve from Years Prep
to 10 in Victorian schools. They provide a whole-school curriculum-planning framework that sets out learning standards for schools to use to plan their teaching and learning programmes, including the assessment and reporting of student achievement and progress. Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

Standards are not introduced from Level 1 for every domain. Where standards are in place, progression points are represented on a scale as developmental points along an underlying continuum between the standards. (VCAA, 2005). Correlation between the learning focus for Levels 1 and 2 in ICT and thinking processes, and the key stages identified in this study, are included in Figure 62. The data and artefacts presented in Chapter 4 clearly reflect the learning set down in the VCAA’s (2005) learning focus statements.

<table>
<thead>
<tr>
<th>Key Stages</th>
<th>VELS: ICT</th>
<th>VELS: Thinking Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovering and engaging with learning</td>
<td>Level 1 ICT</td>
<td>Level 1 Thinking Processes</td>
</tr>
<tr>
<td>This stage occurs early when the students know very little about thinking or ICT. They show curiosity and are interested in both aspects. They are beginning to participate and engage in related activities and their knowledge constructions are emerging.</td>
<td>• safe use of ICT tools</td>
<td>• explore wide variety of familiar contexts</td>
</tr>
<tr>
<td></td>
<td>• leave electrical connections alone</td>
<td>• wonder, question and become adventurous in thinking</td>
</tr>
<tr>
<td></td>
<td>• sit upright in front of computer</td>
<td>• use senses to develop observational skills</td>
</tr>
<tr>
<td></td>
<td>• learn correct terms to name ICT equipment</td>
<td>• look for simple patterns</td>
</tr>
<tr>
<td></td>
<td>• become familiar with common icons</td>
<td>• classify familiar items by similarities and differences</td>
</tr>
<tr>
<td></td>
<td>• develop hand–eye coordination through mouse use</td>
<td>• develop simple explanations</td>
</tr>
<tr>
<td></td>
<td>• work with different types of data: text, numbers and images</td>
<td>• use a range of simple thinking tools</td>
</tr>
<tr>
<td></td>
<td>• create simple information products</td>
<td>• reflect on thinking</td>
</tr>
<tr>
<td></td>
<td>• share their ideas</td>
<td></td>
</tr>
</tbody>
</table>
Key Stages | VELS: ICT | VELS: Thinking Processes
--- | --- | ---
**Analysing**
The students are now using both thinking skills and ICT continuously and seamlessly. These skills have become intrinsic to the students’ daily practices and are used as a matter of course in numerous situations and across a range of curriculum areas.

**Level 2 ICT**
- manipulate text, images and numeric data
- create simple information products
- make simple changes to improve information products
- retrieve files
- save new files
- compose simple electronic messages
- use ICT to locate and retrieve information from a variety of sources

**Level 2 Thinking Processes**
- explore community and environment around them
- consider contexts and information beyond immediate experience
- develop skills in making observations
- use a variety of means to record observations
- develop explanations
- begin to understand importance of evidence
- use a variety of sources for investigating
- order and sequence ideas
- classify concepts, objects and ideas using given criteria
- describe, compare and contrast classifications
- use a variety of thinking tools
- work with peers to develop solutions
- reflect on their thinking processes

**Synthesising**
The students have established thinking and ICT skills and are using them to explore and go further in creating their own understandings, and extrinsic support required to do so is virtually non-existent.

*Figure 62: Correlation between key stages and VELS learning focus statements*

5.5. **SUMMARY: MAIN FINDINGS**

All the data in this study indicated that ICT and thinking skills have been adopted, adapted and integrated across the curriculum in the daily practices of the participating students in a classroom where engaged learning clearly occurred. The students exhibited observable patterns of behaviour which indicated that they progressed through key stages of development as their understandings and use of ICT and thinking skills grew. The key stages find correlation in much of the literature reviewed, and are reflective of current educational practices and the curriculum being developed by educational authorities all across Australia, as well as in the state of Victoria.

The teaching of ICT and explicit thinking skills enhances learning, and learning is even more pronounced when these areas are integrated simultaneously. There are implications for the planning and implementation of successful teaching and learning, and issues related to this will be addressed in the final chapter. The final chapter will also include the study conclusions and recommendations for further research.
CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6. 1. INTRODUCTION

This chapter provides an overview of the conclusions from the data in this study. The chapter revisits the main focus of the study, summarises the main findings, presents the conclusions and makes recommendations relevant to educators in the primary sector. Critical analysis of the perceived limitations of the current research and suggestions for further investigation conclude this chapter.

To recapitulate, in the introductory chapter of this thesis the main focus of the study was depicted as an investigation of the ways in which learners are empowered and learning can be enhanced through introducing and implementing various teaching and learning practices. These practices included adopting, adapting and integrating ICT and incorporating the explicit teaching of thinking skills across the curriculum where daily classroom practice utilised meaningful, engaging and purposeful learning experiences. Initially the investigation concentrated on creating a classroom environment conducive to good teaching and learning practices and making the best use of the resources available. This was important and guided early cycles of the research in action. Having the physical resources set up to accommodate good teaching and learning practices, and with supportive classroom routines in place, the cycles of research in action broadened to incorporate the explicit teaching of ICT and thinking skills in the context of the research classroom, while gathering data relevant to this investigation.

Action research, case study and qualitative data-gathering techniques were chosen for this investigation, and the researcher’s personal beliefs and values are reflected not only in the choice of methodology and interpretation of findings, but also in the choice of a research topic – what one believes in determines what one wants to study, and these methods supported the researcher’s beliefs. Action research is inquiry or research in the context of focused efforts to improve the quality of performance, and is typically designed and conducted by practitioners who analyse the data to improve their own practice. Action research has the potential to generate genuine and sustained improvements in schools or personal practice as it gives opportunities for reflection,
exploration, assessment, sharing of ideas and decision–making, as was the purpose in this study. Case studies of several students were developed to give insights into what the students brought to the particular process, through which the aim of the teaching was to educate the children about and through technology and thinking. The choice of methodology to document this research has been highlighted in Chapters 2 and 3.

6. 2. SUMMARY OF MAJOR FINDINGS

The major findings of this study are interpreted as being embedded in engaged learning practices and progressing through key stages in an ICT/thinking learning process, as represented diagrammatically in Figure 63.
The term ‘engaged learning’ and its features, as outlined by Jones et al. (1995), encapsulate what occurred in the research classroom represented by data and artefacts together with an atmosphere, a learning ambience, a positive learning environment where students are working collaboratively, actively and independently on authentic, meaningful learning activities and inquiries. The features of this learning environment are represented diagrammatically in Figure 64 by Jonassen’s (2005) guidelines for designing constructivist learning environments. The environment in which the learning occurs is as important to its success as is the explicit teaching of ICT and thinking skills.

![Figure 64: Characteristics of meaningful learning guidelines for designing constructivist learning environments (Jonassen, 2005)](image)

6. 3. CONCLUSIONS AND FURTHER CONSIDERATIONS

6. 3. 1. ICT: Infrastructure and Equipment

Extrinsic factors can have significant impact on a research project. Aspects that impacted on the implementation of this research, particularly in the area of ICT, were those of reliable computer hardware and infrastructure. A great deal of time needed to be devoted to ensuring that the technology was ready for student access on a daily basis, and this is an area that has considerable implications for implementing ICT. The explicit teaching of thinking skills can be undertaken with far less equipment and is not limited by infrastructure and equipment in the same way.
The Technology in Catholic Schools Project (Catholic Education Office, 2004), as explicated in Chapter 2, started to bring about change in Catholic schools in the area of ICT. Resources including personnel and financial support, together with professional development, were provided in order to assist schools in making better provision for ICT. This project was an impressive undertaking and gave each Catholic school a minimum starting point for incorporating ICT. What occurred for many schools was that an enormous amount of that allocated funding needed to be used on setting up LANs (local area networks) and connecting schools to WAN (wider area network), which was known in the Catholic sector as the VPN (Virtual Private Network) (MCEETYA, 1999). Connection to the VPN was to enable schools to have Internet access and the ability to transfer data. For many schools, the allocated funding was required for the purchase of servers, routers and cabling, leaving little or no money for hardware or software. Schools with tight budgets and with commitments to other projects already in place found little room for further improvement in this aspect. However, it must be noted here that the Catholic Education Office provides schools with ongoing funding for Internet access and has provided ongoing professional development for teachers in the area of eLearning.

During the 2002 school year, I found myself confronted with many constraints related to computer hardware and, on occasions, software. A huge amount of time had to be spent coaxing along the aging Apple Macintosh machines that made up the bank of machines in the research classroom. The timetable gave only limited access to the laboratory where the newer, faster Microsoft machines were located. It was problematic at times to provide sufficient ICT access for students, and these aspects impacted often on the research. Fast connection, ease of access and reliability of equipment are necessary for optimum learning opportunities.

Over time it has become increasingly important for schools to have a wide range of equipment. ICT no longer refers only to computers. Group presentations today require more than one TV and an averkey (Appendix H). Computers with CD-ROM and DVD drives and burners, scanners, networked printers, digital cameras, digital video cameras, data projectors and screens, and large-screen TVs with VCR and DVD players are viewed as essential pieces of equipment. Adequate planning and budgeting
must be established and maintained. If schools are to educate students for a globalised world, schools must reflect the reality that students will encounter.

In fact, while there is considerable pressure on schools to keep up to date with ICT, and in providing teachers with sufficient professional development to become skilled practitioners, it is extremely difficult to do so in a financial sense. In 2007 I believe that many schools, despite the efforts made by the governing bodies, are still struggling with this issue. The area of ongoing adequate funding for ICT resources – including infrastructure, hardware, software and professional development – needs further consideration from educational authorities across all sectors, as it is imperative for schools to have fast, reliable, well-serviced equipment if they are to deliver the curriculum expected with the introduction and validation of VELS (VCAA, 2005).

6.3.2. ICT: Teaching and Learning Practices

Some educators seem to think that technology used properly must be deployed in one of two distinctive models, and for many years a ‘lab vs classroom’ debate has existed. Over recent years, the preferred model appears to have become ‘classroom’, and while I believe it is essential to have computers in the classroom, the classroom computer model and the lab model are both instructionally sound ways to deploy equipment with pros and cons for both perspectives (Technology tips, n. d.). Technology tips (n. d.) presents succinct pros and cons for having both models, resulting in a balanced outcome.

In this research, the student participants utilised both means of accessing computers and both had their advantages. Having computers in the classroom meant that if a specific inquiry arose it could be addressed at the point of need more readily. The computers were also seen as an everyday tool that could be accessed and utilised as readily as any other learning tool. Having a lab meant that more students could utilise the machines at once, so students experienced less delay in accessing machines, particularly for word-processing tasks which can take less proficient keyboarders longer to complete. Labs allow group teaching of specific skills, with immediate opportunities to practise these skills, allowing a facilitator to respond to individual needs more readily. Labs also provide for group instruction at a staff level which is a
further important consideration. My strong recommendation for schools would be that, if funds and space permit, having both models in a school is highly desirable.

6.3.3. Thinking Processes

Six Thinking Hats for Schools: Book 1 (de Bono, 1992) proved to be an excellent programme for introducing explicit thinking skills to young students. This programme utilises something familiar to young students – that is a coloured hat – to represent different types of thinking. Students can put on a hat, either figuratively or literally, to assist their thinking. Scenarios for stimulating discussion are contextualised with a range of real or imaginary circumstances – think of a pet, what if the drinking taps were filled with lemonade, what if you had two faces – young students are able to readily relate to these notions while learning the strategies behind them. With this programme it is simple to build understandings of the different types of thinking represented, as it provides detailed information for extending students’ thinking skills. The thinking hats can also be used across a range of situations and curriculum areas as they not presented in a prescriptive way and can be adapted to many situations – social, moral and educational. Six Thinking Hats for Schools: Book 2 (de Bono, 1992) is also relevant for older students.

The introduction of other thinking tools and graphic organisers built on and extended the students’ thinking. They assisted in helping students to see and learn about further possibilities. Using these tools across other curriculum areas ensured thinking skills were integrated and became part of the students’ daily practices. Simple webs for brainstorming in integrated inquiry, data charts for recording of facts, writing planners for organising ideas – all of these contributed to the students developing a repertoire of thinking aids.

Utilising de Bono’s (1992) thinking hats programme was successful in 2002 and provided the students with a solid understanding of thinking strategies. In doing action research and being aware of all the aspects relevant to the study, one is careful to be thorough and consistent and I was scrupulous in following de Bono in order to give the students the thinking skills programme to which I felt they were entitled. During this research, the students learned about thinking and added to their thinking skills.
repertoires over the year, while I also learned about thinking and came to realise that the students were capable of being exposed to an even greater range of thinking strategies. Wilson and Murdoch (2005) present thinking skills menus to complement integrated inquiry skills. De Bono’s (1970) early work introduced lateral thinking. A simple google search (Google, 2006) using the key works ‘thinking skills’ results in a plethora of worthy links with strategies to enhance thinking, while a further google search using the key words ‘graphic organisers’ provides an abundance of excellent sites for students to locate and use graphic organisers offline and interactively, successfully combining ICT and thinking skills. Educational publishers have had resources for the explicit teaching of thinking skills available for some years now.

My recommendations for the explicit teaching of thinking skills would be to view the wonderful resources available, select those relevant and suitable for the needs of the learners, and utilise a range of these resources in addition to the ‘six thinking hats’ strategy, to complement the inquiries and investigations in which students are engaged. I would also encourage the development of a Preparatory to Year 6 scope and sequence chart to guide the implementation of thinking skills across the school, thus supporting teachers in building students’ thinking skills and helping produce the thinkers needed to lead our world.

6.3.4. Further Considerations

The previous sections highlight areas that would enhance integrating, adapting and adopting ICT and explicit thinking skills in a classroom, however I believe that there are additional areas to be considered. In the years since I worked explicitly with the students who were participants in this study, I have continued to refine my own understandings of learning and learners, particularly with regards to integrating ICT and thinking. If I were to replicate this research at any time, there is one area in which I would expand my practice: in incorporating ICT and thinking skills even more fully in the literacy block of time. In this research, during the literacy block of time I incorporated thinking skills and ICT in independent learning centres as well as utilising them in working through the stages of writing. If replicating this research, additional aspects I would endeavour to utilise more often are those of shared reading and shared writing. In literacy blocks of time I endeavoured to integrate learning through the use
of enlarged texts that focused on literacy learning needs and integrated inquiry units of work. When introducing a thinking skill or an ICT skill I generally did so at a time outside the literacy block of time and endeavoured to relate this back to reading and writing, with obvious success as the students' understandings grew.

In my current practice I have expanded the types of texts I utilise and I use a variety of enlarged texts that now also include thinking tools, graphic organisers and instructions or procedures for accessing and utilising ICT. An example of this would be a set of directions for students to follow in order to use a particular ICT program. Recently I worked with students to produce a photo story using Photo Story 3 for Windows XP, which is a free program from the Microsoft website with which video stories using digital photos can be created. The directions were presented in an enlarged text (chart, overhead sheet and data projector display) during shared reading and the students then produced a photo story in independent reading and writing sessions. Another example of using shared reading and shared writing would be to introduce a thinking tool such as a data chart in shared reading, model using it in shared writing, and then incorporate its use during independent reading and writing sessions as students visit relevant websites and record specific information.

Thinking processes and ICT are able to be, and should be, incorporated into all curriculum areas or domains, and it is important that educators broaden their understandings and begin to build – or continue to build – them into daily practice.

6. 3. 5. Limitations of the Study

All research methods have benefits and limitations. This can also be true of qualitative methods where the research tends to be less structured and the results harder to interpret than those of quantitative techniques, because the analysis is subjective, it deals with a small sample size and projectability is not possible. With an action research study the findings cannot be generalised to all classroom settings. The generalisability of qualitative research is likely to be conceptual rather than numerical. The results however may provide a direction for future research and establish a firm basis for decision making.
Researcher bias and subjectivity are commonly understood as inevitable (Mehra, 2002), as with one class and one teacher there exists the possibility of the researcher wanting the participating students to look good, and the question of whether the social setting or experience was observed thoroughly enough to support rich and robust descriptions of the observed events. This aspect was addressed in the study by having key findings triangulated, meaning that they were corroborated using multiple sources of information, one of which was the observations of the independent observer (Appendix F).

A participant researcher works fairly much in isolation and the use of a critical friend/peer reviewer is an aspect for consideration. Peer review is an intentional process of gathering information and evidence about the effectiveness of the teaching/learning process, and may have provided additional insights and challenged the researcher’s thinking about actions taken. Peer review offers the capacity to critically review and improve and enhance practice through the provision of constructive critical peer feedback. A critical friend (Stenhouse, 1975) is a trusted listener and sounding board enlisted to act as an interested outsider in a review and development project.

6.4. FUTURE RESEARCH

In the intervening years since this research investigation, there has been significant endeavour to bring about change in educational policy and practices in schools in the state of Victoria. This has been concerned with the Victorian Government’s curriculum reform investigations (VCAA, 2004) and the subsequent introduction of VELS (VCAA, 2005). The rate at which technology is developing and advancing continues to grow, as does the need for consumers with transferable thinking skills.

Our future society will be different from that we have known in the last fifty years. Futurists foresee that in the next couple of decades the world’s community will traverse through a period of rapid technological innovations that will change the foundations of society as we used to know it (Tapscott, 1997; Wallace, 1999; Borgmann, 1999). Changes will engulf all aspects of life (Gleick, 1999). These changes will have great impact on society, work, culture and art. People will have to innovate or evaporate
(Higgins, 1995). They will have to adapt continuously to never-ending permutations and engage in a never-ending adaptation. It makes sense, therefore, to assume that the graduates of today's schooling will need a different set of cognitive and learning skills reflecting the profound change that they will encounter. (Passig, 2003, p. 79)

In 2007 one can reflect on the increased awareness and understandings in ICT and thinking processes that educational initiatives across Australia have brought about. It may be important for research such as mine to be revisited, to see if there has been a positive impact on teaching, learning and classroom practice. I consider that several areas exist for future investigation:

- Have schools developed strategies and processes for keeping abreast of the advances of technology and meeting the needs of citizens of the future?
- Have schools developed strategies and processes for producing learners with necessary cognitive and learning skills?
- Are all students in all schools being provided with sufficient resources, access and opportunity to meet the needs of the future – does the practice match the rhetoric?

There is a great deal of information available noting the importance of ICT and thinking processes in producing citizens of the future, as well as the need for adequate and appropriate levels of resources. It would be both interesting and appropriate for research to investigate whether or not schools across different sectors and with varying backgrounds and demographics are able to deliver the desired teaching and learning practices.

6.5 CONCLUDING STATEMENT

A personal belief I have is that action research in its simplest form is about good practice and that all teachers' practice should include planning, acting, observing and reflecting in order to provide the best possible teaching and learning experiences for the students in their care.

Action research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their
understanding of these practices, and the situations in which the practices are carried out.  
(Carr & Kemmis, 1986, p. 162)

Reflective practice inspires us to engage in continued knowledge development in order to further our understanding of school and classroom events. Reflective practices can be embraced by teams or by individuals, and are about educators studying teaching methods and determining what works best for the students. The rate of change is such that the society that exists when children enter the preschool year no longer exists when those same young people exit the school system 13 years later. As schools, educators and students continue to be challenged by the rate of change in the world, there will be a continued need for reflective practice.

In this study I employed reflective practice and worked to change the ways in which the teaching of ICT and explicit thinking skills were delivered. Through this study I have shown that a group of young students from a northern metropolitan primary school in Victoria have adopted, adapted and integrated explicit thinking skills and ICT into their learning. The students became engaged learners and progressed through stages of learning identified as Discovering and Engaging, Demonstrating and Analysing, and displayed observable behaviours related to the characteristics of each stage, showing increased learning and understanding. Some students moved beyond to the final stage of Synthesising, where they used their understandings independently to apply them to new situations.

The teaching of thinking skills and ICT has a positive impact on student learning.
LIST OF REFERENCES


Education Department of Western Australia. (1994). *First steps: Reading developmental continuum*. Melbourne: Longman.


Marks, G. (1995). The measurement of socioeconomic status and social class in the LSAY project. Melbourne: ACER.


APPENDICES

APPENDIX A: CONFIRMATION OF CANDIDATURE

28/06/2002
Ms Marlene Walters
5 Arthur st.
Bundoora
Vic 3083

Dear Ms Walters,

Re: Confirmation of Candidature for
Doctor of Philosophy by Research thesis

I am pleased to inform you that your application for Candidature of Doctor of Philosophy thesis entitled “Teaching, Learning and Thinking: An Investigation of the Adopting, Adaptation and Integration of the Information Technologies and Thinking Skills in a Primary School in Victoria” has been ratified by Faculty Board and has now been recommended to the University Higher Degrees Unit.

I wish you well in your studies. Should you have any further questions regarding your application please do not hesitate to contact the Faculty Research Office.

Yours sincerely

Heather Porter
Higher Degrees Officer
Faculty of Education, Language and Community Services

Faculty Research Office
9925 7877
heather.porter@rmit.edu.au

cc: Supervisor
Program Co-ordinator
APPENDIX B: HUMAN RESEARCH ETHICS SUB-COMMITTEE (HRESC) RMIT, DESIGN & SOCIAL CONTEXT PORTFOLIO APPROVAL

13/03/2002

To Ms Marlene Walters
5 Arthur st.
Bundora
Vic 3083

Dear Marlene,

Your amended Ethics application was approved by the chair of the Faculty Human Research Ethics sub-committee on 5/03/2002, and has been recommended to the Faculty Board for approval at its meeting of 28/03/2002.

This now completes the Ethics procedures.

We wish you well in your research. Should you have any further questions regarding your application please do not hesitate to contact me on 9925 7840 or email heather.fehring@rmit.edu.au.

Yours sincerely

[Signature]

Heather Porter
Higher Degree Officer
for

Dr. Heather Fehring
Chair
Faculty of Education, Language and Community Services
Human Research Ethics Sub-committee

cc: Head of Department
Dr Heather Fehring
## APPENDIX C: GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>CLaSS</td>
<td>CLaSS (Children’s Literacy Success Strategy) conducted in partnership with the University of Melbourne, was the major early years literacy initiative of the CECV (Catholic Education Commission of Victoria)</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology. ICT includes technologies such as desktop and laptop computers, software, peripherals and connections to the Internet that are intended to fulfil information processing and communications functions.</td>
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<tr>
<td>LaTTiCE</td>
<td>LaTTiCE is a project of the Catholic Education Office, Melbourne that commenced in 1997. The LaTTiCE project supports school-based professional learning teams in the effective integration of Information and Communication Technologies (ICT’s) in the learning process.</td>
</tr>
<tr>
<td>LOTE</td>
<td>Language Other Than English</td>
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<tr>
<td>LBOTE</td>
<td>Language Backgrounds Other than English</td>
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<tr>
<td>M.I.</td>
<td>Multiple Intelligences</td>
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<td></td>
<td>This theory of human intelligence, developed by psychologist Howard Gardner, suggests there are at least seven and possibly nine ways that people have of perceiving and understanding the world. Gardner labels each of these ways a distinct intelligence - a set of skills allowing individuals to find and resolve genuine problems they face.</td>
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<tr>
<td>Navigator Schools</td>
<td>The Navigator Schools Project was launched in October 1995. The objectives of the project were to: create a network of exemplar schools with accessible models of new learning environments where there is access to technology in every classroom, share with others what is learned in creating those environments, provide evidence of additional teaching and learning outcomes in a technology rich environment, and provide a premium professional development resource for teachers and principals across the state.</td>
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</table>
T.C.S.

Technology in Catholic Schools. The Technology for Catholic Schools (TCS) initiative of the Catholic Education Office commenced in 1999 with the establishment of the Catholic Education Victoria Network (CEVN). The CEVN links all Catholic Education Offices and most Catholic schools throughout Victoria. The TCS initiative connected all participating schools to the Internet, assisted in establishing schools with a Local Area Network (LAN) and provided support for schools in learning technology planning and professional development.

V.C.A.A.

The Victorian Curriculum and Assessment Authority has been established to develop curriculum for all Victorian schools, assess student learning and monitor student achievement and conduct research leading to innovative educational programmes.
APPENDIX D: LETTER OF PERMISSION FROM SCHOOL PRINCIPAL TO CONDUCT RESEARCH

SCHOOL

8th October 2001

Doctor Heather Fehring
RMIT University

Dear Doctor Fehring,

Re-Marlene Walter’s Research Project

I hereby give permission for and support to Marlene in her forthcoming research project – Teaching and Thinking in the first decade of the Third Millennium. I have read Marlene’s outline of the project and I am sure that we can all benefit from her research and findings.

She has permission from the Director of Catholic Education to conduct her project. I look forward to receiving notification of approval from the University’s Ethics Committee regarding Marlene’s research project.

Yours sincerely,

Principal.
Ms M Walters
5 Arthur Street
BUNDOORA VIC 3083

Dear Ms Walters,

I am writing with regard to your letter of 4 September 2001 in which you referred to your forthcoming research project into how teachers and students are using new information technologies and incorporating thinking skills in learning. I understand that this research is part of your Doctoral studies at RMIT University. You have asked approval to involve your own class (probably Year 1/2) in 2002 at Holy Child School, Dallas.

I am pleased to advise that your research proposal is approved in principle subject to the following conditions.

1. The decision as to whether or not research can proceed in a school rests with the School Principal. So you will need to obtain approval directly from your Principal.

2. You should provide the Principal with an outline of your research proposal and indicate what will be asked of your class. A copy of this letter of approval, and a copy of notification of approval from the University’s Ethics Committee, should also be included.

3. No student is to participate directly in the research study unless s/he is willing to do so and informed consent is given by a parent/guardian.

4. Any substantial modifications to the research proposal, or additional research involving use of the data collected, will require a further research approval submission to this Office.
Ms M Walters  -  2  -  7 September 2001

5. Data relating to individuals or the school are to remain confidential.

6. You should discuss with your Principal ways in which the results of the study could be made available for the benefit of the school community.

7. At the conclusion of the study, a copy or summary of the research findings should be forwarded to the Information Services Unit of the Catholic Education Office.

I wish you well with your research study. If you have any queries concerning this matter, please contact Mr Mark McCarthy of this Office.

With every best wish,

Yours sincerely,

[Signature]

(Rev. T. M. Doyle)
DIRECTOR OF CATHOLIC EDUCATION
APPENDIX F: JOURNAL OBSERVATIONS OF
INDEPENDENT OBSERVER TERM 4
2002

The first indicator, Vision of Learning discusses what engaged learning looks like. Successful, engaged learners are responsible for their own learning. These students are self-regulated and able to define their own learning goals and evaluate their own achievement. They are also enlivened by their learning leading to excitement for solving problems, understanding, and taking the next step in their thinking. Learners become strategic in knowing how to learn and to transfer knowledge to solve problems creatively. Engaged learning also involves being collaborative - having the skills to work with others and valuing this.

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<th>Transcriptions IO Engaged Learning Summary</th>
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<tr>
<td><strong>Indicators of Engaged Learning</strong></td>
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<tr>
<td>Indicator One: VISION OF LEARNING</td>
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- learners actively participated in regular discussions relating to task selection, and requirements
- learners were continually given opportunity to ask questions to clarify or reinforce task requirements on a regular basis
- learners frequently held informal discussions between themselves, focused on the task at hand. For example
  - discussing individual ideas and choices including reason behind specific selections
  - to clarify and reinforce the task was completed to the requirements
  - sharing opinions and thoughts on others’ ideas and work
- learners actively participated in whole class sharing of work – individually commenting on positive aspects of their work as well as commenting on the work of others by way of oral assessment
- learners displayed pride and importance in the presentation of their thoughts, ideas and work. Indicating a self-initiated as well as teacher set, set of standards for the completion of the required tasks
- learners were confident in being able to express what they had learned from completing tasks as well as how this knowledge can help them in other aspects of their learning
- learners frequently drew on past learning and experiences to assist in the development of new knowledge and expressed the connection between the past learning and present task
- learners used a variety of problem solving strategies involving:
  - soliciting help from peers and their classroom teacher
  - trial and error approach
  - drawing on past knowledge/learning and experience to assist task completion
  - adopting strategies that had been successfully applied before
- learners showed heightened excitement and enthusiasm towards completing a variety of tasks of which similar tasks had been previously experienced
- learners showed great pleasure at the development of a new skill or solution to an ongoing difficulty/problem – an increased sense of pride, ability and self worth was clearly evident in instances where students had felt extremely lost and confused whilst trying to complete such a task
- learners were very enthusiastic and keen to share their learning and new found knowledge with others including peers and their classroom teacher
- learners showed intrinsic motivation through their willingness to complete set tasks, their enthusiasm and excitement at the prospect of completing such tasks as well as the focus and concentration applied throughout task completion
- learners showed pleasure in working with their peers and others in the learning environment, this was expressed or displayed via
  - discussions held on the merits of each student’s contribution to a group tasks
  - the praise given to others for thoughtful and helpful ideas contributed to the group task
  - the debates/discussions held by students regarding decision making in relation to their set task including addressing problems and disagreements that arose
The second indicator, Tasks for Engaged Learning discusses requirements for engaged learning. In order for engaged learning to occur, tasks need to be challenging, authentic and multidisciplinary, are typically complex and involve sustained amounts of time. They are authentic and often require integrated instruction that incorporates problem-based learning and curriculum by project.

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<td><strong>Indicators of Engaged Learning</strong></td>
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<tr>
<td><strong>Indicator Two: Tasks for Engaged Learning</strong></td>
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<tr>
<td>- many of the set tasks related directly or very closely to issues from the real world for example students had to consider and assess elements relating to:</td>
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<tr>
<td>- thoughts and feelings (the student’s own and those of others)</td>
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<tr>
<td>- the impact of choices on themselves and others</td>
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<tr>
<td>- how making different choices can impact on the outcome of something (e.g. a task solution)</td>
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<td>- current real life issues and beliefs</td>
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<tr>
<td>- tasks encouraged students to employ and included their own choices, selections, beliefs and ideas into their work</td>
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<tr>
<td>- tasks encouraged learners to draw on past experiences to help build and understand new learning and experiences</td>
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<tr>
<td>- learners related their pleasure and feelings on content of tasks – indicating the task content to be relevant and of interest to the learner. For example:</td>
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<tr>
<td>- learners commented about how much the ‘loved’ a story or that a particular website or game was their favourite!</td>
</tr>
<tr>
<td>- MW (teacher) commented on the interests of individual students in relation to their enthusiasm to complete specific tasks</td>
</tr>
<tr>
<td>- tasks were regularly completed in either a set 1 hour frame (observation block) to complete one set task or two half hour time frames to compete two smaller set tasks – learners remained focused on the completion of tasks even when difficulties arose</td>
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<tr>
<td>- tasks typically involved a number of steps or mini tasks to be completed to achieve an end result indicating the complexity of the tasks and the required level of understanding of students to successfully complete them</td>
</tr>
<tr>
<td>- learners regularly were challenged in their group discussion and work skills – testing their abilities to negotiate and evaluated pros and cons of ideas and suggestions of others in order to complete required tasks</td>
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<tr>
<td>- through sharing ideas and thoughts within groups, students were challenged in their own thinking as well as their abilities to accept and value or reject, and be able to reason why, on the ideas of others</td>
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<tr>
<td>- learners were required to implement many skills into the completion of each task. For example</td>
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<tr>
<td>- the ability to use an swap between different thinking approaches</td>
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<tr>
<td>- the ability to listen to others</td>
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<tr>
<td>- the ability to add constructive feedback to peers and positive points</td>
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<tr>
<td>- learners were reminded and encouraged to use a variety of approaches when solving problems or addressing issues within a group and individually whilst completing tasks</td>
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The third indicator, Assessment of Engaged Learning involves presenting students with an authentic task, project, or investigation, and then observing, interviewing, and examining their presentations and artefacts to assess what they actually know and can do.

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<td><strong>Indicators of Engaged Learning</strong></td>
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<tr>
<td><strong>Indicator Three: ASSESSMENT OF ENGAGED LEARNING</strong></td>
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<tr>
<td>- assessment techniques were applied which required a demonstration for an audience in order to assess and validate the completed task. For example:</td>
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<tr>
<td>- learners regularly partook in whole class presentations, indicating an aspect of their work that was positive (e.g. a strength). This require reasoning and justifying</td>
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<tr>
<td>- all tasks required an outcome whether it be a list of ideas or thoughts, to have followed a set of instructions in order to prove the task was completed successfully</td>
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<tr>
<td>- learners orally reported to teacher to explain their thinking the approach and steps used to successfully complete a task</td>
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<tr>
<td>- tasks completed demonstrated a progression of knowledge and understanding development</td>
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<tr>
<td>- learners understood the reasons why and were able to justify their choices in relation to assessing their own work</td>
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<tr>
<td>- assessment discussions regarding learners’ work enabled them to develop confidence in their abilities, thoughts and ideas, and identify elements they had not previously considered (as strengths)</td>
</tr>
<tr>
<td>- tasks were structured so the learners’ thoughts could be identified through different stages of task completion. The ideas and changes were made by choice of the learner and could also be identified in this way</td>
</tr>
<tr>
<td>- numerous assessment techniques were implemented and applied to a variety of different tasks, Observation, questioning, collection of work samples and the assessment of the final product or outcome from the tasks were the main ones used</td>
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</tbody>
</table>
The fourth indicator, Instructional Models and Strategies for Engaged Learning presents the notion that the most powerful models of instruction are interactive, where education tasks actively engage the learner, are generative and encourage the learner to construct and produce knowledge in meaningful ways. Students teach others interactively and interact generatively with their teacher and peers which allow for co-construction of knowledge. Some common strategies are individual and group summarising, exploring multiple perspectives, building upon prior knowledge, brainstorming and problem-solving processes.

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<tr>
<td>Indicators of Engaged Learning</td>
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<tr>
<td>Indicator Four: INSTRUCTIONAL MODELS &amp; STRATEGIES FOR ENGAGED LEARNING</td>
</tr>
<tr>
<td>- MW clearly explained the requirements of tasks</td>
</tr>
<tr>
<td>- learners were given (frequently) opportunity to clarify and reinforce their understandings of instructions given</td>
</tr>
<tr>
<td>- on occasion when learners became confused or did not fully understand instructions, MW would explain the task in another way, then if the learner was still having difficulty she would discuss the task with them one-on-one</td>
</tr>
<tr>
<td>- parent helpers were frequently available to lend assistance to learners experiencing difficulties the tasks</td>
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<tr>
<td>- task content was frequently related to the interests of the learners. For example:</td>
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<tr>
<td>- learners showed great interest in content of the internet therefore numerous tasks involved navigation and task completion, through the use of this tool</td>
</tr>
<tr>
<td>- in numerous tasks, learners were given a set of task instructions that offered choice in completing the task. For example:</td>
</tr>
<tr>
<td>- learners were given at least 20 options when they were required to create their own stories by adding verbs, nouns and adverbs to a title of a story</td>
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<tr>
<td>- learners were able to select and apply their own choice of border and such for the photographic and text pieces</td>
</tr>
<tr>
<td>- learners were encouraged to try and solve problems on their own, drawing on prior experience and knowledge and thinking to help them as well as to ‘have a go’, then if the problem persisted to approach a peer, next a classroom helper and lastly teacher</td>
</tr>
<tr>
<td>- tasks frequently required learners to explore ideas in a different light or to consider ideas that were the opposite to prior experience. For example:</td>
</tr>
<tr>
<td>- learners had to put themselves in the position of the Big Bad Wolf in the story of Little Red Riding Hood, pretending she was the bad one, in order to predict and try to understand the feelings and thoughts of the Big Bad Wolf</td>
</tr>
<tr>
<td>- learners were constantly reminded of prior learning and given support to assist them in selecting problem solving strategies</td>
</tr>
<tr>
<td>- learners were always reminded to proofread and check their work and re-read it to identify any aspects that required changes</td>
</tr>
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</table>
The fifth indicator, Learning Context of Engaged Learning is concerned with the learning environment. The classroom must be conceived of as a knowledge-building learning community where shared understandings are developed collaboratively and diversity and multiple perspectives are valued. These learning communities seek strategies to build on the strengths of all of its members and where questions, conversations and goal setting are definitive.

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<tr>
<td><strong>Indicators of Engaged Learning</strong></td>
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<tr>
<td>Indicator Five: LEARNING CONTEXT OF ENGAGED LEARNING</td>
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<tr>
<td>- learners effectively and cooperatively worked in team and small groups to complete tasks during which each learner contributed their own individual and unique ideas and thoughts</td>
</tr>
<tr>
<td>- learners took on numerous roles during group tasks – some students becoming the dominant leaders and others permissive – although on most occasions, all members contributed to the group task completion</td>
</tr>
<tr>
<td>- many tasks involved learners to work with another student to complete specific aspects of the task then to complement the remainder on their own – this worked well and students who usually found they encountered difficulties whilst working on their own, benefited from the support and sharing of knowledge by their peers</td>
</tr>
<tr>
<td>- through group task completion and discussions, learners were exposed to different ideas, thoughts, beliefs, values and perspectives from which they could use to analyse their own ideas etc. Ultimately, learners, through this experience, showed the ability to adjust their own thinking in order to accommodate positive aspects of others</td>
</tr>
<tr>
<td>- whilst discussing tasks, including options for its completion and such ideas, learners were exposed to the ideas of peers and their teacher – opening their minds to other perspectives. This also occurred when students participated in tasks that required them to look at something from another point of view, such as the Little Red Riding Hood task!</td>
</tr>
<tr>
<td>- Students/learners and the teacher truly listened to and valued each contribution made to group/individual discussions as well as through task outcome. Many of these ‘strengths’ were shared among the rest of the class as a demonstration of diverse perspectives and to acknowledge contributions to the learning of others by the teacher!</td>
</tr>
</tbody>
</table>
The sixth indicator, Grouping for Engaged Learning is about the importance of collaborative work that is learning-centred. Heterogeneous groupings offer a wealth of background knowledge and perspectives to different tasks and flexible grouping, which allows teachers to reorganise small groups according to the purposes of instruction is considered one of the most equitable means of grouping and ensuring increased learning opportunities.

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<tr>
<td>Indicators of Engaged Learning</td>
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<td>Indicator Six: GROUPING FOR ENGAGED LEARNING</td>
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- tasks were completed in a vast mix of different groupings for example:
  - male/female groupings/pairs
  - mixed ability groupings
  - similar ability groupings
  - small, medium, larger groupings
    - these groupings extended to a variety of abilities – oral skills; written skills; thinking skills; problem solving skills; confidence in self and within a group environment; confidence in speaking English – communication
  - friendship groupings (or at least a ‘friend’ within a larger group)
  - pairs
  - mixed race and ethnic background groups
  - mixed interest levels
  - mixed prior experience levels

- in my observations, the different groupings (which were stable over several learning experiences) allowed all learners to develop strong learning partnerships and relationships with their group members. This also was evident in the individuals learners would turn to for assistance in task completion

- in the sharing of ideas within groups it was clearly evident that learners had more than ample opportunity to learn from others and that this was an ongoing occurrence

- groupings were changed and adjusted, according to a number of situations:
  - learners present during task completion
  - in relation to the skills required to complete a task
  - prior experience and knowledge

- groupings and task completions required students to work collaboratively with other students, and work independently to complete set tasks
The seventh indicator, Teacher Roles for Engaged Learning is concerned with the role of the teacher and the shift from the role of information giver to that of facilitator, guide, and learner. As a facilitator, the teacher provides the rich environments and learning experiences needed for collaborative study. The teacher also is required to act as a guide incorporating mediation, modelling, and coaching and very often the teacher also is a co-learner and co-investigator with the students.

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<td><strong>Indicators of Engaged Learning</strong></td>
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<tr>
<td><strong>Indicator Seven: Teacher Roles for Engaged Learning</strong></td>
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<tr>
<td>- throughout the period of my observations, MW provided opportunities for learners to share their knowledge with their peers through group tasks, discussions and by allowing all learners to talk at a quiet level throughout the task time allocated. This encouraged students to share their ideas and to question and explore the work of others.</td>
</tr>
<tr>
<td>- various strategies were used (TV and averkey; enlarged text of student work) to demonstrate the task and model what was required to complete the task</td>
</tr>
<tr>
<td>- on a number of occasions, the teacher roamed and moved around the groups to discuss the progress of the their work; during this time she assisted in group discussions requiring mediation, re-explained concepts and element of the task, ensuring learners were on track</td>
</tr>
<tr>
<td>- during whole class discussions, the teacher gave examples relating to each task, essentially providing the learners with choice and options for the completion of the task</td>
</tr>
<tr>
<td>- it was clearly evident that the teacher considered herself a learner amongst the other learners and showed/conveyed this to her students through verbals discussions/explanations. She continually commented out loud when she had learned something from her students, indicating that her students had become her teacher</td>
</tr>
<tr>
<td>- the teacher was always open to learn from both her mistakes, as well as through experience and task implementation</td>
</tr>
<tr>
<td>- the teacher was always aware of changes that could have been made to planning/implementation and was very open and accepting of suggestions from others</td>
</tr>
<tr>
<td>- the teacher continually made herself available for learners to give aid and assistance, when needed, and encouraged and reinforced this</td>
</tr>
</tbody>
</table>
The eight indicator, Student Roles for Engaged Learning discusses one important student role - that of explorer. Interaction with the world and with other people allows students to discover concepts and apply skills. Students are encouraged to reflect upon their discoveries and observe and apply the thinking processes. Students also become teachers themselves by integrating what they've learned and become producers of knowledge contributing to the knowledge of others.

### Transcriptions IO Engaged Learning Summary

**Indicators of Engaged Learning**

**Indicator Eight: STUDENT ROLES FOR ENGAGED LEARNING**

- learners were continually exposed to an encouraged to explore new ideas through task content-including looking at ideas from another point of view, listening and valuing the contributions of peers
- throughout the observation period, learners were introduced to, encouraged and given ample time to explore new learning tools. For example:
  - tasks were planned around the exploration of a new function on the computer
  - tasks involved adopting a new way of thinking (from another perspective)
  - learners were given ample opportunity to adjust to new groupings in which they were to completer required tasks
- learners were given ample amounts of sustained time to explore ideas and tasks through observing the progression and task completion of others, then given the opportunity to explore it themselves, applying the new knowledge they had gained from observing the success of their peers
- tasks were very focused on the thinking process, allowing vast amounts of time for learners to explore and develop their thinking skills in all areas through task completion
- learners and their thinking were continually challenged through the nature of tasks applied and completed
- learners were given tasks relating to various combinations of thinking skills, in which they had to make decisions about their own thoughts, beliefs and feelings in order to complete the tasks successfully. For example
  - Blue → organisational – how? what?; Black → negative points; Red → feelings; Yellow → positive points; White → information; (in all manners of combination)
- some tasks were structured so that learners received immediate feedback on their progression through a task. For example:
  - computer based tasks, requiring students to complete a series of steps, gave feedback at the end of each step as many learners were unable to complete the next step without successfully completing the one prior
- the teacher gave verbal feedback to many students regarding task or partial task completion – she spent time assisting learners who had experienced a complex problem or were lacking a specific skill, giving them positive and/or constructive feedback to help them solve the problem or to boost their self confidence in their abilities
- learners were very capable of articulating what they had learned from a task, many learners were also able to explain how prior learning had helped the completion of the task and how their new knowledge could help them in completing future tasks
**APPENDIX G: JOURNAL ENTRIES OF PARTICIPANT RESEARCHER 2002**

**Tuning In. Early Cycles – Term 1 2002**

**11th February 2002**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review and organise learning environment in relation to research questions.</td>
<td>Audit physical set-up</td>
<td>Machines need relocation will need to negotiate with school administration.</td>
<td>Students are young and appear to have been given limited or no access to computers and incidental exposure to explicit thinking skills. Need to: Reorganise and relocate machines. Allocate time to make preliminary observation of student use of computers.</td>
</tr>
<tr>
<td>Review and organise learning environment in relation to creating an environment conducive to positive learning.</td>
<td>Seek information from previous teachers</td>
<td>Students do not use terminology germane to ICT and explicit thinking. Previous learning experiences do not appear to have lead to internalising of learning nor construction of understandings</td>
<td></td>
</tr>
</tbody>
</table>

**PR reflection**

It is difficult to establish routines in the first few weeks of this junior primary classroom due to the administration of literacy pre-testing procedures. This literacy testing involves one-to-one assessments of student literacy using tools such as Running Records of Reading Behaviour; Letter Identification; Concepts About Print; Clay Word Test; Writing Vocabulary; Hearing and Recording Sounds; BURT Word Reading Test; Record of Oral Language; Peters’ Spelling in Context. In the first 6-7 weeks of school 2002, the classroom teacher was released to administer these literacy assessment tasks at varying times. This meant that the students had at least eight different teachers as well as the classroom teacher and four specialist teachers during that time. This situation made it quite difficult to set up and establish general classroom routines and gather the usual socio-linguistic information one gathers in endeavouring to establish class dynamics and cooperative working groups.

A great deal of time has been spent ensuring the machines in the classroom and the laboratory are operating successfully. It is important for this project that the observations and data collection will be reflective of the learning the students are involved in and not with their ability to deal with machines that are difficult to access or have inaccessible programs. These issues need to be sorted and dealt with.
<table>
<thead>
<tr>
<th>14th February 2002</th>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide classroom based resources and routines to support learning and encourage independence.</td>
<td>Develop a variety of charts and displays using words and icons: • groups • how to… • expert list • if…then • word charts • thinking charts • taskboard • labelled learning centres • labelled equipment tubs</td>
<td>Note which resources are assisting students to stay on task, move to new tasks and develop independence.</td>
<td>Review and revise practices and make any necessary modifications.</td>
<td></td>
</tr>
<tr>
<td>Classroom organisation practices so that students readily know what is required</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build expectations</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>PR reflection</td>
<td>The setting up and modelling use of resources, while time consuming, has proved to be successful. Putting the time into setting up good consistent practices will ensure focused learning, staying on task and engaged learning which will be important as time goes on and work tasks become more challenging. By putting more of an emphasis on the process of establishing and following routines at this stage, rather than on covering a great deal of content and also allowing the students to rehearse and practise routines, means they are becoming more established. It is important for instructions to be kept simple and be supported with icons or key words on charts, particularly given that many students only speak English at school and need time and support to process information. Establishing whole small whole routine for literacy blocks is progressing well, with students working in groups, staying on task and not interrupting teaching group – increase timing of sessions gradually. Computer learning centre included in classroom practice, incorporating free choice access and working cooperatively with a partner or buddy.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>20th February 2002</th>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Averkey to model how to • turn on machines • log on to network • access simple programs • exit programs • shut down machines</td>
<td>Establish routines for working in the laboratory and computer partners Include parent helpers for support for students Model process</td>
<td>Use checklist to note which students are able to follow process</td>
<td>Most students able to do task independently or with support from partner or helper. Further support needed for a small group</td>
<td></td>
</tr>
<tr>
<td>PR reflection</td>
<td>Session largely successful with most students being able to complete task although it is a challenge when 31 students need support at similar times. A small group who had limited access to computers during previous year and who do not have a computer at home need further support. These students also have low oral language and will need more time to process instructions</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
14th March 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce ‘Fitzroy Readers’ software for use in learning centre in classroom.</td>
<td>Present program. Model access and use. Provide simple instructions for ongoing access</td>
<td>Observe access over several sessions. Allocate parent helper to supervise and oversee progress</td>
<td>Simple process. Worked well. SP are accessing this programs regularly during literacy block. Introduce other programs in similar way. Logging on to network well established Extraneous factors such as site licences can impact on computer use</td>
</tr>
</tbody>
</table>

20th March 2002

PR reflection

During these early weeks of school the intention had been to formally introduce thinking skills, however the previously mentioned pre-literacy testing together with an intensive swimming programme greatly impacted on time available to do this. Ensuring that the computers were operating properly and that students would be able to access them had been time intensive. The focus for thinking skills, at this time, became for PR to verbalise and reiterate the notion of ‘being thinkers’ using comments such as ‘when you have finished a task, be a thinker and work out what you have to do next’ or ‘if you are stuck with something be a thinker, look around the room and try to find a solution’. Responses to comments along the lines of ‘I haven’t got a pencil’ would be prefaced by ‘what do you think you could do to fix that?’

When the classroom became more settled and there were fewer interruptions and more consistent blocks of time, class discussions became more focused on aspects such as ‘what are we doing when we think’, ‘what helps us to think’ ‘what is in your mind when you think’ ‘write and draw about what thinking means to you’. This helped encourage students to articulate their thinking without being prescriptive about expression, particularly as some of them were unable to express their thoughts either verbally or verbally in English.

21st March 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessing the Internet</td>
<td>Provide internet password Model access and use. Provide simple instructions for ongoing access Access site located on school’s home site</td>
<td>Observe access over several sessions. Allocate parent helper to supervise and oversee progress</td>
<td>Simple process. Worked well. SP readily accessed Internet and found site Logging on to network well established so logging on to Internet seemed to create no problem</td>
</tr>
</tbody>
</table>

21st March 2002

PR reflection

Smooth implementation. Students worked with a partner and had little problem following the steps to access the Internet.

Will have parent helper repeat and monitor in literacy learning centre
28th March 2002

PR reflection

Life is what happens to you while you're busy making other plans (Lennon, n.d.) is applicable for many occasions and no less so when considering research projects! Often a direction in which one intended to go, must be reviewed, revised and altered. The amount of time that needed to be devoted to setting practical issues in place was far greater than what was originally anticipated and some of the explicit teaching is yet to occur. What has eventuated is that organisational processes have been planned and are being implemented; students are engaged in learning and are using computers regularly and as part of everyday practice. A thinking community is emerging. As student 2M said, “I think about…sometimes, I think about school and I think in pictures.”
### 23rd April 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase additional software and licences for computers in classroom.</td>
<td>Install programs</td>
<td>Monitor students’ ability to use additional software in classroom setting</td>
<td>Have students reflect on use of programs I share time.</td>
</tr>
<tr>
<td>Introduce how to access the Internet in computer laboratory.</td>
<td>Model use</td>
<td>Monitor students’ ability to access the Internet</td>
<td>Collect and view printed task sheets to view students’ success.</td>
</tr>
<tr>
<td>Take a range of tasks for completion to allow individuals to be on computers so as to monitor progress.</td>
<td>Plan tasks that will both instruct and assess</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have other tasks prepared to enable individual access to computers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PR reflection

Students are using computers with increasing confidence albeit with considerable direction. The directed tasks have been designed so that all students will be expected to do the same task so that understanding of task can be assessed. The students are coping well with using two platforms – Macintosh in the classroom and IBM compatible in the laboratory. The classroom machines, while capable of accessing the Internet, are generally being used to access professional programmes and are heavily used in Literacy and Numeracy learning centres. Some students have made informal observations of PR use of the Internet and have been able to access this unassisted and continue researching. Computer Classroom programs have been modelled and are being utilised in Literacy and Numeracy learning centres as they have activities related to both areas and provide an option of reading directions to the students for those with lower literacy levels.

### 30th April 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use video related to integrated inquiry as vehicle to launch explicit thinking skills</td>
<td>View and discuss video.</td>
<td>Make anecdotal notes of students’ participation in thinking skills sessions.</td>
<td>Allow time for oral reflection and discussion</td>
</tr>
<tr>
<td>Introduce ‘Six Thinking Hats for Schools’.</td>
<td>Introduce six thinking hat and continue to implement de Bono’s programme over the term.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PR reflection

de Bono (1992) advocates teaching thinking skills in a separate session if possible to ensure that students can clearly differentiate between the different types of thinking and get a good grasp of it. There were initial reservations about this segregation as there is strong evidence to suggest that students make connections if ideas are integrated. Previous experience with the six thinking hats has shown that some students have a clearer understanding of thinking if introduced separately. In this research project this was done initially and thinking skills later integrated naturally into units of work with students free to make their own constructions. The integrated inquiry taking place is related to inquiring about water and a particular video titled ‘Waterworks’ (Year of Production: 1999 Duration: 4 x 30mins (c) ABC Educational TV) was used as a starting point for thinking as there had been several aspects that students had developed questions about and had in fact been thinking deeply about issues. This provided an ideal way to introduce the six thinking hats and help them to direct their thinking. ‘Six Thinking Hats for Schools’ assists students with differentiating between positive, negative, emotional, factual, creative and organisational thinking and making the thinking involved explicit and clear.

4th May 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log on to network (all tasks)</td>
<td>Review and revise procedures</td>
<td>Monitor students’ ability to use additional software in classroom setting</td>
<td>View work samples after session to determine which aspects need further consolidation</td>
</tr>
<tr>
<td>Access the Internet and locate Sofweb for Students site and explore the virtual classroom.</td>
<td>Model use if required</td>
<td>Monitor students’ ability to access the Internet</td>
<td>View work samples after session to determine which students need further support</td>
</tr>
<tr>
<td>Access Microsoft Word. Insert picture from clipart</td>
<td>Provide verbal and written steps for students to follow</td>
<td>Use checklists &amp; anecdotal records to record student progress</td>
<td>Use hard copies for reflection &amp; further work</td>
</tr>
<tr>
<td>Access the Internet Locate links to online puzzles and colouring</td>
<td>Have other tasks prepared to enable individual access to computers</td>
<td></td>
<td>Allow as many opportunities as possible for students to revisit and refine as they find necessary to build understandings</td>
</tr>
<tr>
<td>Access Microsoft Word. Select font, size, save to network, print.</td>
<td>Allow time for students to have free access to practise skills are completion of directed tasks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sample of directions to save to Network:
This document needs to be saved using the following steps:
File
Save as
Select 12wal on Curric nt_2
File name: Task1yourname
Save

PR reflection
Students worked smoothly through process with success. Some required support with reading directions & used varied strategies – some chose to have directions read out a step at a time as they performed each step; others watched a ‘computer buddy’ and then re-tried. As part of
<table>
<thead>
<tr>
<th>19th June 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan</strong></td>
</tr>
<tr>
<td>Implementation of ‘Six Thinking Hats for Schools’</td>
</tr>
<tr>
<td>Overview and Introduction</td>
</tr>
<tr>
<td>Introduction of Black Hat thinking</td>
</tr>
<tr>
<td>Consolidation of Black Hat thinking</td>
</tr>
<tr>
<td>Introduction of Yellow Hat thinking</td>
</tr>
<tr>
<td>Consolidation of Yellow Hat thinking</td>
</tr>
<tr>
<td>Introduction of White Hat thinking</td>
</tr>
<tr>
<td>Consolidation of White Hat thinking</td>
</tr>
<tr>
<td>Introduction of Green Hat thinking</td>
</tr>
<tr>
<td>Consolidation of Green Hat thinking</td>
</tr>
<tr>
<td>Introduction of Red Hat thinking</td>
</tr>
<tr>
<td>Consolidation of Red Hat thinking</td>
</tr>
<tr>
<td>Introduction of Blue Hat thinking</td>
</tr>
<tr>
<td>Consolidation of Blue Hat thinking</td>
</tr>
</tbody>
</table>

**PR reflection**

Over the terms the students developed understandings of the different types of thinking as presented by de Bono. The hats are introduced in a way that makes it easier for students to understand the different types of thinking and relate it to something they are all familiar with – hats. The different types of thinking - bad points, good points, facts, new ideas feelings and thinking about thinking – are presented in a way that means that they students can readily build understandings. SP were showing understandings in session times and were also beginning to use them in behavioural situations. Instead of ‘dubbing’ students were starting to deal with situation by raising issues in discussion time or at the point in time. Statements such as ‘I feel angry when person x pushes in line,’ ‘I reckon it’s bad when person x calls out because it interrupts me when I’m working’ were being used.
### Finding Out Sorting Out. Continuing Cycles – Terms 3 2002

#### 17th July 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practise and consolidate word processing skills – accessing Word, selecting fonts, sizes saving and retrieving</td>
<td>Provide simple text for students to copy (related to unit of work topic)</td>
<td>Use of ongoing class checklist modified to incorporate required skills</td>
<td>View files to view and record student success in completing task</td>
</tr>
<tr>
<td>Have students go through process of starting a new document, keying relevant data with required formatting, saving and exiting</td>
<td>Teacher observation of students’ ability to engage in task</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PR reflection

Having students copy a simple prepared text meant that they were able to focus on the formatting and mechanical aspects of the task. Most children were generally successful in completing task although it was interesting to note that many students who are not using capital letters consistently in their writing did not consistently use capital letters in copying text, although they are able to use the shift key or caps lock key. It is something to note for focused teaching groups in literacy time.

Their readiness and ability to login to the network, access word processing programs, complete set tasks and save to class folder on the network is established.

#### 19th July 2002

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
</table>
| Thinking Tools  
Concept Map: a Simple Web  
Model use of tool  
Relate to integrated curriculum unit of work (Light & Sound)  
Have students complete own concept map – this will be re-visited and added to at end of unit as an assessment tool | Explain use of thinking tool – relate to what is already known about using thinking tools  
Model use of Simple Web  
Have students complete own web | Note student contribution to class discussion  
Note student engagement in task | Collect and view student work to note understanding of task |

### PR reflection

It was interesting to observe students relating this task to the thinking hats.

‘It’s like when you use your white hat to think’ SP 2G

‘You need to use your white hat to think of things about light’ SP 1E

Each student produced a simple web – some students recorded 1-2 simple ideas.

‘It helps you to see’ ‘Something at the top of the room makes light’

Others produced 4-5

‘The sun gives us light’ ‘You get light from electricity’ There are different kinds of light – the sun, electricity, matches and candles’
### ICT

<table>
<thead>
<tr>
<th>24th &amp; 31st July 2002</th>
<th>ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan</strong></td>
<td></td>
</tr>
<tr>
<td>Practise and consolidate Internet skills – log on to Network log in to Internet find and investigate links from Top Ten primary sites Keep records of URL’s visited</td>
<td></td>
</tr>
<tr>
<td><strong>Act</strong></td>
<td></td>
</tr>
<tr>
<td>Give students directed learning activities</td>
<td></td>
</tr>
<tr>
<td><strong>Observe</strong></td>
<td></td>
</tr>
<tr>
<td>Use of ongoing class checklist modified to incorporate required skills Teacher observation of students’ ability to engage in task</td>
<td></td>
</tr>
<tr>
<td><strong>Reflect</strong></td>
<td></td>
</tr>
<tr>
<td>View files to view and record student success in completing task</td>
<td></td>
</tr>
</tbody>
</table>

**PR reflection**

Students do the log in routines automatically now. It was interesting to observe the ways in which they navigated various sites. Some students rely on the ‘go forward one page’ and ‘go backward one page’ almost exclusively; other students use a variety of methods including going forward and back one page together with accessing others links within the page itself. Some students chose few sites and investigated several features; other students skimmed sites and interacted if something caught their interest or moved to another site if interest was not captured. It was interesting to note that students with lower levels of literacy did not investigate sights that had a lot of print. Sites that used icons and images with less print appeared to be more engaging. Students also enjoyed sites that allowed interaction – jigsaws that required various techniques such as drag and drop or slide; online colouring sites; making up funny stories by entering key words in prepared texts; dress-ups; putting dinosaurs back together;

### Thinking

<table>
<thead>
<tr>
<th>26th July &amp; 1st August 2002</th>
<th>Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan</strong></td>
<td></td>
</tr>
<tr>
<td>Consolidate thinking skills – Relate to integrated curriculum unit of work (Light &amp; Sound) White hat – brainstorm facts about light Yellow hat – what are good/positive aspects about light Green hat – using prisms what new ideas do you have about light</td>
<td></td>
</tr>
<tr>
<td><strong>Act</strong></td>
<td></td>
</tr>
<tr>
<td>Work in groups to think about and discuss light using 3 of the thinking hats to direct discussion</td>
<td></td>
</tr>
<tr>
<td><strong>Observe</strong></td>
<td></td>
</tr>
<tr>
<td>Note student contribution to discussion Note student engagement in task Note student ability to understand task</td>
<td></td>
</tr>
<tr>
<td><strong>Reflect</strong></td>
<td></td>
</tr>
<tr>
<td>Allow students to share insights and evaluate effectiveness and accuracy of responses</td>
<td></td>
</tr>
</tbody>
</table>

**PR reflection**

Students were comfortable about engaging in conversations about light – using the hats provides direction for their thinking and conversations and they seem clear about expectations. It was interesting 3 students – SP 2A, SP 1D and SP 1E recommending that blue hat thinking be used to organise the groups ‘so we know what we’re doing’.
Daily Routine for Writing Workshops

**Whole Class Focus** (20 mins)
Modelled/Shared Writing (10 – 20 mins)

**Mini Lesson** (10 mins – if taken)

**Small Group Focus** (30 mins)
Teaching Group Use of teaching strategy according to need: Language Experience Writing; Small Group Shared Writing; Interactive Writing; Guided Writing

Independent Writing Tasks
Roving Conferences

**Whole Class Share Time** (5 mins)

In Writing Workshops students have been engaged in various aspects of the writing process with regards to teacher directed task. The teacher directed task at this time was a Report text type about the topic *Light*. The Writing Workshops include The Stages of Writing: Planning, Composing/Recording, Revising/Publishing. These stages are modelled to the students during the whole class focus at the beginning of a session and in some small group teaching sessions.

SP are working at various stages but to date all have completed a Report plan using a class pro-forma and have started the composing/recording stage. After initially commencing the writing draft with pencil and paper, some students have elected to do their drafting using the word-processing feature in the computer. As they are able to access their files in both the classroom and the computer lab they find they are able to access their work readily. On the few occasions that there was no computer available, they wrote their information on paper to be keyed in later. A few are using hard copies for revision. Students are also able to book use of a computer during the independent writing time in Writing Workshops.

The ease with which many students are able to access and retrieve their writing from the class folder stored on the network indicates the extent to which understandings in this aspect of ICT is established and being integrated into daily learning experiences.

Recorded 5th August 2002

<table>
<thead>
<tr>
<th>7th August 2002</th>
<th>ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan</strong></td>
<td><strong>Act</strong></td>
</tr>
<tr>
<td>Student investigation</td>
<td>Allow students opportunities to use computers and make own decisions about tasks</td>
</tr>
</tbody>
</table>

**PR reflection**

Students do the log in routines automatically now. It was interesting to observe the ways in which they navigated various sites. Some students rely on the ‘go forward one page’ and ‘go backward one page’ almost exclusively; other students use a variety of methods including going forward and back one page together with accessing others links within the page itself. Some students chose few sites and investigated several features; other students skimmed sites and interacted if something caught their interest or moved to another site if interest was not captured. It was interesting to note that students with lower levels of literacy did not investigate sites that had a lot of print. Sites that used icons and images with less print appeared to be more engaging. Students also enjoyed sites that allowed interaction – jigsaws that required various techniques such as drag and drop or slide; online colouring sites; making up funny stories by entering key words in prepared texts; dress-ups; putting dinosaurs back together. Several students worked on personal writing using word-processing.
### 8th & 15th August 2002  
**Thinking**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidate thinking skills – Relate to integrated curriculum unit of work (Light &amp; Sound) Red hat – how do you feel about light Green hat – use new ideas to create a piece of art reflecting the colour spectrum</td>
<td>Work in groups to think about and discuss light using 3 of the thinking hats to direct discussion Commence art response</td>
<td>Note student engagement in task Note student ability to understand task</td>
<td>Allow students to share work</td>
</tr>
</tbody>
</table>

**PR reflection**

Students were comfortable about engaging in conversations about light – using the hats provides direction for their thinking and conversations however they found the red hat task – relating feelings/emotions to light more of a challenge. They were able to relate to producing their own interpretation of the colour spectrum as they referred back to their experiences with the prisms.

I intend to find some poetry about light and use these in shared reading to see if students are able to identify any feelings or emotions coming through and relate to own experiences.

### 14th & 21st August 2002  
**ICT**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning about computer hardware Extend student knowledge and understandings of ICT beyond applications Internet Applications - bookmarking</td>
<td>Using hands on and visual resources, introduce information about hardware to help students understand the different parts of the computer View, discuss URL’s and ways to bookmark for future reference</td>
<td>Note if students are able to identify the different parts of the computer and name them Observe students’ attempts to bookmark</td>
<td>View student response sheets View bookmarks</td>
</tr>
</tbody>
</table>

**PR reflection**

I think it is important for students to learn by, through and about ICT. Using selected parts of two books with a focus on computer hardware and which are aimed at junior primary level, SP viewed, touched and discussed various parts of computer hardware and peripheral devices. A peripheral device is any device attached to a computer in order to expand its functionality. Some of the more common peripheral devices are printers, scanners, disk drives, tape drives, microphones, speakers, and cameras. Keyboards, monitors and mice generally are no longer considered to be peripheral devices but part of the base system.

SP were keen to learn more about the machines and worked cooperatively in small groups learning about these aspects.

**References:**

- Computers in the Classroom Level 1 (1999) R.I.C. Publications
- Computers in the Classroom Level 2/3 (1999) R.I.C. Publications

**Bookmarking** – through visiting sites regularly students have largely become familiar with URL’s/website addresses. Bookmarking with Internet Explorer Favourites was quickly learned. Bookmarking with school intranet/internet graphical interface needed further explanation and revision in the second session with some students still requiring further support with including bookmarks on the school ‘My Internet’ graphical interface.
### 22nd & 29th August 2002

<table>
<thead>
<tr>
<th><strong>Plan</strong></th>
<th><strong>Act</strong></th>
<th><strong>Observe</strong></th>
<th><strong>Reflect</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidate thinking skills – Relate to integrated curriculum unit of work (Light &amp; Sound)</td>
<td>Work in rotating groups to participate in/ conduct a series of experiments to do with making sound and using a variety of material</td>
<td>Teacher observation as students work through tasks</td>
<td>Invite students to reflect on findings</td>
</tr>
<tr>
<td>Over 3 sessions conduct series of experiments about Sound – Categorise using 1. white hat 2. yellow hat black hat 3. red hat green hat</td>
<td>Elastic bands stretched to varying lengths around nails on boards Glasses with water at different levels Striking a range of surfaces Using various tools to strike surfaces Putting different small solids into containers and shaking</td>
<td>Group feedback/ share time to present results/opinions</td>
<td>Make recommendations about further experiments</td>
</tr>
</tbody>
</table>

**PR reflection**

Students readily engaged in the ‘hands on’ experimentation and some interesting sounds, and in some cases rather loud sounds, were created. Using the hats as a framework for categorisation guided students as they evaluated the sounds they had created and they moved easily through the process.

### 5th & 12th September 2002

<table>
<thead>
<tr>
<th><strong>Plan</strong></th>
<th><strong>Act</strong></th>
<th><strong>Observe</strong></th>
<th><strong>Reflect</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use blue hat thinking to plan and create own sound maker</td>
<td>Use the information gathered as criteria for designing and creating own sound machine Plan and organise equipment needed Organise time frame for creation</td>
<td>Observe students on task</td>
<td>View and evaluate final products</td>
</tr>
<tr>
<td>Provide hard copy of plan to be followed</td>
<td></td>
<td></td>
<td>Compare to plan</td>
</tr>
</tbody>
</table>

**PR reflection**

Students actively engaged in planning and creating sound machines. There was great enjoyment in SP implementation of the task as they used a trial and error approach (with lots of sound emanating) as they worked towards their creations. Blue hat thinking was clearly in evidence as they organised and reorganised. What was also evident was their use of black, yellow and green hat thinking as they were evaluating their efforts and coming up with alternate ideas. It was interesting to note that no SP abandoned an original idea entirely but worked on improving/modifying an original idea.
Over the terms the students have been using the computers in a variety of ways in order to build computer skills. I’m delighted at the way in which these little kids have been able to get on with job of using computers. Most of what we have covered is nothing like what they would be doing at home or what they might have done last year and yet they are able log on to the network and the Internet with usernames and passwords, access online information and games, print, save and some of them can even bookmark. They can start new Word documents, insert pictures, save, print, retrieve and have fun! I wish they could teach some of the teachers these things!! Simple tasks can provide insight into students’ ability to open a document, move cursor to appropriate section, key in information, save and print. PR is able to access relevant folder, check for saved files and record appropriate information on checklist.

An effective strategy has been to call these little tasks ‘tests’ as an endearing trait displayed by this group of students is that they love to do ‘tests’ to prove their computer expertise. By consensus, practice tasks such as the one below usually had the word test as part of the file name. In fact many of the students did not wait for the PR to check the main folder to see whose work was there, but looked to see if they had saved their own work properly and marked the checklist. They were always honest and retrieved the task and re-saved if it was not in the correct folder.

These tasks are all completed - not necessarily in one session – in the computer laboratory. The main reason for this is the efficiency of the machines. These tasks, while appearing brief, require students to begin with a machine that is not turned on. This ensures that each student is learning how to turn machines on and shutdown correctly as well as logging on to each aspect as required. This is important for independent usage and building better understandings.
### 4.4.2. Going Further – Focused Project Reflective Cycles Term 4 2002

**Planned Observation: October 8 2002**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe student use of thinking tools</td>
<td>Prepare learning experience that calls on SP to think about the recent school holidays in relation to the six thinking hats</td>
<td>SP were comfortable in discussing the recent holidays within the parameters</td>
<td>Positive outcome - nearly all the SP contributed to class discussion, staying within the context of the recent holidays and the six thinking hats</td>
</tr>
<tr>
<td>Develop a learning experience using a familiar topic and a graphic organiser related to six thinking hats</td>
<td>Invite regular replacement teacher in to implement lesson</td>
<td>28 SP contributed to discussion in varying capacity and within the set parameters</td>
<td>Many SP were able to record the main points in the graphic organiser appropriately however few used the grid in planning a recount in writing workshops</td>
</tr>
<tr>
<td>Observe and video tape session</td>
<td></td>
<td>SP were generally clear about the expectations</td>
<td>Use of video technology may need to be introduced in a prior session to alleviate inhibitions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Video camera caused initial shyness</td>
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<tr>
<td></td>
<td></td>
<td>CRT worked hard to stimulate discussion and implement task</td>
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</tbody>
</table>

**PR reflection: October 8 2002**

A productive session – one cannot give the perfect lesson, make perfect observations and record a video - so use of this strategy provided a way around some of these constraints. Having a teacher familiar to the SP and other than the PR deliver the lesson provided a unique opportunity for observation. Having a video camera in the room on the second day of the final school term provided somewhat of a challenge, but one that could be overcome. The other teacher was conscious of wanting ‘to do a good job’ for the PR and the SP appeared to be initially daunted by the presence of the video camera although they became less conscious of its presence as the lesson progressed.

The positives of this experience are that the SP were engaged in focused discussion with many able to complete the related grid within the parameters set, using six thinking hats method to direct their thinking. It also gave the PR an opportunity to purely observe events without the constraints of having to implement the lesson and allowed more focused observation to occur and to observe the interactions (facial expressions, body language, head-nodding of the less vocal SP).

The SP in this group is well used to having a variety of people working with it in various capacities and adapts readily. It will be important in subsequent sessions to ensure that the SP see the IO presence as nothing unusual – just another idea ‘Ms W’ has for learning and thinking.
**Planned Observation: October 14, 2002**

<table>
<thead>
<tr>
<th>Selected annotations from journal of Independent Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students are asked questions with relevance to a topic … positive encouragement and constructive feedback is given from the teacher</td>
</tr>
<tr>
<td>• Group discussion/led by the teacher – very briefly</td>
</tr>
<tr>
<td>o teacher reinforced main ideas of activity and the specific tasks students were to complete</td>
</tr>
<tr>
<td>o reinforcement that the information and ideas discussed and documented were the important aspect of the activity</td>
</tr>
<tr>
<td>• 1. whole group 2. small group 3. individual work 4. whole group Q&amp;A 5. whole group coming together to share work ideas and work generated * students discussed thinking skills colour to form into a circle in a specified order (blue hat thinking skills being displayed)</td>
</tr>
<tr>
<td>• Students were positive and enthusiastic about participating…contributing own ideas to group project…continually discussing with other group members what they had recorded on own template</td>
</tr>
<tr>
<td>• Students use other’s ideas to build their own contributions – agreeing/disagreeing with suggestions given them justifying their own responses</td>
</tr>
<tr>
<td>• Students justify…reasoning</td>
</tr>
<tr>
<td>• Most students orally discussed ideas in detail, reasoning and giving examples…not all students wrote reasoning…after being reminded a number of students included reasoning in their responses</td>
</tr>
<tr>
<td>• It is clear that the students understand and can adopt a thinking skill – using that skill to compete the task</td>
</tr>
<tr>
<td>• Students displayed further thinking skills by discussion task and organising themselves prior to completing the task – represented Blue hat thinking skills…worked well together – taking turns and listening to each other</td>
</tr>
</tbody>
</table>
## Planned Observation: October 18, 2002 Timetabled Computer Lab Session

Consolidation of computer skills through carrying out teacher directed and self selected tasks

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
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</thead>
<tbody>
<tr>
<td>Investigate SP competency in being able to complete a teacher directed task that required them to utilise skills (included skills - logging on to LAN (local area network), accessing the Internet with a username and password, accessing various software packages, beginning, printing, retrieving, editing and saving work to class folders using a process that easily identifies personal work)</td>
<td>Review and revise procedures</td>
<td>Most SP were able to successfully able to complete simple task although several had difficulty with locating the quotation marks on the keyboard. They were largely familiar with using the shift key to produce capital or uppercase letters but some had not come to realise that on keys other than letter keys, there were two symbols on each which could be accessed through use of the shift key. This is something to be covered in share time and subsequent sessions.</td>
<td>SP have worked well on personal organisational skills that allow them to engage in and complete set tasks. The procedures for accessing various programs on the computers have become second nature to most. A handful still require a card with the usernames and password displayed which is more to do with spelling expertise rather computers skills. All SP worked through set task with most moving on to work independently of self-selected tasks. SP appear to have learned a great deal about using computers and are well on the way to learning through using computers. They are a group of very young children (6-7 year olds) who had little experience with computers in the school setting and yet are accessing technology with increasing confidence.</td>
</tr>
<tr>
<td>Teacher directed task involving skills as outlined above and self selected tasks</td>
<td>Provide verbal and written steps for SP to follow</td>
<td>All SP were able to work productively in session. Some took all allocated time to complete teacher directed task. For some SP this was because of slower keyboarding skills; other SP took longer over copying the text. The majority of SP went on to self-selected tasks on the computer</td>
<td>All SP worked through set task with most moving on to work independently of self-selected tasks. SP appear to have learned a great deal about using computers and are well on the way to learning through using computers. They are a group of very young children (6-7 year olds) who had little experience with computers in the school setting and yet are accessing technology with increasing confidence.</td>
</tr>
<tr>
<td>Teacher directed task <code>Test 3</code> which required login, go to MS Word, select a particular font and font size and copy a small passage correctly paying attention to capital letters, quotation marks and full stops</td>
<td>Have other tasks prepared to enable individual access to computers (class is split into two groups - first group do <code>hands-on</code> computer tasks; second group was exposed to learning about computers (parts of a computer ref: Computers in the Classroom)</td>
<td>Allow time for SP to have free access to practise skills on completion of directed tasks</td>
<td>All SP worked through set task with most moving on to work independently of self-selected tasks. SP appear to have learned a great deal about using computers and are well on the way to learning through using computers. They are a group of very young children (6-7 year olds) who had little experience with computers in the school setting and yet are accessing technology with increasing confidence.</td>
</tr>
<tr>
<td>To access self selected tasks SP needed to have checked accurate completion of set task, exit of that task. Access to desired task or site to be done without assistance or interruption to others</td>
<td>Allow time for SP to have free access to practise skills on completion of directed tasks</td>
<td>Most SP were able to successfully able to complete simple task although several had difficulty with locating the quotation marks on the keyboard. They were largely familiar with using the shift key to produce capital or uppercase letters but some had not come to realise that on keys other than letter keys, there were two symbols on each which could be accessed through use of the shift key. This is something to be covered in share time and subsequent sessions.</td>
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</tbody>
</table>
**Planned Observation: October 18, 2002**

Consolidation of computer skills through carrying out teacher directed and self selected tasks

**Selected annotations from journal of Independent Observer**

- Students were clearly capable of accessing ICT via the computer system/network – the majority of students were able to logon to the network, requiring usernames and passwords (that were entered from memory) and copied from the blackboard today’s password
- A number of students skipped the test instructions and selected files and documents previously known/used. After being reminded of the task from the teacher – these students competently exited from the document they were in and opened the correct file
- When encountering difficulties …students confidently trialing various ways to access the information they required
- Students clearly understood and had developed an ability and confidence in accessing documents, files, text details on the ICT computer systems
- A number of student experimented at various stages of the test to check their work for example:
  - SP 1H selected a number of various fonts before the selecting the one required for the test, then typed out random letters on the keyboard to test out the font before continuing with the task
  - SP 1M – after starting to type out test text, she realised that she had not used capital letters in her typing and used the arrow and delete key to correct her work before proceeding
- The majority of students displayed ICT skills in their ability to self correct and use such skill to aid in the successful completion of their tasks eg use delete function, use close window function, use highlight text function, use shift key and caps lock key to capitalise letters, use mouse buttons competently, using keys to insert text previously left out when completing task

**Planned Observation: October 22, 2002**

Application of de Bono’s (1992) PMI (Plus Minus Interesting ideas) method to direct focused discussion about Media in Art based on Jeannie Baker’s book *When the Forest Meets the Sea*. Session implemented by regular CRT (as previously) and observed by PR

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
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</thead>
<tbody>
<tr>
<td>Introductory/Tuning in session for new unit of work</td>
<td>Prepare learning experience that calls on SP to think about techniques in Art</td>
<td>Many SP contributed to discussions</td>
<td>SP stayed on task and generally contributed to the discussion</td>
</tr>
<tr>
<td>Introduce another de Bono thinking tool – PMI</td>
<td>Invite regular replacement teacher in to implement lesson</td>
<td>SP offered very good interpretations analyses of each picture in book as a whole</td>
<td>CRT worked tirelessly to keep children on task, bringing discussion back to techniques</td>
</tr>
<tr>
<td>Using a thinking tool to view and discuss an artist’s work</td>
<td>Observe session</td>
<td>Some SP were able to offer opinions on the techniques used in the book as well as the story they felt was being conveyed</td>
<td>SP ably articulated perceptions of the story emerging in each picture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Most SP using the tool tended to make six thinking hat references</td>
<td>SP readily used thinking methods to analyse each picture</td>
</tr>
</tbody>
</table>
**PR reflection: October 22, 2002**

Application of de Bono’s (1992) PMI (Plus Minus Interesting ideas) method to direct focused discussion about Media in Art

A productive session in which the SP displayed use of thinking skills to analyse and discuss ideas and demonstrated that they were largely honing these skills and utilised them readily throughout this session.

The CRT worked well with SP eliciting positive responses and providing encouraging and affirming feedback to all contributions while guiding SP, where necessary, back to the focus of the session.

Some of the SP observations:

| SP 2G: Plus – | it was good because the artist used real outdoor materials to make the outdoor parts |
| SP 2J: Plus – | the artist used read sand to make the footprints look real – she used 3D |
| SP 1F: Minus – | you’d need to take care doing art like that in case your art blew away |
| SP 1P: Minus – | it would be too hard to change the art if you made a mistake but |
| Interesting Ideas – | you could make new ideas from the mistakes |
| SP 1A: Plus – | it makes you feel like you’re really there – what she has use makes it look real |
| SP 2I: Plus – | using those things (materials) – lots of details |
| Interesting Ideas – | I could use tissue too to make water |
| SP 1G: Plus – | recycling materials found outside to make it look natural |
| Interesting Ideas – | should only use found materials – environmental message |
| SP 1D: Plus – | found things from nature, cut them up and re-arranged them |
| SP 2K: Interesting Ideas – | you could walk on wet sand and take photos to get footprints |
| ST 1H: Interesting Ideas – | you could use a doll to get that picture |
# Planned Observation: October 23, 2002 Timetabled Computer Lab Session

**Utilising ICT skills – experimenting with new software**  
Continue building ICT skills – retrieving documents and adding borders

<table>
<thead>
<tr>
<th>Plan</th>
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<th>Reflect</th>
</tr>
</thead>
</table>
| Provide SP with opportunity to experiment with using new software program. Criteria for using software:  
- use own knowledge to access program  
- if having difficulty go through class ‘trouble-shooting’ routine  
- if unable to solve problem consult computer partner or peer  |
| Locate to laboratory for experimentation  
Usual practice of having other tasks separate to ‘hands-on’ computer tasks were provided  
SP could work independently or choose computer partner for this task  
Time frame of 25 minutes was designated after which SP could save and exit or continue  |
| SP immediately and successfully accessed Kid Pix program.  
Those who initially were unsure used observation of peers in order to get started  
Immediate engagement  
After designated time frame SP largely chose to continue exploration. Those who chose to save and exit program used time to access other favourite sites  |
| An excellent opportunity to see SP using ICT knowledge and skills which they did so capably  
The confidence with which SP are using ICT is growing steadily  
The skills SP are displaying are transferable and not specific to one particular task, machine or situation  |

## PR reflection: October 23, 2002

As ICT coordinator PR was responsible for the installing of new software on the LAN in conjunction with ICT Technician. A new program Kid Pix 3 had been purchased and had been installed in the computer laboratory and most of the SP noticed the new icon immediately. A wonderful and unintentional opportunity presented itself to observe SP ICT skills in action.

**Utilising ICT skills – experimenting with new software**

### Selected annotations from journal of Independent Observer

- Students were clearly able to access their files showing thorough understandings of the skills required – logging on to system, opening specific computer program, locating specific files and opening them
- spent a significant amount of time exploring the program options on the Kid Pix program using various functions to select and reject choices. SP 2C quickly learned how to adjust screen for Kid Pix program; after peer asked for assistance she explained why and how you perform the action and requested that the peer perform the steps under a watchful eye to ensure understanding
- while exploring Kid Pix SP 1A spent a significant amount of time exploring the functions available when using text based components eg changing text box size, font colour, font style and font size then using keyboard functions to self correct his work
- A number of students learned very quickly how to alter the volume on the machines to accommodate needs for the Kid Pix program
- Students transferred previous knowledge to the requirements of the Kid Pix program. Teacher(using Averkey) briefly modelled saving a file in the Kid Pix program. All students were able to transfer knowledge gained from saving work to LAN to saving to the Kid Pix file. This required them to select, name and save the file within Kid Pix and exit the program.
- Students use various ways to edit work – SP 2J used delete and backspace keys to adjust spaces in work; SP 2B used arrow, delete and backspace keys to correct spelling and punctuation
Planned Observation: October 23, 2002
Continue building ICT skills – retrieving documents and adding borders

Selected annotations from journal of Independent Observer
Students retrieved a previous document they had been working on as part of their Writing Workshops. After retrieving the document the students firstly made changes to work including corrections and alterations to the previous draft. Students then experimented with adding borders to their work before making a final selection and saving work. Majority of students were able to successfully save their work although a few saved work with incorrect file names and in incorrect location. After a quick modelling session, students retrieved work and saved it correctly. Steps for this were modelled and students were expected to then perform the steps themselves.

Planned Observation: October 23, 2002
Learning about technology

Selected annotations from journal of Independent Observer
When working in the laboratory students not accessing the computers are actively engaged in various learning tasks. The task for this session required reading ICT information and complete written responses to increase their knowledge of computer hardware. Students worked in small groups discussing, comparing and clarifying responses and seeking opinions. Some students were unsure of the difference between a floppy drive and a hard drive so they sought assistance from the teacher who asked them to consider the facts. They re-read the information and continued discussion.

Planned Observation: October 25, 2002
Media in Art: Preparation for group mural (before recess)

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss observations</td>
<td>Implement session</td>
<td>Discussion and reflection of precious</td>
<td>A good basis for next part of process which</td>
</tr>
<tr>
<td>from previous session</td>
<td>allowing time and opportunity for</td>
<td>session tuned SP into task. Each SP noted</td>
<td>is group planning</td>
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<tr>
<td>and reflect on</td>
<td>individuals to record ideas</td>
<td>down ideas for general plot/theme, visual</td>
<td>Providing time for personal reflection and</td>
</tr>
<tr>
<td>techniques observed</td>
<td></td>
<td>presentation and suitable materials</td>
<td>planning allows all SP to come to next</td>
</tr>
<tr>
<td>Reflect on previous</td>
<td></td>
<td></td>
<td>session with ideas in mind</td>
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<tr>
<td>group discussion about</td>
<td></td>
<td></td>
<td>Provided opportunity</td>
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<tr>
<td>fairy tales (six thinking</td>
<td></td>
<td></td>
<td>to ensure that all SP had clear</td>
</tr>
<tr>
<td>hat task)</td>
<td></td>
<td></td>
<td>understanding of task and related</td>
</tr>
<tr>
<td>Individual task –use</td>
<td></td>
<td></td>
<td>vocabulary – important for all students but</td>
</tr>
<tr>
<td>thinking hats and</td>
<td></td>
<td></td>
<td>particularly for those with LBOTE</td>
</tr>
<tr>
<td>brainstorm ideas for</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>inclusion in mural</td>
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<tr>
<td>White: information to</td>
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<tr>
<td>be included</td>
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<tr>
<td>Yellow: good things to</td>
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<tr>
<td>be included</td>
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<tr>
<td>Green: ideas to make</td>
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<tr>
<td>work interesting and</td>
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<tr>
<td>creative</td>
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</table>
### Planned Observation: October 25, 2002

**Media in Art: Planning for group mural (after recess)**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group discussion of ideas</td>
<td>Implement session allowing time and opportunity for individuals to present ideas</td>
<td>Groups discussed, negotiated and recorded ideas for general plot/theme, visual presentation and suitable materials</td>
<td>SP are well used to discussion now and use of the six thinking hats method is apparent. SP will focus discussion by making comments such as ‘what facts do we need to put in’</td>
</tr>
<tr>
<td>Make decisions – theme, techniques, work allocation (Blue hat)</td>
<td>Group discussion and negotiation about ideas to be included and theme and materials to be decided</td>
<td></td>
<td>Many groups solved dominant personalities by using blue hat thinking – ‘has everybody been able to give an idea’ ‘I think it’s good to take turns so that we can all say our ideas’</td>
</tr>
<tr>
<td>Make sketch, prepare materials list</td>
<td></td>
<td></td>
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<tr>
<td>Whole group feedback to clarify issues</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Selected annotations from journal of Independent Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students discussed individual ideas in terms of what ideas each student had come up with – looking at and identifying strengths and positive aspects of each student’s work/ideas and how they could best benefit the group projects</td>
</tr>
<tr>
<td>• Discussing how the fairy tale would be set out-ordering ideas of individual students and how these could be incorporated into their work (blue hat thinking – students considered and discussed the decisions that would have to be made)</td>
</tr>
<tr>
<td>• Red hat thinking was also prominent in group discussion – how people felt as well as yellow, blue and white</td>
</tr>
<tr>
<td>• SP 1F displayed blue hat thinking by reinforcing task orally and ensuring others in the group understood the task</td>
</tr>
<tr>
<td>• Once decisions were made on the setting, background etc students set about sketching out a draft …-this involved discussing ideas as they were added to the sketch…making comments about the appropriateness of inclusions to the sketch</td>
</tr>
<tr>
<td>• Each group presented their ideas and draft sketch to class – explaining selections and choices; justifying inclusions – particularly using white hat thinking – information included, yellow hat thinking – good points of plan; blue hat – organisational aspects</td>
</tr>
<tr>
<td>• Some groups moved on to recording specific detail on sketch plan – information to be included; organisational details – specific colours, media, settings, character and background details and other equipment</td>
</tr>
<tr>
<td>• SP 2J – looked through tasks required and checked off what had been completed eg we’ve done the information facts and the background…</td>
</tr>
<tr>
<td>• SP 2K – very dominant in group discussion – ‘I’m going to…’ ‘the background is going to be…’ Group needed to work through this in order to continue – used turn taking strategy to make sure everyone was heard</td>
</tr>
<tr>
<td>• SP 1P – very focused on how group would order ideas to make mural</td>
</tr>
<tr>
<td>• SP 1D – tool on role of ordering individual contributions; often expressing own feelings/thoughts on group work – ‘yeah I like that idea…’ M’s idea is good – we could help make it work…’</td>
</tr>
<tr>
<td><strong>Planned Observation: October 25, 2002</strong></td>
</tr>
<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td><strong>Media in Art: Planning for group mural (after recess)</strong></td>
</tr>
</tbody>
</table>

**PR reflection: October 25, 2002**
At the end of the session each group had determined a theme, made decisions and started a list of materials needed and was working on the sketch/plan they would follow. Most groups began compiling lists of equipment and materials that would be needed to complete the task. Prior to this, equipment and materials for art sessions had already been determined and although SP were often involved in setting up and cleaning up, they hadn’t really been involved in deciding equipment and materials. The way in which they went about doing this and the decisions they made were commendable.

Class discussion then centred around timing. Timetabling special projects can be a challenge given the ongoing demands of school life, particularly in the final term of the school year. In this class setting, Thursday afternoons were set aside for visual art sessions, a time which was generally uninterrupted and when art parent helpers were available. It was noted that there would be a need to have backgrounds prepared prior to the next formal timetabled session to allow drying time. A special session was set down the following day for groups to reach consensus regarding background presentation and each group worked outside the classroom preparing this.

This session demonstrated clearly that SP are using thinking skills as a matter of course. They use the skills as designated by the task and do so readily but it can be readily observed that SP are employing the hats in general discussions as a way of focussing their thinking and making their points. Many SP are articulating ideas much more clearly and are able to justify opinions which many found a challenge earlier in the year.

SP engagement in this task was confirming and while PR monitored the groups, none of them required any adult intervention. Groups were able to discuss and accomplish the set task cooperatively.

Am conscious that much of the decision-making regarding the materials to be used for this mural has been based on discussion and viewing the work of an artist. Little has been based on practical experience although in visual art sessions SP have had opportunities to paint, cut, paste, crumple, crush, print and construct. It may be important to find time for further experimentation before proceeding to next stage of producing group mural.
## Planned Observation: October 30, 2002 Timetabled Computer Lab Session

### Utilising ICT skills – using new software

Continue building ICT skills – retrieving documents and adding borders

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
</table>
| Practise previously taught skills  
- Retrieve document, edit, add border, save and print  
- Using Kid Pix program SP need to create Kid Pix worksheet containing pictures, texts, coloured background  
- Noting various conventions  
- Save work to appropriate folders  
- Complete independent learning tasks | Implement planned activities | Students worked independently  
Peer assistance occurred at point of need – students modelled and explained for troubleshooting purposes | SP have internalised understandings and display competence in accessing computers  
Students are able to apply knowledge gained to new situations and learning experiences |

### PR reflection: October 30, 2002

SP displayed competence and confidence in logging on to the LAN, locating and opening appropriate programs and then retrieving and opening specific files. SP moved to carry out established routines before moving to the next tasks which built on previous skills. SP were able to move readily through the known routines and then keep going through the subsequent tasks transferring knowledge to do so. Those not involved in ‘hands-on’ computer related tasks moved immediately to cooperative groups where they focused on completing activities based on learning about technology. SP read instructions, used various thinking strategies to make a response to open-ended questions and documented these responses. SP were engaged in their learning experiences and were working both independently and cooperatively as the demands of the tasks required.
<table>
<thead>
<tr>
<th>Planned Observation: October 30, 2002 Timetabled Computer Lab Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilising ICT skills – using new software</td>
</tr>
<tr>
<td>Continue building ICT skills – retrieving documents and adding borders</td>
</tr>
</tbody>
</table>

**Selected annotations from journal of Independent Observer**

- Students listened to explanation of concepts to be considered and used today in correcting final work drafts – this was specifically fixing up work to include single spaces between words and commas and two spaces after full stops; changing the style and size of fonts using the highlighting function and letting the computer move the text to a new line when it has run out of space on the current line
- SP 2G showed competence in used keyboard functions; highlighted parts of text and deleted; used enter key to form new line in text; inserted single spaces between words and double space after full stop consistently; inserted capital letters into text
- SP 1A was unsure of how to insert border. Discussed using the options under “features” in the tool bar and then decided that ‘borders and shading’ would be the most useful option – he then investigated this option, found a selection of borders, made his choice, successfully inserted the border, saved his work and exited the program to go on to another task
- SP 1Q competent in using backspace and arrow keys to insert words and spaces and self correct mistakes
- SP 2J competently used mouse to scroll down list of font styles, used left and right mouse buttons; able to highlight text and select new fonts until he made a final selection
- SP 1H was not consistent in understanding about the different spaces but able to insert single spaces where necessary and also used this function to move text to a new line
- SP 1J able to insert single spaces between words and also checked the number of spaces between words, self correcting any inconsistencies
- SP 1D on opening file discovered photo was missing – used arrow keys to scroll up and down and used highlight function to see if the photo box was still there; she then relocated photo
- SP 1O inserted single and double spaces; delete and backspace function; inserted capitals
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Provide opportunity for SP to experiment with different media and monochromatic paint and observe what effects could be achieved.</td>
<td>Implement planned activities</td>
<td>SP became engaged in experimenting with a variety of media to achieve different designs and effects</td>
<td>SP were engaged and focused on the task and wholeheartedly explored the use of media and various materials.</td>
</tr>
<tr>
<td>SP were encouraged to use two particular thinking hats – blue (planning) and green (new ideas). SP to use blue hat thinking in deciding what they might use to experiment with in the immediate task and also to determine what media they might use in producing group mural. SP to use green hat thinking to be creative with design and effects. Possible use of yellow hat thinking when presenting ideas to group.</td>
<td>Monitor participation</td>
<td>SP discussed and exchanged ideas about techniques and effects</td>
<td>Discussion flowed freely as SP took notice of what others were doing, commented and exchanged ideas and shared techniques.</td>
</tr>
<tr>
<td>Ensure SP are on task.</td>
<td></td>
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</tbody>
</table>

**Selected annotations from journal of Independent Observer**

- Students used Yellow hat thinking to discuss what were the good points and/or best techniques used during the experimentation process.
- Each student displayed own work and gave one good point about own experimentation.
- SP 1P elaborated on good point about work and provided explanation of technique.
- SP 2J explained that a technique that had been tried out would be incorporated into group mural ‘to make flowers’.
- SP 1F used a variety of materials to experiment with making lines of different lengths and thicknesses. Noted which media would give the desired thicknesses for the group mural and which would be more useful depending on the amount of paint that needed to be added.
- SP 2F noted that he was using his blue hat as ‘you need to plan what you do ‘cos it is good or not’.
- SP 1P explained how he experimented with adding white paint to get light and shade and make designs stand out in monochromatic work.
- SP 1F noted that student SP 2I used light and shade by adding white to get a 3D effect.
Planned Observation: November 6, 2002 Timetabled Computer Lab Session

Applying thinking skills to evaluate ICT tasks

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</tr>
</thead>
<tbody>
<tr>
<td>Purpose of this session was for SP to review and assess own work developed and saved during previous session in computer lab</td>
<td>Action was unable to proceed as planned because of ICT issue</td>
<td>SP responded readily to modified tasks</td>
<td>There were several positives arising out of this session – SP show real independence as users of technology, using machines and accessing programs readily</td>
</tr>
<tr>
<td>Use of graphic organiser for recording observations</td>
<td>Modified task implemented until session had to be abandoned</td>
<td></td>
<td>SP adapted readily to modified tasks which was one of further experimentation with software package</td>
</tr>
</tbody>
</table>

PR reflection: November 6, 2002

Well Murphy’s Law (1978) was well and truly in evidence today! Certain assumptions had been made by the PR regarding the retrieval of saved documents produced in the Kid Pix 3 program based on use with previous versions of Kid Pix. In fact, although the SP went about retrieving their work in the usual manner, the documents did not open. Also as can happen when one least desires it, some SP ‘remembered’ that they had forgotten to save their previous work. The solution to this was not an immediate one so SP were directed to access the software package and using their green hats, experiment with previously unexplored features of the program. With the supervision of a parent helper present (as is usual with visits to the computer laboratory) PR was able to investigate whether or not this issue was able to be solved readily or would require further investigation outside this session time. Just as PR had determined a solution to the problem, SP were sent for in order to have their heads checked by the school nurse from the local council doing routine investigations for outbreaks of head lice!

Head lice can be problem in more ways than one! Session abandoned!

Planned Observation: November 6, 2002 Timetabled Computer Lab Session

Applying thinking skills to evaluate ICT tasks

Selected annotations from journal of Independent Observer

- Use 4 hats to assess own Kid Pix work – Yellow – Good points Black – Not so good points Green – New ideas Blue – How can you organise this
- Instructions for the completion of task were given – written instructions on board as well as visual demonstration. Task required 3 specific elements – retrieving work, using the hats to assess, completing the grid
- Task did not work – moved to 2nd task
- SP 1E in exploring the options/functions, was very confident in accessing and using numerous techniques
- SP 2M was confident in completing the task on her own – experimented in inserting different objects/functions. Sought peer assistance from SP 1M with saving
- SP 1N used program confidently
- SP 2L was very confident and easily performed the task
- SP 2H and SP 1N worked collaboratively. SP 1N shared shortcuts discovered in exploration; SP 2H discovered several ways to insert text and modelled this function to others around her. Both explored inserting images
Planned Observation: November 8, 2002

Using thinking hats to innovate a familiar Fairy Tale – the tale of Little Red Riding Hood with the wolf as the main character and LLRH as the villain.

<table>
<thead>
<tr>
<th>Plan</th>
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<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use thinking hats to innovate a known fairy tale</td>
<td>Re-read and discuss previously heard and familiar version of Little Red Riding Hood</td>
<td>SP participated in set task with different levels of thinking being displayed</td>
<td>Insufficient time was allocated with PR trying to achieve an end product without allowing enough opportunity for exploration and depth of topic</td>
</tr>
<tr>
<td>To integrate thinking hats into planned speaking and listening session followed by incorporation into writing workshops</td>
<td>Using a graphic organiser with key questions related to text SP work in collaborative groups to view Little Red Riding Hood from different perspectives</td>
<td></td>
<td>Revisit</td>
</tr>
<tr>
<td></td>
<td>Use organiser to record ideas</td>
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</tbody>
</table>

PR reflection: November 8, 2002

The notion behind this session was to observe the ways in which SP would integrate the thinking skills they had been exploring regularly in relation to the integrated inquiry unit of work (Fairy Tales/Christmas) and writing workshops. It was intended to be a standalone session that would be observed by IO for two purposes – to view SP using these thinking skills in a particular situation that could be documented and to tie thinking, listening, speaking and writing together within the context of the integrated inquiry unit.

PR noted anecdotally at the time “Although I was generally satisfied with the results I got, I feel that I am trying to create a situation which will enable the independent observer to see whether or not the children are using their thinking skills in other activities after having had three terms of learning and practice. While I am not dissatisfied with what I am getting from the children and what is being recorded by the observer, I feel that the crowded curriculum, the inflexible timetable, the ‘big brother is watching you’ situation that can occur in schools, is having a greater impact that I realised it might. The sessions are a week apart and for some children that gap is large and I am conscious that many second language learners need to have connections to previous learning but it seems that if the learning experiences are too far apart it can be difficult for them to make the connections. Therefore I endeavoured to make each learning experience that the independent observer views to have a beginning, an activity time and a conclusion within each session. This does not mean that there is no connection between each session – we always have a share time to chat or a discussion in the next session that reminds us. I feel that this session was somewhat rushed in an endeavour to ‘get it done’. I probably should have had a longer oral session and spread the activity over 2 sessions but other factors unique to the local situation impinge on this happening. The children were all able to complete the tasks to varying degrees, some with more depth that others – this is life isn’t it? What might I do differently next time: allow more initial discussion, do two hats at a time and focus children’s thinking more; have another session within a day or two to consolidate (to hell with big brother – this is important!!) and allow more sharing and discussion and the opportunity to go back, reflect and make changes – good basic teaching practice.
Planned Observation: November 8, 2002
Using thinking hats to innovate a familiar Fairy Tale – the tale of Little Red Riding Hood (LRRH) with the wolf (BBW) as the focal character and LLRH as the villain

Selected annotations from journal of Independent Observer

- Introduction and explanation of today’s task. Think about LRRH as a bad person (black hat) and think about yourself as the BBW and how you would feel (red hat); how would you like the story to end (green hat); what plans would you make (blue hat)
- Students spent time visualising becoming BBW and put themselves in his shoes
- Students discussed acceptable topics to write about at school
- Students worked together in four groups to 6-7 students in each group to discuss and come up with their answers
- Throughout the tasks, students were required to discuss and problem solve to complete specific tasks eg ways in which they allocated roles such as collecting materials – this required students to use organisational thinking to discuss and compare ideas and opinions to solve these problems
- SP 1Q – red hat – said that BBW would be sad because he had no food to eat and or clothes to wear and no water; he would also be sad because he has nothing to do
- SP 1O – red hat – he would feel sad because the man (woodchopper) came along and cut my tummy open and it would hurt
- SP 2G – black hat - said that LRRH is a little show-off and – red hat - BBW is jealous of her
- SP 1E – red hat - said he would feel sad because BBW would be cold and have no clothes to wear and not house to live in and be hungry because he has not food to eat and thirsty because he has no water to drink
- SP 1H – blue hat – the plans she would make would put a pot of boiling water into which LRRH would step and disappear forever or BBW could also play tricks on her to scare her off forever
- SP 1A – blue hat – said he would use camouflage, scare off LRRH and eat all the goodies

Planned Observation: November 11, 2002
Using thinking hats to innovate a familiar Fairy Tale – the tale of Little Red Riding Hood with the wolf as the main character and LLRH as the villain. Follow up session

<table>
<thead>
<tr>
<th>Plan</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To follow up previous session using thinking hats to innovate a known fairy tale</td>
<td>Review, revise and clarify previous tasks</td>
<td>SP added information to set task</td>
<td>Insufficient time was allocated with PR trying to achieve an end product without allowing enough opportunity for exploration and depth of topic</td>
</tr>
<tr>
<td>To integrate thinking hats into planned speaking and listening session followed by incorporation into writing workshops</td>
<td>Allow time for self reflection</td>
<td>SP began transferring ideas to planning format</td>
<td>Revisit</td>
</tr>
</tbody>
</table>

PR reflection: November 8, 2002
This session was held within three days of the previous session. Much of the reason for this was to give SP an opportunity to make reasonable connections to the previous task without a whole week in between sessions. SP showed a willingness to try to seek alternative events for LRRH and BBW and organise these ideas under the umbrella of the thinking hats method. While ideas are somewhat simplistic in many cases, they do indicate the use of the thinking hats and are reflective of the age of SP.
### Planned Observation: November 11, 2002

Using thinking hats to innovate a familiar Fairy Tale – the tale of Little Red Riding Hood (LRRH) with the wolf (BBW) as the focal character and LLRH as the villain

#### Selected transcriptions of Interviews

| IO: | Okay so what were you actually looking at for your black thinking hat, what was the question there? |
| SP 1E: | What are the bad things about Little Red Riding Hood? |
| IO: | And what are some of the things you wrote down? |
| SP 1E: | She doesn’t share things, she took a long, long time, she picked roses instead of going to her grandma’s house, she was smelling roses, she…a lightning bolt… |
| IO: | Why do you say she’s a lightning bolt? |
| SP 1E: | Um she doesn’t share things. |
| IO: | Who doesn’t she share things with? |
| SP 1E: | The wolf because he was hungry and he was just there all alone, he hasn’t got anywhere to sleep…he can’t go anywhere. |
| IO: | Oh okay so did you write these ideas down pretending that you were the big bad wolf? |
| SP 1E: | Yes. |

| IO: | What did you have to do with the green hat, that was an interesting one? |
| SP 1E: | How would you like the story to end? I would like the story to end that the wolf stays alive and grandma and wolf and the axe cutter move into little red riding hood’s house. |
| IO: | So what sort of thinking were you using for writing your ideas? |
| SP 2K: | I was using the black hat. |
| IO: | Fantastic and what does the black hat stand for again? |
| SP 2K: | Bad points. |
| IO: | The bad points okay so what are some of the other bad points you put down about little red riding hood? |
| SP 2K: | She was ugly, she was smelly, she doesn’t take care, she never has a shower, she um is naughty, she doesn’t share. |
| IO: | Okay how, how do you think she doesn’t take care? Have you got any examples, can you remember anything? |
| SP 2K: | Because she doesn’t take care of her own self, she keeps doing other stuff when her mother tells her to her grandma’s and she went for a walk in the woods by herself. |
| IO: | She didn’t do that. How was she naughty? |
| SP 2K: | She didn’t listen to her mother when she told her to go to her grandma’s she went another way. |
Planned Observation: November 13, 2002 Timetabled Computer Lab Session

Transferring ICT skills to new tasks

<table>
<thead>
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<tbody>
<tr>
<td>Purpose of this session was for SP to use learned ICT skills to access and interact with various sites not previously visited</td>
<td>Tasks sheets were distributed and interactions monitored</td>
<td>SP engaged in tasks and able to complete tasks</td>
<td>SP are able to navigate websites successfully</td>
</tr>
<tr>
<td>Recording specific items on task sheets would indicate if SP had successfully navigated sites</td>
<td>SP are provided with support in reading instructions where necessary so that tasks are displaying their ability to utilise ICT skills rather than reading skills</td>
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</tbody>
</table>

PR reflection: November 13, 2002

The standalone sessions in the computer lab provide opportunities for focused teaching and focused application on the part of SP. Extra sessions in the lab and access to the machines in the classroom allow SP to consolidate their skills. SP are demonstrating that they are able to navigate round a variety of sites and enter and exit various programs with ease. SP are using the machines as tools to enhance their learning – they are doing simple research, locating specific information, word processing, accessing sites for leisure and building visual literacy skills.

Planned Observation: November 13, 2002 Timetabled Computer Lab Session

Transferring ICT skills to new tasks – Internet Sites

Selected transcriptions of Interviews

Locating specific link in specific site
IO: Okay so SP 1A and SP 1J what are you going to first?
SP 1A: Top primary site.
IO: Top primary site, and then where are going next?
SP 1J: Um art gallery. Scroll down left and then go to the art gallery.
IO: What kind of art gallery is it, what does it say on the sheet there?
SP 1J: Global Children’s Art Gallery.
IO: Okay.
SP 1A: Global Children’s Art Gallery. Scroll down the side.
SP 1J: No it’s still loading.
SP 1A: Go to Art Gallery, scroll down to the…
SP 1J: No, no, no, no, go to, scroll down the left, scroll down the left, keep on scrolling, come on. Global Art Gallery, Global Art Gallery.
IO: Which side of the screen is the left side?
SP 1J: It’s this side, that’s where it is.
IO: That side, do you see Global Children’s Art Gallery?
SP 1J: Yes, here we are…
Interactive stories – learning about parts of speech

IO: Okay so what type of words do you need to add into your alien story?
L: Spaceship.
R: Spaceship.
IO: Okay yeah.
L: You have to come down by spaceship…
IO: A mars bar…your naming word.
L: Adverb.
IO: So what one are you going to put in?
L: The mars bar came quickly?
IO: Okay. Quickly will be your adverb?
R: To run away.
IO: Okay. And what sort of word is that?
SP 1J: A verb…

IO: So what do you need to do next before you go out of it SP 1J?
SP 1J: Print it.
IO: How are you going to do that?
SP 1J: We go to file, yeah file, go haunted house…
IO: SP 1J remember you need to print one each.
SP 1J: So can I print the alien and he print the haunted house?
SP 1J: I think the alien…
IO: Was there any other way that you could get back to your alien story without logging into it again?
SP 1A: Go back.
IO: Have you tried that?
SP 1J: Yep…
SP 1A: Go back, go back, go back. Go forward, go forward. Scroll down, scroll it, scroll it.
IO: And what happened now did you press the forward button?
SP 1A: Go to this, go to this. Go forward.
IO: Forward where?
SP 1A: Forward to the story that you just did.
IO: To the story you just did, so have you printed that one?
SP 1A: Click on print.

Planned Observation: November 20, 2002 Timetabled Computer Lab Session
Transferring ICT skills to new tasks – Internet Sites

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<tr>
<td>Purpose - for SP to use learned ICT skills to access and interact with various sites not previously visited</td>
<td>Tasks sheets were distributed and interactions monitored</td>
<td>SP engaged in tasks and able to complete tasks</td>
<td>SP are able to navigate websites successfully</td>
</tr>
<tr>
<td>Recording specific information about sites</td>
<td>Support provided with reading of instructions</td>
<td></td>
<td>SP with lower literacy skills rely heavily on graphics</td>
</tr>
</tbody>
</table>

PR reflection: November 20, 2002
This session was a follow on to the previous session in the lab where SP continued on with previous independent directed learning tasks or moved to another independent directed learning task.
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Transferring ICT skills to new tasks – Internet Sites</strong></td>
</tr>
<tr>
<td><strong>Selected annotations from journal of Independent Observer and selection of transcriptions</strong></td>
</tr>
<tr>
<td>• SP 2I confidently logged onto the network, then top primary sites home page in preparation to complete his work. Discussed the process he will use to fix his mistakes from last and talked about the steps he will follow to complete the tasks.</td>
</tr>
<tr>
<td>SP 2I: The mistakes I have to fix is to get stuff, the person related to the picture.</td>
</tr>
<tr>
<td>IO: Okay so what do you actually need to do to make sure that you get the correct artist?</td>
</tr>
<tr>
<td>SP 2I: You have to login to pictures and then you find a picture that you like the best and then you write down the artist name. During the completion of task 3 SP 2I explained the process of how he was going to complete the task – explaining step by step, his choices and what he selected</td>
</tr>
<tr>
<td>• SP 2C talked about how she completed her tasks, the steps she followed and how she fixed up her mistakes</td>
</tr>
</tbody>
</table>

| • SP 1E talked about choices he did and why he didn’t make other choices. This task was related to an interactive story he accessed on a particular Internet site. |
| IO: Yellow. Put your yellow thinking hat on. What were some yellow thinking hat things about this story, some good points about this story? |
| SP 1E: Well he invited his friends. |
| IO: He did invite his friends to his party. |
| SP 1E: Yes. |
| IO: What’s another yellow thinking hat? |
| SP 1E: They gave him presents; instead of not giving him presents they gave him presents. |
| IO: That’s a good thing isn’t it yeah. Are there any more yellow hat thinking? |
| SP 1E: Na. |
| IO: Take your yellow hat off, put your black hat on. Can you tell me some black hat thinking things about this story? |
| SP 1E: He um (end tape) |
| IO: So tell me some black hat thinking things about this story. Tell me what black hat thinking is first so I know. |
| SP 1E: Well it could make, if his friends didn’t come he would be sad because he, it’s his birthday and he wants his friends to come. |
| IO: Is that a bad point or is, you’re talking about him and how he would feel so is that another thinking hat? |
| SP 1E: Yes. |
| IO: What hat is that? |
| SP 1E: Um the red hat. |
| IO: The red hat because you’re talking about his feelings. |
| SP 1E: Yeah. |
| IO: So what about some black hat ideas, are there anything, is there anything you’d like to change about the story? |
| SP 1E: Well if you, if it was black hat his friends wouldn’t come. |
| IO: They wouldn’t come in the story yeah. |
| SP 1E: And they wouldn’t give him presents. |
| IO: Okay fantastic. Are there any other things you want to talk about the story? No, all right well what do you have to do now to finish up all your tasks? |
| SP 1E: I’ve got to go back to Cool games. |
| IO: Okay how did you go back to cool games? |
| SP 1E: I clicked cool games. |
| SP 1E: And then we go to cool games page and have free time. |
SP 1P: We had to go to the um Internet and we had to go on the website.
IO: Yep, what website was that?
SP 1P: You scroll down and you see primary sites and you pick one there and …
IO: What task did you do, what activity did you do in the primary website, in the primary top sites today?
SP 1P: We did wacky tales and we had to do typing because if you click on a story you had to do a verb and a noun and stuff and do the correct stuff.
IO: Okay so you selected a story. What story did you select to do today, what was your story choice?
SP 1P: The Mummy, The Animal Show and The Alien and, and I forgot.
D: Did you have a favourite out of those three stories?
SP 1P: There were four stories.
IO: Four, sorry, did you have a favourite one out of the four?
SP 1P: The Alien one.
IO: Why did you like the alien one?
SP 1P: Because when I finished the story it said great on a star.

Planned Observation: November 22, 27 & 29 2002 Timetabled Computer Lab Session

<table>
<thead>
<tr>
<th>Plan</th>
<th>Act</th>
<th>Observe</th>
<th>Reflect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose - for SP to use learned ICT skills to access and interact with various sites not previously visited</td>
<td>Tasks sheets were distributed and interactions monitored</td>
<td>SP engaged in tasks and able to complete tasks</td>
<td>SP are able to navigate websites successfully</td>
</tr>
<tr>
<td>Recording specific information about sites</td>
<td>Support provided with reading of instructions</td>
<td></td>
<td>SP with lower literacy skills rely heavily on graphics</td>
</tr>
</tbody>
</table>

PR reflection: November 22, 27 & 29 2002

These sessions were an opportunity for the Independent Observer to view SP working on a variety of teacher directed and self-selected independent learning tasks. These tasks included accessing published computer software programs, the Internet and word processing. It was very much a time of consolidation of what had been learned over the year and the provision of opportunities to display these skills.
**Planned Observation: November 22, 27 & 29 2002 Timetabled Computer Lab Session**

**Selected transcriptions of Interviews November 22, 2002**

<table>
<thead>
<tr>
<th>IO:</th>
<th>You chose Kids Pix, why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1A:</td>
<td>Because it has fun stuff and it also has um games where you can like put candy and you can also put bugs in everything and draw pictures.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay, why did you choose Kids Pix over another game?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Because it’s better than any other game I’ve seen.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay. What sort of game is Kids Pix?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Art game.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay. What sort of things can you do in Kids Pix game?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Draw pictures. And you can make stamps.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay so what one would you choose if you had all those options to do, make stamps, write, um do some drawing?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Stamps.</td>
</tr>
<tr>
<td>IO:</td>
<td>Why would you do stamps?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Because it does tree stamps and it does dinosaur stamps and it just goes by itself and you can make it bigger with the shift.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay what are you making bigger when you press the shift key?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>The dinosaurs.</td>
</tr>
<tr>
<td>IO:</td>
<td>Imagine you have free time on the computer. What Internet site would you choose to go to?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Um Yahooligans.</td>
</tr>
<tr>
<td>IO:</td>
<td>How come?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Because it’s got puzzles and it’s got dinosaur puzzles and it’s also got some other games.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay, do you want to show me how you get to Yahooligans? What did you just click on?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>Explorer.</td>
</tr>
<tr>
<td>IO:</td>
<td>Okay. What’s the next thing that you do? You’re typing in <a href="http://www">www</a>. Okay, you typed a Y and what happened there?</td>
</tr>
<tr>
<td>SP 1A:</td>
<td>It brought all the Y things you have.</td>
</tr>
</tbody>
</table>
### Planned Observation: November 22, 27 & 29 2002 Timetabled Computer Lab Session

<table>
<thead>
<tr>
<th>Selected transcriptions of Interviews November 27, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IO:</strong> Okay well how about you show me how we get into the Internet and then we’ll look at a site together.</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> All right.</td>
</tr>
<tr>
<td><strong>IO:</strong> Okay so you tell me how we get in there.</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> Press Internet two times.</td>
</tr>
<tr>
<td><strong>IO:</strong> Okay Internet Explorer.</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> And then you write the class name.</td>
</tr>
<tr>
<td><strong>IO:</strong> Okay.</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> The password.</td>
</tr>
<tr>
<td><strong>IO:</strong> And then what happens?</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> And then it loads. Then you go…</td>
</tr>
<tr>
<td><strong>IO:</strong> So you were going to, from the um school site what Internet site would you go to after this one, what one would you like to go to?</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> Primary Site.</td>
</tr>
<tr>
<td><strong>IO:</strong> Okay which one would you choose once you’re in the Top Primary Sites?</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> Fun Brain words</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> And I go through lots of words.</td>
</tr>
<tr>
<td><strong>IO:</strong> That’s your favourite one in there is it?</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> Yeah I like to go to animals.</td>
</tr>
<tr>
<td><strong>IO:</strong> And you match words with pictures in this one do you?</td>
</tr>
<tr>
<td><strong>SP 2L:</strong> Yes.</td>
</tr>
</tbody>
</table>

### Planned Observation: November 22, 27 & 29 2002 Timetabled Computer Lab Session

<table>
<thead>
<tr>
<th>Selected transcriptions of Interviews November 29, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IO:</strong> Fantastic. What do you like the best about Kid Pix?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> I like um, it’s got all of the good art activities and all of the things you used to do like good ideas for art and you use them to do some good art and have ideas when you’re doing art.</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Yeah you press on start and then you go um documents, no not documents, programs, you go there.</td>
</tr>
<tr>
<td><strong>IO:</strong> Oops, start again. Start, programs, what’s the one at the top there? Do you know what it’s called?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Um access…</td>
</tr>
<tr>
<td><strong>IO:</strong> Accessories.</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Accessories.</td>
</tr>
<tr>
<td><strong>IO:</strong> Yep, fantastic. And what can we find in there?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Just looking for games.</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Yeah. So we could just go to paint.</td>
</tr>
<tr>
<td><strong>IO:</strong> So you could just go to paint as well, fantastic. I’ll ask you the second question now if you want to close the paint for me. Excellent; file and exit, okay. Imagine you have free time on the computer. What Internet site would you go to?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Billy Bear for Kids.</td>
</tr>
<tr>
<td><strong>IO:</strong> Why would you go there?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Because it’s got heaps of puzzles to do and I like doing jigsaw puzzles.</td>
</tr>
<tr>
<td><strong>IO:</strong> Fantastic, do you know how to get to Billy Bear for Kids?</td>
</tr>
<tr>
<td><strong>SP 2K:</strong> Yes.</td>
</tr>
</tbody>
</table>
SP 2K: Double click on Internet Explorer.
IO: Okay. What do you need to do now?
SP 2K: I need to type in my user name and password.
IO: Okay so now you’re on the Internet what do you need to do to find the Billy Bear for Kids page?
SP 2K: I need to look for Billy Bear for Kids; I need to look for Primary sites.
IO: Okay so how are you doing that, what are you doing? So what site are you on now?
SP 2K: I’m on the home page.
IO: Okay, beautiful.
SP 2K: …Internet
IO: You’re scrolling down.
SP 2K: Primary websites. Top Primary sites.
IO: What site did you just choose there?
SP 2K: Billy Bear for Kids, this is another way you can go in it.
IO: Okay and this site’s called?
SP 2K: Yahooligans.
IO: Okay fantastic, so you go into Yahooligans.
SP 2K: And I press, where’s the other box, now I press on there.
IO: Go to search.
SP 2K: I type in Billy Bear for Kids.
IO: Okay so you’re searching for Billy Bear for Kids on the Yahooligans site. And do you get anything that comes up?
SP 2K: Yes.
IO: Yep what comes up?
SP 2K: You get this up it says Billy Bear for Kids now you click on Billy Bear for kids, it says help there.
IO: What do you click on?
SP 2K: Billy Bear, Billy Bear Playground.
IO: Okay and what are some of the things that you can do in the Billy Bear for Kids site there now you’re there?
SP 2K: You can do heaps of puzzles and things.
IO: Okay and why do you like that site so much? What’s the best part about the site?
SP 2K: That’s its got heaps of stories and art things.
IO: Okay, fantastic. All right well we can stay on that page and I’ll just ask you the last question okay. Imagine you had free time again and you could do anything on the computer you liked, you had a choice of everything that’s on the computer, what would you choose to do?
SP 2K: Of everything that’s on here? So I would go on this one?
IO: And what’s that one? What’s this site here?
SP 2K: Billy Bear for Kids.
IO: You’d go on Billy Bear for kids if you could do anything?
SP 2K: Yes.
IO: Yeah, fantastic. Is it for the same reasons you said before?
SP 2K: Yes.
IO: Yeah, is there anything that you like most about Billy bear for kids?
SP 2K: Yes I like it because it’s got more other free books that you can read that you’ve never read before.
IO: So it’s got books there as well. What other things does it have?
SP 2K: Um it’s got other art activities and it’s got heaps more other things like art stuff, painting and all that.
APPENDIX H: AVERKEY INFORMATION

An Averkey is a video converter with which you can easily project any computer application on to a screen or television.

Averkey® system is manufactured by Avermedia

Sample usage
APPENDIX I: BASIC INDICATORS

BASIC INDICATORS

OBSERVATIONAL SURVEY AND RUNNING RECORDS

Note: the scores listed below need to be looked at in relation to your school and adjusted accordingly. The scores need to be looked at in conjunction with the hard data to give a true picture of a child's strengths and weaknesses.

END PREP/BEGINNING YEAR ONE

ORAL LANGUAGE - less than a score of 13- these students are at risk and may have difficulty with getting underway with reading and writing. They may experience difficulty with understanding and following the simplest of instructions and understanding stories that are read to them.

A lot of work needs to be done on oral language in order for, them to be successful.

Need to look at the hard data to see what sort of errors the child is making.

LETTER ID - less than 20 letters recognised means the child may experience difficulty problem solving on text. (50+)

- Look for a consistent/dominant mode in identifying letters. Is it consistent? If it is not the child may experience confusions.

WORD TEST (CLAY 15) - less than 10 will need assistance. (10+)

BURT WORD TEST (110) - simpler words than Clay - 20 words average, 30 words target. (20 – 30+)

HEARING AND RECORDING SOUNDS IN WORDS-DICTATION - less than 20 at the beginning of year 1 means the child will need extra support/assistance. (30+)

Must have:
- Every initial sound
- Some final sounds

CONCEPTS ABOUT PRINT - less than 12 will need extra support (17+)

Understand concepts of –
- Book handling (items 1,2,7,8)
- Directionality (items 3,4,5,6)
- Concepts about words and letters (Items 21,22,23)
- How does this test relate to their text level?

TEXT LEVEL - Minimum level 1 target level 5

WRITING VOCAB - 20-30 words

Look at the test, what sort of words is the child writing? (20 - 30)
END YEAR ONE

ORAL LANGUAGE - 28 +
LETTER ID - 54
WORD TEST -15
BURT - 40 AVERAGE, 60 TARGET
HEARING AND RECORDING SOUNDS - 32+
CONCEPTS ABOUT PRINT - 20+
TEXT LEVEL - MINIMUM LEVEL 15 TARGET 20
WRITING VOCAB - 40-60 WORDS
APPENDIX J: SAMPLE OF SCHOOL-BASED PLANNER OF INTEGRATED UNIT WORK: LIGHT & SOUND

### Integrated Unit: Light and Sound

**Year Level:** 1/2CAM; 1/2JOD; 1/2WAL  **Date:** Term Three 2002 Wks 1-5

<table>
<thead>
<tr>
<th>Points to remember</th>
<th>Key Understandings</th>
<th>Focus Questions</th>
</tr>
</thead>
</table>
| **Gathering Materials**  
What has already been produced in this area?  
What materials are available to us?  
Do we need to do any reading about this topic?  
Do we know any experts in this area? | - Light enables us to see things around us  
- Some objects make their own light – luminous  
- Other objects reflect light – non-luminous  
- Light travels in straight lines  
- Light is reflected when it meets objects.  
- Dark coloured objects reflect less light  
- Light is bent or refracted when it passes through things (eg water)  
- Shadows are formed when an object blocks light  
- White light is made up of a spectrum (red, orange, yellow, green, blue, indigo, violet) | - What light sources can we identify?  
- How do we classify luminous and non-luminous sources?  
- When are we able to find ways to observe the colours of the spectrum?  
- What observations can we make about reflecting light?  
- What sorts of things can be used to produce sounds?  
- What sorts of things can we do to make sounds high/low, soft/loud? |
| **Understanding**  
What do we hope students will understand about their social or physical world by the end of this unit?  
What is important and relevant for these students? | | |
| **Tuning In**  
How can we engage students in this topic?  
What media can we use? | | |
| **Preparing to find out**  
How can we assist students to pull it altogether?  
What curriculum processes would help here? (art, drama, language)  
How can we see if they are making connections? | | |
| **Related Experiences**  
How can we further students’ experience and understanding of this topic?  
How can we challenge the students’ ideas and give them new perspectives?  
Reflection and Action  
How can we empower students to act on what they have learned? | | |

### Vocabulary

- Light, sources, luminous, non-luminous, reflection, refraction, sun, stars, moon, electricity, light bulbs, flames, candles, rays, Sound, vibrations, loud, soft, high, low, frequency, waves, vacuum, air, particles

### Assessment Statements

- Does the child:
  - participate in simple experiments
  - show an understanding of how sounds are made
  - show an understanding of the features of light
  - identify the colours of the spectrum
### Resources

<table>
<thead>
<tr>
<th>Books</th>
<th>Video/Audio materials</th>
<th>Computer programs</th>
<th>Internet Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various Factual Texts</td>
<td>Videos</td>
<td></td>
<td><a href="http://www.brainpop.com">www.brainpop.com</a></td>
</tr>
</tbody>
</table>

### Date | Activity | Focus/Assessment | Inquiry Model
---|---------|------------------|------------------|
Discuss what understandings we already have about
Light
Sound

Record information in simple web format

Visit brainpop website and view video clip about light and sound.

Read factual text ‘Light and Colour’. Discuss.

Go outside and investigate own shadows at different times of the day. Discuss and compare findings.

Shadow puppets. Using an overhead projector make shadow puppets.

Make profile shadow. Trace onto sheet, cut out and guess whose profile it is.

Make a Water Prism. Investigate the colours of light. Paint spectrum.

Make paper glasses with different coloured lenses; view other coloured papered and guess what colours you think you saw(filters)

Blow bubbles – observe spectrum

Make a colour wheel. Spin and observe.

Investigate shadow stick clocks one sunny day.

1. **Tuning In**
   - Activities should provide students with opportunities to become engaged with the topic
   - Ascertain the students’ initial curiosity about the topic
   - Allow students to share personal experience of the topic

2. **Preparing to Find Out**
   - Establish what the students already know about the topic
   - Provide students with a focus for the forthcoming experience
   - Help in planning of further experiences and activities

3. **Finding Out**
   - Further stimulate the students’ curiosity
   - Provide new information which answer some of the students’ earlier questions
   - Raise other questions for the students to explore in the future
   - Challenge students’ knowledge, belief and values
   - Help students to make sense of further activities and experiences which have been planned for them

4. **Sorting Out**
   - Provide students with concrete means of sorting out and representing information and ideas arising from the ‘finding out’ stage
   - Provide students with the opportunity to process the information they have gathered and present this in a number of ways
   - Allow for a diverse range of outcomes
Ask chn to record things they have learned about light.

Re-visit simple web. Check if responses are still correct. Add any new learning.

5. Going Further
Activities should
- extend and challenge students' understanding about the topic
- provide more information in order to broaden the range of understandings available to students

6. Making Connections
Activities should
- help students draw conclusions about what they have learned
- provide opportunities for reflection both on what has been learned and on the learning process

7. Taking Action
Activities should
- assist students to make links between their understandings and their experience in the real world
- enable students to make choices and develop the belief that they can be effective participants in society
- provide further insights into students' understandings for future unit planning
APPENDIX K: VICTORIAN ESSENTIAL LEARNING STANDARDS: OVERVIEW AND STRUCTURE

Victorian Essential Learning Standards: Overview

This material is an extract from the Victorian Essential learning Standards by the Victorian Curriculum and Assessment Authority (VCAA), Australia. For more information visit http://vels.vcaa.vic.edu.au
# Victorian Essential Learning Standards: Structure

Within each strand of learning, the essential knowledge, skills and behaviours are organised into domains with further divisions into dimensions. Standards are written for each dimension. The relationship between the strands, domains and dimensions is shown in Table 1.

<table>
<thead>
<tr>
<th>Strand</th>
<th>Domain</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical, Personal and Social</td>
<td>Health and Physical Education</td>
<td>Movement and physical activity</td>
</tr>
<tr>
<td>Learning</td>
<td></td>
<td>Health knowledge and promotion</td>
</tr>
<tr>
<td>Interpersonal Development</td>
<td>Building social relationships</td>
<td></td>
</tr>
<tr>
<td>Personal Learning</td>
<td>Working in teams</td>
<td></td>
</tr>
<tr>
<td>Civics and Citizenship</td>
<td>The individual learner</td>
<td></td>
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<td></td>
<td>Managing personal learning</td>
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<td></td>
<td>Community engagement</td>
<td></td>
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<tr>
<td>Discipline-based Learning</td>
<td>The Arts</td>
<td>Creating and making</td>
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<tr>
<td></td>
<td></td>
<td>Exploring and responding</td>
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<tr>
<td></td>
<td>English</td>
<td>Reading</td>
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<td></td>
<td></td>
<td>Writing</td>
</tr>
<tr>
<td></td>
<td>Languages Other Than English</td>
<td>Speaking and listening</td>
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<td></td>
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<tr>
<td></td>
<td>Humanities</td>
<td>Communicating in a language other than English</td>
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<tr>
<td></td>
<td></td>
<td>Intercultural knowledge and language awareness</td>
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<tr>
<td></td>
<td>Economics</td>
<td>Economic knowledge and understanding</td>
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<tr>
<td></td>
<td></td>
<td>Economic reasoning and interpretation</td>
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<tr>
<td></td>
<td>Geography</td>
<td>Geographical knowledge and understanding</td>
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<tr>
<td></td>
<td></td>
<td>Geospatial skills</td>
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<tr>
<td></td>
<td>History</td>
<td>Historical knowledge and understanding</td>
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<td></td>
<td></td>
<td>Historical reasoning and interpretation</td>
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<tr>
<td>Mathematics</td>
<td>Number</td>
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<tr>
<td></td>
<td>Space</td>
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<td></td>
<td>Measurement, chance and data</td>
<td></td>
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<tr>
<td></td>
<td>Structure</td>
<td></td>
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<tr>
<td></td>
<td>Working mathematically</td>
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<tr>
<td>Science</td>
<td>Science knowledge and understanding</td>
<td></td>
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<tr>
<td></td>
<td>Science at work</td>
<td></td>
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<tr>
<td>Interdisciplinary Learning</td>
<td>Communication</td>
<td>Listening, viewing and responding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presenting</td>
</tr>
<tr>
<td></td>
<td>Design, Creativity and Technology</td>
<td>Investigating and designing</td>
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<tr>
<td></td>
<td></td>
<td>Producing</td>
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<td></td>
<td>Information and Communications Technology</td>
<td>Analysing and evaluating</td>
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<tr>
<td></td>
<td>ICT for visualising thinking</td>
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<td>ICT</td>
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<tr>
<td>Thinking</td>
<td>ICT for creating</td>
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<td>ICT for communicating</td>
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<td></td>
<td>Reasoning, processing and inquiry</td>
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<td></td>
<td></td>
<td>Creativity</td>
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<td></td>
<td></td>
<td>Reflection, evaluation and metacognition</td>
</tr>
</tbody>
</table>

### Table 1: The structure of the essential learning strands

This material is an extract from the Victorian Essential learning Standards by the Victorian Curriculum and Assessment Authority (VCAA), Australia. For more information visit [http://vels.vcaa.vic.edu.au](http://vels.vcaa.vic.edu.au)