Chapter 1. Introduction

Chapter 1 introduces the thesis by identifying the focus and describing the temporal and historical context of the study. The significance of the study is then highlighted. Finally, the strengths and weaknesses of the study are presented and the organisation of the thesis is outlined.

1.1 Focus of the study

This study essentially focuses on the interactions of people, mainly children, and technologies. In the broadest sense, technologies may be defined as the systematic ways in which practices are undertaken. Therefore, we may talk of technologies of farming, technologies of teaching or technologies of writing. A more commonplace and widely accepted understanding of the term is one that embraces tools that have become increasingly sophisticated as we move to the 21st Century. In this study, the term technologies will generally refer to tools or cultural artefacts that people use as they undertake activities in their daily lives.

People have always interacted with various technologies, creating new ones, helping to shape their meaning and significance through using them, and in turn being shaped by the technologies they use. As well, many technologies have had profound impacts on the broader social and physical environments within which people live. Technologies have always played an important part in children’s lives. Children directly experience technologies through their rich daily interactions with their toys and other objects both inside and outside their homes. They also have indirect experiences through their personal encounters with
society and its institutions, through their enriched or impoverished physical environment or through the expectations, attitudes and values that adults bring to such roles as parenting or teaching.

Of all the technologies currently available to children, and others in society, the communication and information technologies have particular social and educational significance. In particular, the computer and its related technologies are predicted to have significant transformative consequences for society and the individuals within it (Logan, 1995). Together with a range of other communication and information technologies, such as the television, video-recorder, telephone, stereo and radio, they are becoming a part of the fabric of children's daily experiences. This is occurring through their progressive presence in homes, schools, arcades, local libraries and other public and private spaces. The doctoral study focuses on two of these social settings, the home, arguably the most important one, and the school.

The idea for the doctoral study came about as a result of a graduate teaching programme where teachers, as part of their course work, collected data about what experiences and technologies the children in their classes had at home and reflected on how these could, would or should shape their teaching. In this sense, the study is 'problem-based', that is, the idea for the research stemmed from an observed phenomenon in the real world that was problematic. This idea of a real world 'problem' as the catalyst for research was central to Dewey's theory of inquiry (cited in Sherman and Webb, 1988) and was seen as a way of unifying theory and practice. Thus, while this notion is not a new one, the use of the label 'problem-based' to describe this doctoral study may be novel.

Part of what makes the observed phenomenon problematic is the realisation that not all families and all children share equal access to computers and related technologies in their lives. Educators need to be concerned about 'the information rich' and 'the information poor' and the growing gap between these two groups for the social and educational implications are significant. (Fatouros, Downes and Blackwell, 1994). As well, there is much evidence that boys and
girls do not participate to the same extent or in the same way in computing activities at home or at school (Clarke, 1987; Scott, 1996; Shashaani, 1994; Wheelock, 1992). It is important to understand the nature of these differences and the resultant social and educational implications. In order to do so, educators need to develop a rich and accurate picture of how children, who have access to computers in their homes, incorporate them into their lives; how they are shaped by their interactions with the computer and the socio-cultural context in which they use computers; and how, in turn, they reshape the computer to their own ends and reshape the socio-cultural contexts within which they use computers.

Much rhetoric exists around the notion that people are changed irrevocably through their interactions with technologies. Speaking generally about communication and information media, Meyrowitz (1985 and 1996) argues that media influence social organisation and behaviour. Logan (1995) argues that media not only have an impact on social patterns but also directly affect the psyche and the ways in which people think and learn. He argues that a medium of communication creates a sensory bias, and hence a new cognitive style. For example, he argues that the printed word encourages linear, sequential and analytic patterns of information processing and organisation and, alternatively, electronic media encourage holistic, integrated, synthetic, generalist, and metaphorical patterns. McLuhan (1964), well known for his saying, ‘the medium is the message’, warns that the changes are often subtle and hard to identify as patterns of perceptions are altered steadily and without resistance. Focusing on children and computers, the claims range from children now being considered ‘alien’ (Green and Bigum, 1993) to less graphic claims about them having evolved new learning skills, new forms of literacy and new media grammars which they bring into their learning environment (Heppell, 1994; Downes and Fatouros, 1995). This study explores one aspect of the relationship between children and computing technologies, how they interact within the home.

The home is an important site for the study of the interactions of children and computers because it is within their own home that children have a greater ability to negotiate their daily lives. Mayall (1994a) argues that compared to other social
settings, particularly the school, it is in the home that children have a relatively high ability to influence adults and social conventions. Thus in their homes, compared to their schools, children have greater control over how they interact with the computer. However, even within the home children are constrained by the decisions adults make about the allocation of space, time and other resources and their management of behaviour. In turn, adults’ decisions are influenced by a wide range of factors from the socio-cultural and economic environment outside the home.

In many ways the computer is an unusual technology within the home because, unlike most other domestic technologies such as the television, it has shifted from the government, business and education sectors into the home. Like the telephone, it was never originally conceived as a domestic technology. Haddon (1992) argues that the very nature of home computing arises, in large part, from processes and discourses outside the home. Murdock, Hartmann and Gray (1992, p157) identify four major discourses around the home computer which were operating by the mid 1980s. These were the discourses of:

- self-referring practice in which machines appeared as a space for creative activity and problem solving;
- ‘serious’ applications related to the schoolroom and workplace;
- game playing and fun which represented the microcomputer as another screen-based entertainment facility; and
- righteous concerns for the welfare of the young.

These competing discourses are possible because today’s domestic computer is a multifunctional technology. In the home, the multifunctionality is enabled through the use of a wide range of software and peripheral devices. An individual using a computer can accomplish many different tasks and activities ranging from exotic uses such as digitising video images to more mundane uses such as word processing. The same computer can, at different times, be a child’s game-playing machine or an adult’s telecommunications device for international business activity. Because of this multifunctionality, the study of children’s
interactions needs to take account of the variety of uses to which children and significant others in the home, namely adults and siblings, put the computer.

It is within this framework of environmental constraints, competing discourses and diversity of use that children actively negotiate with adults and others their own sets of interactions with the computer. The notion that children are actors and negotiators as well as being acted upon is a central tenet of the study. For this reason the study focuses on children’s own descriptions of their environments, their experiences and their activities; indeed, it puts them at the centre of the analysis.

The overarching goals of the doctoral study are twofold; the primary goal is to make a contribution to the knowledge about and understanding of the ‘lived’ experiences and interactions children have with computers in their homes; and the secondary goal is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools.

1.2 Background to the study

It is important to understand that the study was conducted at a particular time and that the computer, as a technology with its own history, is particularly characterised by its rapid rate of change and development. Its rate of change continually outstrips not only the pace of its dispersal and use but, more importantly, the pace at which its design, production, marketing, uses and impact can be scrutinised and can be influenced by other than technological factors.

In addition, the nature of childhood, families and their households is evolving, albeit at a somewhat slower pace. When considering the interaction between children and computers within their homes, we need to take account of the historical situation of the child and of the home, as well as the computer.

The school is possibly one of the few institutions whose culture and practices have changed so little in the last one hundred years that the average classroom would be instantly recognisable by all previous generations of school pupils
(Tyack and Cuban, 1995). While there are advantages to this type of stability in schooling, it can cause problems for children whose world outside school is rapidly changing and who themselves may be changing because of their interactions with this world and its technologies.

In brief, the following descriptions characterise the slice of time within which this study is situated:

- The increasing pervasiveness in our society of a wide range of new electronic technologies for communicating and information handling.
- The rapid evolution of these technologies. They are becoming more sophisticated, and they are converging from the older separate technologies of computing, electronics, telecommunications, and broadcast media. At the same time the price of the multifunctional microcomputer is decreasing and becoming more affordable as a domestic technology.
- There is a rapid increase in home ownership of computers. This ownership is not uniform across socio-economic and cultural boundaries nor across nations.
- These are significant changes in the physical and social contexts of family life and in childhood.
- Little if any significant changes have occurred generally inside schools, or with particular regard to the integration of computing into the learning process. While there has been an increase in the provision of computer hardware and related technologies and in the development of new policy frameworks, little if any changes have occurred in classroom practice.

In order to more fully understand the implications of the temporal context of the study, some of these aspects will be discussed further.

1.2.1 Changes in the domestic computer

The domestic computer is a multifunctional technology in continual evolution, and thus susceptible to change in both what it represents and how it is used. Following is a list of some of the changes that have occurred in the last ten years.
Abstract

- The first computers entered homes as ‘build yourself kits’ for the hobbyist. The second wave of computers were ‘ready built’ but their main use was programming. Today’s computers come with sophisticated operating systems, a wide range of software and peripheral devices such as printers, CD-ROM drives and modems. This dramatically increases the range of possible uses and users in the home.

- Early computers were difficult to use. Users needed to formulate commands with complex syntactical structures. Today’s domestic computer is relatively easy to use. User interfaces are more intuitive and rely on selections from menus and icons.

- The domestic computer is marketed as a multifunctional computer. There are no longer low-end games-only computers. Dedicated games machines, such as those produced by the Sega and Nintendo companies, now exist alongside the domestic computer. The state of the art graphic capability, a necessity for the latest games, continually shifts from being available on the latest multifunctional computer to being available on the latest dedicated game-playing machine. This fluctuation shifts the emphasis on game playing on the home computer to the dedicated games machine and back again over time.

- The place of sale of domestic computers now includes the homeware stores where it is sold alongside home furniture and other appliances as well as the specialist computer store. The typical domestic ‘package’ contains computer, operating system, applications software, a range of other educational and recreational software, a printer, CD-ROM drive, microphone, speakers, and more recently an inbuilt modem.

- New technologies, for example modems and now digital scanners and cameras, are regularly being added to the domestic market, continually changing the range of possible uses in the home.

These are but some of the changes that have contributed to the significant shift in what was ‘home computing’ in the early 1980s to what it is today. These changes have implications both for reflections on previous studies of the domestic
computer and, in this doctoral study, for understanding the role of the computer in the home.

1.2.2 Changes in families and childhood

In the last few decades there have also been significant changes in childhood, albeit at a lesser pace than the changing computing technologies. Some of these changes relate to the changing nature of families. For example, there have been changes in the number of single-parent families; in the numbers of families where both parents work; and in lifestyle decisions based on parental perceptions about safety in the community. Regardless of these changes, families still maintain a stable authority relationship: that of parents over children. Understanding the nature of today’s family is important in the context of this study as family life helps define the socio-cultural context of children’s home computing. It also contributes directly to changes in childhood and the defining characteristics of today’s child. Some of these characteristics are:

- the more child-centred approaches to raising children (Zinneker, 1990);
- the regulation of out-of-school hours outside the home, often structured with sporting, cultural and recreational activities and at the same time the deregulation of inside-home life, including control over media activities (Ennew, 1994; Ward, 1994);
- the increasing number of Australian children born into homes with computers and other electronic technologies as part of the furniture (ABS, 1994); television is still the dominant electronic medium in children’s lives (Cupitt and Stockbridge, 1996; Kubey and Larson, 1990); and leisure activities such as reading and outdoor and indoor unstructured play have decreased, but not necessarily in direct response to increased access to electronic media in the homes (Ishagaki, 1986).

Such characteristics suggest that while today’s children have less freedom outside the home, within the home they have increasing control over a range of media activities, which include computer use.
1.2.3 Changes in schools

Although it might be accurate to say that the physical environment of schooling and aspects of teaching practice have changed little in the last hundred years, there have been significant changes occurring in education at the systems level. Several of these changes are significant for this study. These include:

- The Australian teaching profession is ageing. The majority of today’s teachers grew up and were educated in a world dominated by print. Their personal control over print-based processes played a major part in their becoming teachers and continue to play a role in their work as teachers;
- There is also an increased awareness of schools as sites for the development of human capital (Marginson 1993);
- There are clear shifts in government policy towards centralised curriculum, school-based management, and assessment for accountability.

At the government and systems levels there has also been considerable attention paid to computers in schooling. From the early 1980s there have been numerous national reports and projects (Commonwealth Schools Commission, 1983; Commonwealth Schools Commission, 1984; Commonwealth Schools Commission, 1985; House of Representatives Standing Committee on Employment Education and Training, 1990); curriculum statements at both the national and state levels (Australian Education Council and Curriculum Corporation, 1994; Education Department of South Australia, 1987; Education Department of Tasmania, 1985; Queensland Department of Education, 1983; Queensland Department of Education, 1990); significant funding initiatives in recent years to improve the provision of computer hardware and infrastructure for schools and professional development initiatives by the various educational systems (for example, the NSW Computers in Schools Policy (CISP) is providing $184 million over 4 years (1995-9) for linking all schools to the Internet, for a roll-out of computers to provide a ratio of 1:14, and for curriculum materials and training for 15000 teachers across the state). Notwithstanding these initiatives, there has been little widespread adoption of computers for teaching and learning.
in schools (Bigum et al., 1987; Fitzgerald, Hattie and Hughes, 1985; Shears, 1995).

1.2.4 Implications of these contextual factors for the study

The above social and technological factors place this study in a particular historical context, a particular slice of time in Australian history. As well as mapping out the broader technological and socio-cultural context of the study, they make problematic any simple definition of a 'computer' that might be found in a child's home. Similarly, they also make problematic any fixed notion of family or childhood. For these reasons, the study needs, in part, to focus on a careful description of the diversity of conceptions of the major 'actors' in the study: computers and children. In this way, the findings and interpretations of the study may have value beyond the actual historical timing of the study.

1.3 Significance of the study

The study is significant for a number of other reasons. Firstly, it makes two theoretical contributions. These are a contribution to the continuing discourse on multi-disciplinary frameworks for theory building and the development of a middle range theory relating to children's interactions with the computer.

Secondly, the study has far-reaching pedagogical implications. There is no doubt that the capacity of computing technology is going to make a major difference in the economic, social, cultural and physical world in which we live. Many pundits believe that the pace of change is increasing to the point that society will experience quantum leaps forward rather than small evolutionary steps in our use of and reliance upon the new communication and information technologies (Kelly, 1994; Negroponte, 1995). This study provides insights that increase our understanding of how this generation's children will handle the 'brave new world' into which future generations of children will be born. Each of these contributions will be discussed in turn below.
1.3.1 Theoretical contributions

The development of a theoretical framework for considering interactions of children and computers in their homes was indeed a difficult process. Neither traditional psychological nor sociological theories by themselves could illuminate a pathway to a better understanding of the interactions of children and computers; nor could theoretical perspectives based on the technology itself. Finally a blended theory that draws on concepts from the Theory of Affordances (Gibson, 1979), and perspectives from cultural studies theories and the newly emerging childhood studies (James and Prout, 1990) was constructed. Chapter 2 describes the journey to development in detail.

The critical analysis of existing theories and the developed theoretical framework both make a significant contribution in terms of understanding the various frameworks for considering problems and issues that arise out of the daily interactions between people and technology. The analysis highlights the convergence of various theories around the notion of reciprocity where both person and technology are ‘actors’ and ‘acted upon’. Such reciprocity avoids both the techno-centric and socio-centric approaches. The blended framework is significant in the fact that it draws on the newly emerging field of childhood studies to place the child at the centre of the study, as both focus and informant, and as both a psychological and sociological conception. In this way, the framework integrates the psychological and sociological domains as well as structural and poststructural perspectives.

The middle range theory that is developed explains how children and computers interact within the domestic environment. As such, it provides for parents and educators a better understanding of how and why children conceive of and use the computer in particular ways. In this way, the theory debunks the commonly held notion of the computer as ‘just a tool’, or a neutral technology that can be shaped by teachers’ practices in classrooms. It acknowledges that computers in schools will come already inscribed with the marks of other social uses.
Furthermore, children will arrive at school with informal competencies and predispositions developed from the use of computers outside of the school.

1.3.2 Pedagogical implications

Most of the teachers in today's schools grew up before and indeed were trained before the advent of computers in children's lives. Logan (1995) argues that these teachers cannot fully comprehend the changes or the implications of these changes, because they view them through the eyes of a past era. As schooling cannot wait for the future generation of teachers who have grown up with these new domestic and other electronic technologies, education systems need to have strategies to help teachers recognise these changes, come to grips with them and even exploit them in ways which enhance children's learning.

The failure of schools to respond to these challenges of the new technologies and to the possibility of 'new' children will increase the alienation these children feel between the world they experience in and outside school. Their 'outside the school' world of leisure, entertainment and informal learning will be increasingly based in the electronic media while their classroom world of formal learning will continue to be embedded in print. As well, the newly emerging capabilities that these children bring to their learning outside of school will continue to be ignored inside school. Qvarell (1986) has already found that children describe marked differences between their inside school and outside school learning.

By providing a well-grounded insight into children's 'lived' experiences and activities with computers, this study can contribute to the development of strategies to reform schooling. This will allow educators and media pundits to move away from strategies based purely on speculation and rhetoric and to use strategies based on verifiable accounts of what happens.
1.4 Strengths and limitations of the study and the organisation of the thesis

To conclude this introduction to the thesis, the strengths and weaknesses of the study are presented and the organisation of the thesis is outlined.

1.4.1 Strengths and limitations of the study

As mentioned in Section 1.1, the rapid rate of technological change outstrips the time taken to engage in and write up a doctoral study. In this sense, the technology will always be ahead of any sustained study of its impact. By the time this thesis is read, new technologies will be available in homes, and children and the other members of their families will be exploring new ways of using them. However, in this study the most important contribution to new knowledge is the deeper understanding of the interaction between children and computers, therefore the actual recency of the technologies used is relatively unimportant. What is more important is how this interaction changes the behaviours and capabilities of the children and the implications of these changes for schooling.

A second special feature of the study arises out of the fact that the data which was analysed in this study was collected as part of a research project funded by Compaq Computers and the University of Western Sydney. The common purpose of the project and the doctoral study was to describe how Australian children used computers in their homes and to create a rich collection of data that could be reanalysed within a more comprehensive and sophisticated theoretical framework.

The doctoral study also draws on unpublished data from the Australian Bureau of Statistics’ [ABS] 1994 and 1996 surveys of household use of information technology. This data only became available during the data collection phase of the study, so its findings were not available in time to help shape the study. However, the data is included in the literature review as the findings act as a form of triangulation of the data collected in the doctoral study. The analysis of this data, of itself, is significant, because the two published reports of the ABS only
include tables and analyses relating to general households within Australia. The current study drew upon a range of data that is available on request from the ABS but will not otherwise be published.

1.4.2 Organisation of thesis

Chapter 1 introduced the thesis by identifying the focus and describing the temporal and historical context of the study. The significance of the study was then highlighted. Finally, the strengths and weakness of the study were presented and the organisation of the thesis outlined.

Chapter 2 presents the analytical route taken to develop a theoretical framework of the study. It begins with a critical analysis of a range of theories and perspectives commonly used in educational computing and related fields and moves onto the definition of the blended theoretical framework to be used in the study. It ends with an elaboration of the goals of the study, through the formulation of four sets of questions.

Chapter 3 presents a review of the literature for the purposes of finding out how the phenomenon of children’s interactions with domestic computers and related fields of enquiry have been researched, and what contributions the findings of that research can make to refining or redefining the contexts, constraints or focus of this study. The Review is organised around Bronfenbrenner’s levels of context: the macrosystem, the mesosystem, exosystem and microsystem (the home). In each of these sections key themes, trends and issues are identified and discussed.

Chapter 4 presents a description of the methodology of the doctoral study. It begins with an overview and rationale for a multi-method, multi-staged design. Following from this is a brief discussion of the issues related to the design of the study. Finally, the details of each step in the three stages are outlined.

Chapter 5 is the first of three chapters of results. It deals with the contextualisation of family computing and the affordances of the home computer
in terms of its functional and symbolic meanings. The chapter begins with an analysis of the physical and social contexts of children’s home computing that emerged from various stages of the study. It ends with a discussion of the affordances of the family computer as shaped by the functional and symbolic meanings that evolved in the above contexts.

In Chapter 6, the focus shifts from the contexts of children’s computing to their actual uses; from the concept of the computer as a conceivable phenomenon to the concept of the computer as a useable phenomenon. The chapter begins with a detailed description of the range of children’s activities with the home computer. Out of this comes a tentative framework of children’s uses. This framework is used to systematise the nature and purposes of children’s use. From this comes a clearer picture of the multidimensionality of children’s uses: they can be leisure or work-related, playful or purposeful. The chapter ends with a discussion about how children come to create through their activities an affordance of the computer as ‘playable’.

In Chapter 7, the focus shifts from the home to the school. The chapter begins with the views, interests and expertise of the teachers. The second part of the chapter focuses on children’s reports about what they do with computers at school, how often they use them, and their views of ‘school computing’. These reports are analysed in ways that highlight the similarity and differences between home and school, that reflect on issues already identified in the previous two chapters and that raise for the first time issues associated with school computing. The analysis of these issues adds to the growing lists of issues that home computing places before today’s educators.

The final chapter, Chapter 8, provides a summary of the thesis by restating the goals of the thesis and summarising the major findings. The significance of these findings and their implications are then presented. After this, a review of the study is undertaken, and suggestions for further research are made.
1.4.3 Conclusion

As stated on p. 5 the overarching goals of the doctoral study are twofold; the primary goal is to make a contribution to the knowledge about and understanding of the ‘lived’ experiences and interactions children have with computers in their homes; and the secondary goal is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools. The actual questions that elaborate the goals and drive the study are formulated in Chapter 2 after the development of a theoretical framework.
Chapter 2. In search of a theoretical framework

Chapter 2 presents the analytical journey to the development of a theoretical framework for the study. It begins with a critical analysis of a range of theories and perspectives commonly used in educational computing and related fields and moves on to the definition of the blended theoretical framework to be used in the study. It ends with an elaboration of the goals of the study, through the formulation of four sets of questions.

2.1 Introduction

In doctoral theses, analyses of the theoretical literature are commonly incorporated into the general review of literature. In this thesis, the theoretical literature is analysed separately in this chapter which is followed by a chapter that analyses the empirical literature. The decision to proceed this way stemmed from the nature of the study, a ‘problem-based study’ in the new interdisciplinary field of educational computing.

As mentioned on p. 2 of the thesis a significant feature of this study is that the original research idea was conceived in response to an observed phenomenon in the lives of children in the classes of the author’s graduate students (Downes, 1994). The phenomenon observed was children’s high degree of home computer ownership in some classrooms compared to little in others, and a lack of knowledge on the part of the teachers about how those children who had computers used them. In this sense, the study arises from an observed phenomenon in the daily work of the researcher, not from the researcher’s
interest or expertise in a particular theoretical position. This does not deny the fact that the researcher, through experience and personal philosophy, did not already have some preferred paradigmatic and theoretical ways of viewing the world but rather, recognises the study as one that is fundamentally exploratory and interpretive in nature, conceived in response to an observed phenomenon rather than in response to a particular theoretical position.

The field within which the observed phenomenon is situated, educational computing, is a new field. It is one of the many emerging fields of academic study that is truly multi-disciplinary. In this study, the problem is to understand the interactions and relationships between the child and the computer in the home. As an interpretive work, it could benefit from multiple perspectives using theories that draw on the perspective of the child, the psychological; of the context, the sociological; and of the computer, the technological. While it is recognised that such blending may not be seamless, it may well be more powerful than the use of any single theory. The search for a theoretical framework that can provide a powerful explanatory and predictive basis for the phenomenon is a significant part of the study.

The study needed a theoretical framework that provided constructs and relationships with the power to describe, explain and predict the events which occur at the meeting place of children and computers in the home. In the following section a number of theories drawn from a variety of perspectives are carefully analysed for their potential contribution to a deeper understanding of children’s interactions with computers in the home. Such a careful and extended analysis is necessary to underpin the later definition of an emerging blended theory which, for the purposes of this study, best fits the meeting place of children, computers and homes.

Initially it appeared that it was a simple matter to align all theories within one of the three perspectives: psychological, sociological or technological. The following analyses, however, reveal that as the three elements of person, society and technology begin to achieve equal status, as both actors and ‘acted upon’,
within different theories, the three broader perspectives begin to converge within these theories.

2.2  **Theories emanating from a psychological perspective**

A number of different psychological theories have been used in the study of adults’ and children’s use of computers. In general these are based on a perspective of ‘impact’ studies where the individual is affected by their use of the computer or related technologies (Braun and Giroux, 1989; Ferrari, Klinzing, Paris, Morris and Eyman, 1985; Kubey and Larson, 1990; Rhee and Bhavnagri, 1991; Siann, Macleod, Glisso and Durndell, 1990; Silvern and Williamson, 1987; Silvern, 1985-1986). Following is an analysis of three theories that have the potential to contribute to the current study. Each of the three approaches share emphases on the ‘contextualised’ and/or ‘active’ child. Only the last approach, cultural psychology, also includes cultural artefacts as separate elements within its theory.

2.2.1  **Ecological psychology**

Bronfenbrenner’s ecological systems theory (Bronfenbrenner, 1979) sees the developing child within a complex system of relationships affected by multiple levels of the surrounding environment. These levels extend the child’s environment beyond the immediate to include other social settings outside of the child’s experience that none the less affect her/him. As well, it sees a significant role for the wider social-cultural context. Bronfenbrenner describes four nested levels that influence the child’s development:

- **The microsystem** that refers to the activities and interaction patterns in the child’s immediate surroundings, such as the home.
- **The mesosystem** that refers to the connections between the various microsystems such as the home, the school and the neighbourhood.
• **The exosystem** that refers to the social settings that do not contain children but which affect the child's experiences in immediate settings. An example of this might be the parent's workplace.

• **The macrosystem** that refers to the values, laws and customs of a particular culture.

Importantly, Bronfenbrenner stresses that all relationships are bi-directional and reciprocal within these levels. He sees children as both products and producers of their environments in levels in which they participate.

This theoretical framework was originally derived to provide a more sophisticated scientific paradigm for investigating the impact of the environment in child development and as such, in practice, underplays the role of the child as a 'producer' of his/her environment. However, it does offer a conceptual framework for positioning the home (and the school) within the wider social context and for discussing the relationship between both mesosystem and exosystem influences on the home environment. What it lacks is explicit recognition of the role of the cultural artefact. Conceivably, the reciprocal and bi-directional interaction of children and cultural artefacts as well as adults and other children, at the microsystem level, would be consistent with the overall theory. For these reasons, this theoretical framework is able to make a significant contribution to the development of a theoretical framework for this study, because it provides a way of categorising the socio-cultural context of children's computing.

### 2.2.2 Social constructivist approaches

Social constructivism, a variant of the theory of constructivism, also offers the current study some important concepts. Its basic tenet is that individuals interact with their environment and actively construct knowledge by interpreting and making sense of their experiences. What social constructivism, from a Vygotskian basis, adds to the basic tenet of constructivism is the contextualisation of this interaction and interpretation in a socio-cultural environment where interaction with others impacts both on what is learned and
on how it is learned. In this approach a common body of knowledge is built and shared by a social group through interaction and then it is internalised by the individual. The process of internalisation involves some personal ‘adaptation’ of the socially constructed meaning. Some theorists in this field, for example, Cobb and Bauersfeld (1995), also recognise that the individual’s actions and interactions and the socio-cultural context are reflexively related. That is, individuals actively contribute to the development of a socio-cultural context that both enables and constrains their actions and interactions. This takes Bronfenbrenner’s notion of children as both products and producers further by denoting their power to actively construct their own knowledge within socio-cultural contexts that they, themselves, have helped shape. Of all of the psychological theories examined, this is the one with the most active role ascribed to the individual.

This approach also highlights the importance of social interaction and the role that adults and others with expertise can play in supporting learning. What it does not do is provide any useful constructs which recognise the power of cultural artefacts to help shape the socio-cultural context nor does it elucidate the nature of the interactions between individuals and their technologies.

2.2.3 Cultural psychology

Crook (1992) defines cultural psychology in the following way:

Cultural psychology confronts the fact that human development occurs in an environment fashioned by the creative activity of very many previous generations. It invites us to pay special attention to this feature of the human condition; to recognise that development takes place in a medium of culture. It dwells on our engagement with the various technologies and the various social rituals that have evolved to mediate our interactions with the material environment and with each other. (p.223)
The above approach differs in a number of ways from more traditional psychological approaches. It foregrounds the role of the artefact, it makes the child-in-context the unit of analysis and it makes central the issue of ‘mediational means’. Crook (1992) argues that this approach is more appropriate for the study of the social development of children interacting with computers because it acknowledges that children’s social experiences occur within particular settings and are organised around artefacts that shape the nature of the social interactions that unfold.

This theoretical framework recognises the importance of all three elements: the child, the artefact (computer) and the environment. However, it fails to emphasise the child as active, that is, the child who shapes the context and the cultural artefact at the same time as being shaped by it. In this sense, while recognising cultural artefacts as key elements in the social development of the child, it ascribes less agency than the previous two theories. It also fails to provide useful constructs to better understand the ‘mediational means’ of the interactions between child, computer and the socio-cultural context.

2.2.4 Conclusion

While the above psychological theories mainly focus on an understanding of social and cognitive development, they do provide some useful concepts for thinking about the nature of children’s interactions with computers in their homes.

All three theories stress the importance of the socio-cultural context within which interactions take place. In this study, the home and the social system of the family as well as the world outside the home provide that context. Of particular importance will be the beliefs and practices within the microsystem, the home, which enable and constrain children’s interactions with the computer, as well as those activities of the child that help construct those beliefs and practices. Importantly, social constructivist theories provide some key concepts for explaining how children construct their knowledge through the processes of developing shared understandings with those around them. Finally, through
Bronfenbrenner’s ecological systems theory, the importance of the indirect contributions of the wider socio-cultural contexts (mesosystem, exosystem and macrosystem) outside the home can also be highlighted.

2.3 Theories emanating from a sociological perspective

To date sociological theories, or those derived from them, have made little contribution to the understanding of children’s interactions with computers. This is not to say that sociologists have ignored this new technology, but rather, they have concentrated on theories which provide frameworks for understanding the social construction of technology in the adult world, particularly in terms of the way economic and military interests have shaped technological choices and discourses and the interaction of these with social class and gender. Interest in children seems to have been lacking. It would appear as if sociologists generally regard the relationship between children and computers as a psychological phenomenon. Buckingham (1993a) in the early 1990s laid a similar complaint about sociologists’ lack of interest in children and television.

At a broader level, there have been continuing concerns about the many branches of sociology ignoring childhood, or treating it from the perspective of socialisation theory, which, according to James and Prout (1990), only regards childhood as a rehearsal of adult life. From this perspective, children are passive subjects of structural determinations, not unlike the role children have in behavioural theories within the psychological tradition. In response to this concern, childhood studies or the sociology of childhood is emerging as a separate field of study within sociology.

2.3.1 Childhood studies

A complex range of reasons exists for the emergence of a field of childhood studies. These reasons are carefully presented and discussed by James and Prout (1990). In summary, they are:
the increasing problematisation of childhood as images of famine, war, poverty, and the growing awareness of child abuse challenge traditional beliefs of childhood. This builds on the work of Aries (1962) which looked at the historical changes in conceptions of childhood;

the ‘silence’ of children’s voices in empirical research about and for children. Too often they are represented as immature adults or in the passive voice as recipients of adults’ attention and treatment, or as mentioned above, the subjects of structural determinations;

the dissatisfaction with developmental theory and socialisation theory as the organising basis for any theoretical frameworks in sociology and other disciplines for empirical research and policy development relating to children.

While James and Prout (1990) clearly state that this paradigm is still developing theoretical and empirical frameworks, they offer the following six features as defining this new paradigm. These features are:

1. Childhood is understood as a social construction. As such, it provides an interpretive frame for contextualising the early years of human life. Childhood, as distinct from biological immaturity, is neither a natural nor a universal feature of human groups but appears as a specific structural and cultural component of many societies.

2. Childhood is a variable of social analysis. It can never be entirely divorced from other variables such as class, gender or ethnicity. Comparative and cross-cultural analysis reveals a variety of childhoods rather than a single and universal phenomenon.

3. Children’s social relations and cultures are worthy of study in their own right, independent of the perspective and concerns of adults.

4. Children are and must be seen as active in the construction and determination of their own social lives, the lives of those around them and of the societies in which they live.
5. Ethnography is a particularly useful methodology for the study of childhood - it allows a more direct voice and participation in the production of the sociological data than is usually possible through experimental or survey data.

6. Childhood is a phenomenon in relation to which the double hermeneutic of the social science is acutely present. That is, to proclaim a new paradigm of childhood sociology is also to engage in and respond to the process of reconstructing childhood in society.

The first four of these features have importance for the current study. In particular, the notion of childhood as a social construction stresses the importance of understanding childhood as it exists and is portrayed today through both the discourses that surround childhood and the ‘lived’ experiences of children. Children’s interactions with computers can only be understood in terms of the wider conceptions of their childhood. For example, much of the rhetoric around issues of concern by politicians and parents about children’s playing of violent computer games stems from conceptions of children on the one hand as innocent and in need of protection and on the other hand as vulnerable to corruption and even potentially dangerous.

Also, of great importance is the active role children are given in their social lives. While many other theoretical frameworks also stress this characteristic of children, childhood studies, with a strong basis in interpretive sociology, provides useful concepts by drawing on Giddens’ (1979) theory of structuration. This theory provides a view of how structure and agency relate to each other, and stresses that they co-exist as complementary partners of the one process:

Every act which contributes to the reproduction of a structure is also an act of production, and as such may initiate change by altering the structure at the same time as it reproduces it. (Giddens, 1979, p. 69)
This problem of the relationship between structure and agency, or in Bronfenbrenner’s terms the child as both ‘product’ and the ‘producer’, is rarely tackled by other theories. In the main, their proponents seem content to recognise both the active and acted-upon role of children, but do little to elucidate the relationship between the two. This study, which focuses on the interactions between children and computers in the home, needs to be framed by a theoretical space which provides for both structure and agency and facilitates exploration and explanation of the links between the two. This aspect of childhood studies, as derived from Giddens’ work, provides an essential part of a theoretical framework for the current study. According to James and Prout (1990), the attribution of agency to children is a significant contribution of childhood studies.

2.3.2 Cultural studies

Cultural studies as a theoretical approach also provides some useful concepts for the study. Originally blended from an encounter with literary studies and sociology, it draws on a wide range of theoretical approaches, such as post structuralism and the broader socio-cultural theories of language and cognition. Slack (1989) states that the central questions of cultural studies involve the role of ideology and power in the relationship between textuality, discourse and social practice.

Two of these terms, text and discourse, need defining for the purposes of this study. Luke (1995-6), drawing on the work of Foucault and others (Foucault, 1972; see also Collins, 1989; Gee, Michaels and O’Connor, 1992; Kress, 1985), defines the essential terms, text and discourse. He defines ‘text’ as “language in use...any instance of written and spoken language that has coherence and coded meanings...texts are those artefacts of human subjects’ work at the production of meaning and social relations.” (Luke, 1995-6, p.13). Texts include talk between parents and children, teachers and children, and among children, artefacts such as stories, advertisements, government policies, documentaries, and computer software such as games or word processing software. These texts have both a constructive and constitutive role. Luke (1995-6) explains that texts can position
and construct individuals and groups, making available various meanings, ideas and versions of the world. At the same time, they are used by individuals and groups to make sense of their world and to construct social actions and relations.

Discourses are recurrent themes and wordings that are systematically organised and which give expression to identifiable systems of meaning and fields of knowledge and beliefs (Kress, 1985; Luke, 1995-6). According to Luke, texts are often multi-discursive and individuals, in negotiating everyday life, assume various positions in discourses. Authors such as Collins (1989) argue that discourses, particularly those that become the dominant socio-cultural discourses, normalise particular power relations, ways of knowing and belief systems almost as if they were common sense.

Buckingham (1993a) has applied this theoretical framework to some major empirical work with children and television. In doing so, he argues against the more common structurally deterministic views of the role of class, ethnicity and gender in favour of a more active view of children who help shape their own social and cultural position. This approach recognises the position and power of the person - the child; the technology - the television; and the social context. It has in many ways the best fit in terms of the current study about children, computers and homes. It recognises the inter-connectedness of people, technology and context (social, cultural and historical) and it ascribes a dual role (actor and ‘acted upon’) for children in terms of their interaction with the technology, as well as with their social position. It also provides concepts such as ‘discourse’ and ‘text’ to explain how the relationships between children, technology and the social context are mediated. Morley and Silverstone (1990) have used this theoretical approach in their studies of domestic computing. They defined the technology as a text in the sense that there is a discourse of computers and computing that influence its meaning and relevance in everyday life.

Buckingham (1994), in his later work with children and television, takes it further in as much as he applies the notion of ‘text’ to the programmes that children watch on television. In this sense, television is a complex network of
texts. In Buckingham’s approach children, as viewers or ‘readers’ of these texts, construct reality from these texts at the same time as being positioned by them through the mediation of the discourses in which children participate. While this may also be so for children who interact with computers, there is a significant theoretical problem in not recognising that the computer is more than a text, an instance or artefact of language in use. It is a multifunctional tool that enables people to undertake a range of physical and intellectual tasks. The question that arises is whether the interactions between child and computer can be fully explained in terms of readers, writers and texts; or whether the interaction between child and computer needs to be viewed, at times, as an interaction between a person and a non-textual artefact. This latter perspective implies that aspects of the interactions between child and computer need to be thought of in the same way as interactions between people and the tools of physical work such as hammers, tennis racquets, telephones or typewriters.

2.3.3 Conclusion

Both childhood studies and cultural studies offer much to a developing theoretical framework for the study. Their post-structural approaches oppose the notion that individuals or groups have singular, essential or fixed identities because of their socio-cultural characteristics, age or gender. They assume that subjectivities are constructed and contested through textual practices and positionings within discourses in everyday life. In many ways, the approach they adopt is consistent with the notion of the shared construction of knowledge put forward in the theories of social constructivism. What it lacks is a strong conceptual basis for explaining interactions with the tool-like features as well as the textual features of the computer.

2.4 Theories emanating from a technological perspective

A number of technological theories exist which attempt to explain the relationship between technology, society and individuals. These include general theories of the social construction of technology, and two specific theories, the
theory of the computer as an evocative object, and the theory of affordance. Each of these theories has the potential to make a significant contribution to the doctoral study.

2.4.1 The computer as an evocative object

Turkle’s (1984) theory is that the computer is an evocative object. As well as being instrumental, she argues that it is a projective medium that stimulates children’s thinking about their physical and psychological world. She postulates that there are three stages in children’s relationships with the computer. They are the metaphysical, mastery and identity. In the metaphysical mode, which dominates the early childhood years, children construct theories that help them situate the computer in the world of living and non-living things. They tackle concepts such as animate and inanimate, conscious and not conscious. They are reflective about their world and the place of the computer. In the mastery mode, which is linked to the primary years, children are more concerned with ‘winning’, with mastering the computer and the wide variety of games available on the computer. Turkle sees this time as a time of action rather than reflection. Seeking challenges is a dominant activity in this mode. In the identity mode, which is dominant in the early adolescent years, experiences are focused on questions of identity, making sense of self, particularly in relation to how others see the self. Turkle argues that sexual identity is an important issue at this stage.

These three modes of relating are not exclusive. An individual can relate in all three ways, but for many, as a function of their age, personality and social world, one of them becomes predominant. Turkle further found that these modes also related to differences in adults’ relationships with computers, where the computer played a large part in the adults’ lives.

Turkle builds her theory on data collected in the early 1980s from children and adults, where the use of computers formed a large part of their lives. The adults were programmers, PC owners or those interested in artificial intelligence. Given the year of the study, these adults would have to be considered innovators with the technology. The children were also significant users of computers and related
technologies at a time when they were still considered novel. In fact, the timing of this study places it at a period where strong social discourses about computers had yet to emerge and the individual’s familiarity with computers preceded a wider social or cultural familiarity.

One of the strengths of Turkle’s theory, in terms of the focus of the current study, is the balance between the perspective that the technology has a determinative impact and the opposite extreme that technologies can only be understood in terms of the meanings people give them. Another is the recognition that the computer is a particularly rich and varied technology that can serve a wide range of purposes. This fits comfortably with the notion of the multifunctionality of the computer and with the notion that different children may interact with the computers in markedly different ways. Certainly all the participants in Turkle’s study had gone beyond instrumental uses.

However, there are a number of limitations with Turkle’s theory. Firstly, it pays too little attention to the wider social and cultural context. There is no conceptual framework for linking the actions and interactions between the individual and the computer with the broader social and cultural situation, nor with the specific situation in which these individuals encountered the computers and related technologies.

Secondly, there is a sense of exaggeration of the power of the computer to evoke. Turkle fails to contextualise the cognitive or intellectual development of the children she is working with. Research about children’s emerging theory of mind would suggest that many objects, experiences and events in the daily lives of younger children evoke thinking about concepts such as ‘real’ and ‘unreal’, ‘live’ and ‘not live’ (Dockett, 1994; Flavell, Flavell and Green, 1987). In this context the computer would be yet one more stimulant for this type of metaphysical thinking, albeit one whose opaque processes and properties might be a particularly sharp stimulus. Similarly, older children in their non-computing life are involved with a wide variety of play situations where mastery of games with rules is a natural part of their lives and many early adolescents are immersed in
their search for identity through their peer relations and the images they are presented with in the media as well as their close personal relationships. What Turkle’s theory fails to answer is whether the computer can evoke new or novel insights in the minds of the children using it or whether it behaves in the same way as many other cultural artefacts.

For the purposes of the current study, the theory of the computer as an evocative object has limited application. It focuses too heavily on the ‘agency’ of the computer at the expense of the role of the socio-cultural context.

2.4.2 Social construction of technology theories

A variety of theories exist under the banner of social construction theories of technology. As a group of theories, they concentrate on the relationships between technology, society and culture. Generally, these theories share the view that technological artefacts do not possess capacities solely through the virtue of their physical and technical features. The nature, form and capacity of a technology is the result of the social relations involved in its design, manufacture and production and the symbolic meanings derived from ‘the social’ as constructed in and through discourse, meaning and representation. Critiques of the theories, from within the community of involved scholars, focus on whether technical phenomena are shaped by social processes or whether they are, in fact, constituted by social processes (Grint and Woolgar, 1995). This debate is central in the development of a theoretical framework for this study. The former position gives some agency to the technology as constituted by its form and function, albeit acknowledging the role of ‘the social’ in shaping its form, its function and its use. The latter denies such possibilities.

The theoretical framework for this study cannot afford to privilege either the social or the technological, just as it does not denote the child as either ‘actor’ or ‘acted upon. The notion of reflexivity is central to the framing of the study. Thus in this study, the former view is taken: technical phenomena are shaped by social processes.
2.4.3 Affordance theories

In pursuing the notion of the reflexive relationship between the technology, the person and the socio-cultural context, the concept of ‘affordance’ was identified as potentially useful. Qvarnell (1989) used this concept to explain some aspects of interactions between children and computers outside of schools. In her studies, the focus was not the child as a psychological being, but the computer as a conceivable and useable phenomenon. She was interested in knowing how children themselves perceive and conceive the possibilities and functions of computers in a variety of settings and which affordances they accepted or rejected. Crook (1992) in his use of cultural psychology to frame social development and computer use also used ‘affordance’. He argued it was useful because it pointed in both the direction of the subject and the material world which encompasses the subject’s behaviour.

The concept of affordance comes from work in the area of perception, particularly visual perception. James Gibson (1979) defines affordance in the following way:

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill ... it refers to both the environment and the animal in a way no existing term does. It implies the complementarity of the animal and the environment. (p.127)

Gibson (1979) explains that the physical properties of a surface, such as horizontal, flat, extended and rigid, afford support for particular animals. This affordance is relative to the size and weight of the animal. For some animals it is walk-on-able and run-over-able, for others it is sink-into-able. Affordances are unique to a particular animal. For example, other surfaces are climb-on-able, fall-off-able, get-under-able, or bump-into-able relative to the animal.

Different animals also perceive different affordances. If a surface is horizontal, flat, extended, rigid and knee high relative to the observer in a society where
'sitting' is common, then the observer may perceive the object as sit-on-able. As knee heights vary for adult and child, the affordance of 'sit-on-able' is relative to the observer. Gibson (1979) argues that affordances are neither solely an objective property of the environment nor solely a subjective property of the observer; they are both.

He also suggests that what observers perceive when they look at an object is the affordances, not the actual qualities of the object. The perceiving of an affordance is not a process of perceiving a value-free object; it is the process of perceiving a value-rich ecological object. For example, a post box affords letter mailing to a letter-writing human in a community with a postal system. The observer may or may not attend to the affordance according to his/her needs but the affordance is invariant it is always there to be perceived. In this sense, Gibson defines affordances in terms of what he calls 'ecological' physics instead of physical physics. Furthermore, he develops a theory about the visual processes involved in the perception of physical affordances. While the theory is not relevant to the current study, the concept of affordance deserves closer attention.

Elanor Gibson, (1982) who took this concept into the domain of developmental psychology, argued strongly against a phenomenal explanation of the observer bestowing a meaning on an object. She argued for the importance and uniqueness of the concept of affordance because it contends reciprocity between the observer as an actor and an environment that offers something in its physical properties to support a need. The affordance is always there to be perceived. The affordance is not bestowed on an object because of the need of the observer. In this sense, both observer and inanimate objects can be considered as actors.

Over the last fifteen years, the theory of affordances has been extended to social perception and social interaction. Recent theorists have also come to recognise the importance of culture (Valenti and Good, 1991). In such theories, children are seen as actors within socio-culturally-structured environments who are able to transform these contexts but are also limited by them. According to Valenti and
Good cultural practices “hide some affordances, reveal others, and allow the child to participate in the creation of still others” (p.93).

Qvarnell (1989), like Crook (1992), extended the concept of affordance to cultural artefacts. Using this concept, she was able to share the focus between the child and the computer. Furthermore, she was able to attribute the important characteristic of ‘actor’ to the child, and to the object, the computer, through its ecological properties. Such an approach provides a powerful theoretical framework for the current study. The child is conceived of as an actor who perceives and acts in relation to the affordances of the physical object, the computer, within a particular context of the social and cultural environment, the home.

2.4.4 Conclusion

Gibson’s (1979) concept of affordance is of particular interest when considering the multifunctionality of the domestic computer. The concept can be used to help explain how different individuals from within the same family and from different families might perceive different potential uses of the computer. As used here, the concept has been extended well beyond what Gibson called the ecological physical properties of the object to include affordances derived from the symbolic meaning of the multifunctional domestic computer. Following on from the work of Valenti and Good (1991), it also offers a way of understanding the social context as able to hide, reveal and shape affordances.

2.5 A blended theoretical framework

The preceding analysis has provided a number of useful concepts that can be blended to form a theoretical framework of value to the current study. The blending does not produce a seamless theoretical framework, rather, a way of shifting the focus to incorporate the child, the computer and the socio-cultural context. When any one of these elements is in focus, the others fade a little into the background. Together, however, they provide a rich set of lenses through which to view the relationship between children and computers in the home. This
approach takes up Cobb’s (1994) challenge to abandon the ‘quest for a one-size-fits-all’ perspective.

In summary, the concepts that will shape the framework of the study are:

- children as active in construction and determination of their own social lives, yet not able to be isolated from their gender, class and ethnicity (from theories of social constructivism and childhood studies);
- ‘affordance’ as a property of both the object and the observer within a particular socio-cultural context. This concept has been extended to include not only the physical properties (from the theory of affordance) but also the constitutive symbolic meanings (from the theories of the social construction of technologies);
- discourses and texts which constitute and are constitutive of social relations, power and ideology (from cultural studies theories);
- socio-cultural contexts whose structural features constrain and enable the individuals and groups within the context while at the same time being shaped by the ‘agency’ of those individuals and groups (from theories of social constructivism, cultural studies and childhood studies and using Giddon’s theory of structuration);
- levels of socio-cultural contexts - microsystem, mesosystem, exosystem and macrosystem with which the child directly or indirectly interacts (from ecological systems theory);
- childhood, gender and technology (specifically computing/computer) as social constructions, whose relationships are affected by their own surrounding discourses as well as other discourses. In particular, both childhood and technology may have strongly gendered constructions (drawn from childhood studies, cultural studies and the social construction of technology theories).

Because these concepts come from a diverse range of differing paradigms and perspectives, some seem to be in direct conflict with each other. For example, the structural approach of Giddens (1979) to the concepts of structure and agency and the post-structural approach of cultural studies concepts of texts and
discourses appear to conflict. However, it might be more useful to see these on a continuum, rather than as diametrically opposed. Livingstone and Gaskell (1995) who engage in research on media in children’s lives, also argue for the transcending rather than perpetuating competing disciplinary orientations. Her framework focuses on interaction between a social conception of the individual and a structural conception of society that leaves space for the agency of both.

In the particular blending put forward in this study there is sufficient commonality and consistency across perspectives to provide a rich integrated theoretical framework. This stems from the notion of the duality of agency, of the child, the computer and the socio-cultural context across all concepts and perspectives.

To more fully understand the theoretical space being defined by these elements and the related concepts mentioned above, each element needs to be looked at separately as well as in the complexity of its relationships with the others. In the following paragraphs, each of the three elements will be considered separately, before discussion of the relationships.

The child is active in constructing and determining his/her socio-cultural life within the home and at the same time is constrained and enabled by the context he/she is helping to shape. As part of this agency, the child interacts and interprets the interactions with the home computer and hence refines the perceived affordances of the computer and contributes to the discourses of domestic computing.

The multifunctional domestic computer offers a range of affordances shaped by its symbolic meanings (or social constructions) and instrumental features. The instrumental features stem from the actual applications and uses defined by the available hardware and software in the home and the symbolic meanings derive from the discourses that surround the computer as a domestic technology (in the microsystem of the home) and in its other forms in the mesosystem (particularly the school), exosystem and macrosystem.
The home is a microsystem of the child, with its own socio-cultural practices, beliefs, gendered relations and resources. These enable and constrain the child while they are at the same time shaped by the child’s experiences and understandings. This microsystem is a part of the wider socio-cultural context with which children interact, namely the mesosystem, the exosystem and the macrosystem. It is worth noting that the resources in the home include the adults and others who may provide role modelling, scaffolding and social contexts for the child’s learning about and use of the computer.

The key feature of all relationships is reflexivity. Each element within the framework ‘acts upon’ and ‘is acted upon by’ each other element, and their relationships, in turn ‘act upon’ and ‘are acted upon by’ a variety of discourses within the wider socio-cultural context.

2.6 Restatement of goals within a theoretical framework

By using concepts identified in this chapter the primary and secondary goals can be refined and key questions developed. The primary goal may be restated as one of better understanding the reciprocal relationship between the child and the computer within the socio-cultural context of the home, the microsystem. In line with the above theoretical framework, the interactions will be addressed from both the vantage of the child and the computer. On one hand, there will be a focus on the affordances of the multifunctional domestic computer in terms of its instrumental and symbolic meanings. There will also be a focus on how children reshape the computer to their own ends by their recognition of particular affordances and the variety of uses to which they put the computer. Both of these elements will be investigated in terms of their reflexive relationship with the constraining and enabling socio-cultural microsystem of the home, and the extended levels of contexts, the mesosystem, the exosystem and the macrosystem.

Within this blended theoretical framework the questions to which the study is directed can be stated in the following terms:
1. What computing resources exist in children’s homes? What affordances do these resources enable?
2. What are the socio-cultural contexts of children’s home computing? What discourses and family practices surround children’s uses of computers? How do these discourses and family practices interact with children’s perception of affordances and their use?
3. What is the nature of children’s uses of the home computer? What affordances of the domestic computer do children perceive? How do children’s interactions with the computer in their home shape these affordances?

Because the secondary goal of the doctoral study is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools a further set of questions is asked. These are:

4. What are the discourses about educational computing in which primary-school teachers participate? How do the computing experiences children have at school differ from those in their home?

Collectively, these questions become the focus of the study. As such, they will form the theories that will be built to explain the interactions between children and computers in the home. In the following chapter, the review of empirical and other literature will be shaped in terms of the framework developed in this chapter.
Chapter 3. Review of research and other literature

Chapter 3 presents a review of the literature for the purposes of finding out how the phenomenon of children’s interactions with domestic computers and related fields of inquiry have been researched, and what contributions the findings of that research can make to refining or redefining the contexts, constraints or focus of this study. The chapter begins with a review of the international and national research literature on the diffusion of computers into homes. Following this, the chapter focuses, in turn, on the literature relating to the socio-cultural contexts of domestic computing and more generally on children’s computing and game playing. In all these sections key themes, trends and issues are identified and discussed.

The literature discussed in this chapter is largely the literature available before and during the data collection phases of the research. As such, it helped define the context and shape the focus and design of the study. Two national studies were underway at the time of the doctoral study; the results of these have also been included in this review. The reasons for this inclusion are discussed in detail in Section 3.1.2 on p. 42. It is sufficient to say here that the researcher was aware of their design and focus, and that this knowledge influenced decisions about the nature and scope of this study. During the course of the study, between the time the data was collected in 1995-6 and analysed in 1997-8, further research results and conceptualisations of issues to do with home and school computing were published. This literature is not canvassed in this chapter, rather, it is referred to in the discussion of the results when relevant.
3.1 Studies of computers and households

Before considering the broader topics of the socio-cultural contexts of domestic computing and the general literature related to the interaction of children and computers, it is important to establish some baseline data about the penetration of computers into households, particularly Australian households, with children. This is necessary because an essential assumption of this study is that computers are becoming widespread in society and in children’s lives, particularly outside of school. So widespread is the penetration that it is imperative that educators recognise this significant change in many children’s lives. It is also important for educators to recognise that not all children are sharing in this significant change, and for them to understand which factors contribute to this inequity. Some of these factors can be revealed in statistical data about household ownership, others relate more to the enabling and constraining factors within the child’s physical and socio-cultural environment of the home. These latter factors will be discussed in Section 3.2, p. 50. A third and final reason for beginning the literature review with demographically based data is to help situate this study in its historical and temporal context.

3.1.1 International studies on diffusion of computers into households

In the early to mid 1980s there were many studies that focused on the diffusion of computers beyond the workplace. Most of these studies, because of their historical context, focused on adults who were innovators and early adopters of the technology (Rogers, 1983).

Dutton, Rogers and Jun (1987) conducted a meta-analysis of these studies and found that the demographic variables associated with adoption of home computers were age, gender and socio-economic status. The individuals were more likely to be middle aged (around parenting age), male and come from a middle or higher socio-economic status. They were more likely to share a household with children and use a computer at work. Interestingly, a positive attitude to science and technology was also identified as a factor in several of the
studies. Dutton et al. suggested that this accounted for why many of these individuals adopted computing with little reason beyond learning more about the technology. In general, the households used the computer for work, word processing, education, entertainment, home management and learning about the computer.

A later study by Caron, Giroux and Douzou (1989) found that the adopters in their sample had a wider spread of occupations and a higher proportion of women than reported in earlier studies. They concluded that computing was no longer the exclusive domain of the innovators, and that their sample represented, according to Rogers’ (1983) theory, the early majority. One interesting result in this study was that 25% of the sample had had no prior experience with computers and the decision to purchase, usually made by an adult male, related to a conviction about technology’s importance to the whole family. This factor was especially evident in households with children. Caron et al. coined the terms ‘informed’ and ‘naive’ buyers to differentiate these buyers from those with more knowledge.

Following the trends identified in the study by Caron et al. (1989), it would be reasonable to expect that recent studies, in the mid 1990s, might find that household computers are more widespread and that the computer owners of the mid 1990s would be the early and late majority who have a broader range of demographic characteristics. In fact, Dutton et al. (1987) predicted that socio-economic status would probably be a transient influence on household ownership because of the lowering price of computers.

The following studies demonstrate that while domestic computers are more widespread, socio-economic status, and to a lesser extent, age and gender, are still major influences on household ownership. While the component technologies of computers have dramatically decreased in price, the expectations for more powerful and sophisticated computing equipment have increased dramatically, such that the general purchase price for a home computer is still relatively high today. Some of these changes to home computers and computing have already been detailed in Section 1.2.1, p. 6.
In 1994, the Times Mirror Centre for the People and the Press undertook a major survey of technologies in American households. This study found that socio-economic status is a determining factor in household ownership of all types of electronic technologies, but particularly so for computers and on-line services.

In general, the study found that home computers were used by more than one family member (multiple users) and were used for a variety of purposes. The range of purposes was fairly similar to those in lists generated by earlier studies, however programming the computer had virtually disappeared and the range of less common uses had increased dramatically to include activities such as keeping track of genealogy, pursuing hobbies, creating artistic designs and maintaining mailing lists. This increase in the range of activities reflected the greater range in application software available in the mid 1990s. Using the computer for work- and study-related activities remained a common use for adults. The study also reported on a range of issues to do with children's use of computers in the home. These findings will be discussed more fully in Section 3.2.4.3, p. 78.

3.1.2 Computers in Australian households

In terms of comparisons with OECD countries, in 1994 Australia was a relatively high home-ownership country (23%). For example, our penetration of computers into households was less than the USA (37%) and Germany (28%), about equal to the United Kingdom (24%) and more than France (15%) and Japan (12%), (Australian Bureau of Statistics, 1994).

The Australian Bureau of Statistics [ABS] has undertaken two major studies of Household Use of Information Technology in Australia. The data for these two studies was collected in February 1994 and February 1996. It is important to note that the data collection and published analysis for the 1996 study occurred after the conceptualisation of this doctoral study and the collection of data for Stages One and Two (this staged approach will be explained in Chapter 4). However, the 1994 results were available and did influence this study's focus and contact was made with the Australian Bureau of Statistics [ABS] to discuss the parameters of
their proposed 1996 study. Subsequently information about the proposed 1996 study, including the questions to be asked, was made available to the author. Similarly, in the early stages of the doctoral study, it was known that another national study, by the Australian Broadcasting Authority, was planned for 1996 (Cupitt and Stockbridge, 1996). Information about the focus and nature of questions to be asked in this national survey was similarly made available to the author and influenced aspects of Stage Three of the study.

Knowledge of the parameters and content of these two proposed national population-wide surveys had a significant impact on the focus and nature of this doctoral study. While the actual results of these studies were not available before the data collection and preliminary analysis of this doctoral study, it was thought to be appropriate to include the relevant results in the literature section.\textsuperscript{1} The main reason for this was that the proposed nature and content of the two studies did indeed help shape the parameters of this doctoral study. Furthermore, in terms of the intellectual work undertaken in analysing and interpreting the results of the doctoral study, the results of these two national studies, help situate the study by providing concurrent population-based data about the contexts of Australian children’s interactions with computers in their homes.\textsuperscript{2}

Because of the concurrence, the different perspectives, and the different data collection methods of the three studies, the Australian Bureau of Statistics study, the Australian Broadcasting Authority study and the doctoral study, they combine to create a richly informed picture of children’s interactions with computers in their homes. The two national studies also provide an effective form of triangulation of the data collected within the doctoral study. For this reason, the results of the two national studies will be presented in detail.

\textsuperscript{1} The Australian Bureau of Statistics also provided, on request, a number of tables not reported in their publications. Where this data is used or reported a footnote will indicate the full title of the table which was provided by the Bureau.

\textsuperscript{2} Results from two other less important but still relevant studies conducted in 1995 are also referred to in a number of places in the following review. These are the Apple Computer Australia Report 1996 and the Reark Research 1995 that is cited in the Australian Broadcasting Authority’s report (Cupitt and Stockbridge, 1996).
3.1.2.1 Household ownership

Of the 2.5 million computers used in households in 1996 the overwhelming majority (79%) were owned by a member of the household (ABS, 1996). The remainder were owned by employers or registered home businesses.

The results of the two ABS studies (1994 and 1996) indicate that over the two-year period to 1996 there was significant growth in household use of computers in Australia. Listed below are some of the findings:

- computer usage in private households in Australia increased from 23% to 30%;
- the total number of computers in households increased from 1.9 to 2.5 million;
- the percentage of computer-owning households with printers remained reasonably static, increasing marginally from 80% to 82%;
- the percentage of computer-owning households with CD-ROM equipment increased substantially from 13% to 41%;
- the percentage of computer-owning households with modems increased slightly from 17% to 23%; and
- the use of integrated software packages increased from 32% to 43% in households with a computer.

The 1996 ABS study also collected information on future purchasing plans in relation to hardware and software. Using this data, they estimated that 19% of households (including those already with computers as well as those without) intended to purchase computer equipment in the twelve months from February 1997. The results from both ABS studies clearly indicated that the mid 1990s was a time of rapid growth in domestic computing in Australia. As well, the mid 1990s was seen as the beginning of the emergence of the multi-computer household. Estimates of the number of Australian households with more than one

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3 All numbers and percentages from the Australian Bureau of Statistics, including the data in tables derived from unpublished data provided by the ABS, are based on population estimates and have standard errors of less than 25%.
computer varied between 6% and 8% (Apple Computer Australia Pty Ltd, 1996; Cupitt and Stockbridge, 1996).

A number of studies have looked at the variables that are linked to household ownership. They revealed that household ownership was related to higher incomes, geographical location, level of education, type of employment and having children. The following section, Section 3.1.2.2 on households with children, will discuss in more detail the relationship between households with children and the ownership of computers. This section will focus on the other variables.

The 1996 ABS study found that 33% of households in capital cities have computers compared to 24% in the remainder of Australia (see Table 3.1); the Apple Computer Australia study (1996) reported 43% of households with adult white-collar workers owned computers relative to 26% of blue collar workers; and a number of other studies confirmed that income was strongly linked to ownership (ABS, 1994 and 1996; Cupitt and Stockbridge, 1996; and Reark Research cited in Cupitt and Stockbridge, 1996).

Only one of these studies, the 1996 ABS study, reported data that explored the relationship between some of these variables. Table 3.1 reports the relationship between ownership and income found in the 1996 ABS study. While strong, the relationship is complex in that it changed over time and geographical location. Middle and higher income households showed a dramatic increase in ownership from 1994 to 1996 and geographic location had a greater impact with the lower and middle income households.
Table 3.1 Households using computers by income

<table>
<thead>
<tr>
<th>Household Income $</th>
<th>% using in February 1994</th>
<th>% using in February 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capital Cities</td>
<td>Rest of Australia</td>
</tr>
<tr>
<td>0-13 000</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>13 001- 24 000</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>24 001- 38 000</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>38 001- 46 000</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td>46 001- 57 000</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td>57 001 &amp; over</td>
<td>48</td>
<td>44</td>
</tr>
<tr>
<td>Not stated</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>Average</td>
<td>27</td>
<td>16</td>
</tr>
</tbody>
</table>

The important message from these studies is that the inequalities seen in international studies from the early 1980s continued to exist in Australia in the mid 1990s. While the relationships between the factors are complex, they combine to perpetuate the situation that not all households have or may have in the future the resources to purchase home computers.

3.1.2.2 Patterns of ownership in households with children

A number of Australian studies have confirmed that having children in a household increases the likelihood of having a computer, and that this increasing likelihood is further linked to the age of the children within the household. The 1996 ABS study found that 47% of households with dependants had computers. The Australian Broadcasting Authority (Cupitt and Stockbridge, 1996) found that 59% of households with children between the ages of eight and seventeen years of age had computers. Apple Computer Australia (1996) reported 47% for households with children and Reark Research (cited in Cupitt and Stockbridge, 1996) found 55% in households with six to eleven year olds and 60% with twelve to seventeen year olds. Furthermore, ownership of computers was related to a variety of factors such as income and level of education. The strong relationship
with income and households with dependants, found in the 1996 ABS study, is presented in Table 3.2 below.

The link between level of education of parents and ownership in families with children is confirmed in the Apple Computer Australia (1996) and the Australian Broadcasting Authority (Cupitt and Stockbridge, 1996) studies and matches the findings of a 1994 major US study (Times Mirror Centre for the People and the Press, 1994). The Australian Broadcasting Authority study reported that 75% of households with parents with tertiary educational levels owned computers compared to 61% with technical and 47% with secondary education levels.

<table>
<thead>
<tr>
<th>Household Income $</th>
<th>% using in February 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14 000</td>
<td>23.0</td>
</tr>
<tr>
<td>14 001-27 000</td>
<td>29.1</td>
</tr>
<tr>
<td>27 001-44 000</td>
<td>39.5</td>
</tr>
<tr>
<td>44 0001-66 000</td>
<td>54.1</td>
</tr>
<tr>
<td>66 001 &amp; over</td>
<td>70.1</td>
</tr>
<tr>
<td>Not Stated</td>
<td>49.7</td>
</tr>
<tr>
<td>Average</td>
<td>46.9</td>
</tr>
</tbody>
</table>

Family type was also linked to ownership. The 1996 ABS study found that 45% of households with married couples and dependants had computers, while 30% of households with single parent and dependants had computers. Interestingly in the ABS studies the growth from 1994 to 1996 was slightly greater in single-parent households with children than in any other category, being from 20% to 30%, while in married-couple households with children the growth was from 38% to 45%. While this allowed the gap in these two groups to reduce a little, it did not impact the overall trend, that in the mid 1990s in Australian households with dependants, a range of factors contributed to divide children into two groups, those with access to computers in their homes and those without. These trends
also clearly identified that by 1996 computers were found in the homes of late adopters (Rogers, 1983), as well as innovators and early adopters, or as Caron et al. (1989) described it, in the homes of naive buyers as well as informed buyers. This is a significant contextual factor, as the participants of the present study will include children who could be considered early and later adopters. As such they may have significantly different characteristics than those described in the early studies of children and computers, where the children, themselves were innovators (Turkle, 1984).

3.1.2.3 Ownership of other electronic equipment

Several of the previously mentioned studies also looked at other electronic equipment in households with children. The Australian Broadcasting Authority (Cupitt and Stockbridge, 1996) and Reark Research (cited in Cupitt and Stockbridge, 1996) studies reported on other entertainment equipment while the ABS (1996) study reported on equipment related to computing.

In terms of entertainment equipment the Australian Broadcasting Authority (Cupitt and Stockbridge, 1996) study found that televisions, radio/cassette or CD player, video players and stereo systems were much more commonly found in homes than computers. Each of these items was found in between 89% and 100% of homes. As well, they found that 76% of households had more than one television and 83% more than one radio/cassette or CD player. These figures indicated that the television, radio/cassette/CD player and stereo systems still dominated the domestic entertainment scene. In terms of electronic game-playing devices, video game machines and hand held game machines also competed with the computer with 58% of households having video game machines and 39% hand-held game machines.
In terms of equipment related to computing, the ABS study (1996)\(^4\) found that of those families with dependants that used computers, 86% had printers, 50% had CD-ROM equipment, 23% had modems and 12% had scanners or other equipment. Compared to households without dependants, ownership of printers and CD-ROM was higher and ownership of scanners or other equipment and modems was lower.

Modem ownership in Australia was still at a relatively low level in 1996. Estimates varied from 7% of households with children and/or teenagers (Cupitt and Stockbridge, 1996), to 23% of the households that own computers (ABS, 1996). Interestingly the 1996 ABS study found that modems were located in a higher percentage of households without dependants than with dependants.

### 3.1.2.4 Families with children but no computers

There are obviously a number of reasons why not all families own computing equipment. The ABS (1996) study\(^5\) found that of the families with dependants that did not have computers 60% indicated they did not have a computer because the cost was too high and 19% because they had no use for a computer. Of the remaining identifiable reasons 6% said they had access elsewhere, 2% said computers were a bad influence and 2% said they did not know how to use a computer. From these figures, it could be inferred that the majority of these families would have a computer if they could afford it. It is worth noting that lack of knowledge about computers was not a main deterrent. This is consistent with the results of the study by Caron et al. (1989) that identified the existence of significant numbers of ‘naive’ buyers.

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\(^4\) The following percentages on other equipment were taken from data in an unpublished table obtained from a series of tables the ABS called: A14: Use of peripheral IT by households frequently using a computer by family type, 1996: 110A Printers, 110B Scanners, 110C CD-ROM Equipment, 110D Modems.

\(^5\) The following percentages on reasons were calculated from data in an unpublished table obtained from the ABS called: Reasons for not having a computer or modem by family type, 1996 (controlling for households with dependents).
In contrast, reasons for not having modems differed from the above pattern. While 31% stated that costs were too high, 48% stated that they were not interested, would not use it or preferred not to have one. This more negative response to modems is surprising given all the media attention to the ‘information superhighway’ and public policy initiatives over the last five years. It could also be inferred that while the ‘necessity’ for home computers in households with dependants was well accepted among the general public a similar acceptance of modems did not or did not yet exist in Australia. While this may change dramatically in the near future, the identified lack of general acceptance of the modem as a domestic appliance in 1996 in households with children helps situate this study in a specific temporal context.

Overall, the national demographic studies indicate that the doctoral study is situated at a time when close to 50% of Australian families with children have computers and related devices in their homes. While the range of families owning computers is diverse, there is still a strong relationship between socio-economic factors and ownership. These findings clearly support the exhortation that educators need to recognise this change in the lives of many of the children they teach. Furthermore, it highlights that the matter of equity is still clearly on the agenda, as particular groups of children do not have access in their homes.

### 3.2 Socio-cultural contexts related to home computing

In order to understand better the socio-cultural contexts of home computing it will be important to review literature relating to all levels of social contexts because structures, practices and discourses both inside and outside the home may impact on children’s interactions with computers. This review is organised using Bronfenbrenner’s (1992) system of levels of socio-cultural contexts: the macrosystem, the exosystem, the mesosystem and the micorsystem.

#### 3.2.1 The macrosystem

The macrosystem relating to the child’s interactions with the domestic computer is defined by the values, laws and customs of the wider culture within which the
child lives. Of particular interest to this study are the cultural and social constructions of technology, computers and computing and, in particular, domestic computing as well as the construction of childhood itself. These constructions can be best depicted by the social discourses that surround these life stages, objects and processes. As well, a number of other discourses and issues that may influence the relationship between child and domestic computer will be discussed.

3.2.1.1 General issues surrounding technology and computers

A wide range of literature exists on the general topic of technology, and specifically on topics related to computers and computing. These relate to the technologies themselves, their development and use, and their social contexts and implications. While it is inevitable that there are connections between these broader topics and the focus of this study, this section on general issues will only discuss those with clear and direct links to domestic computing. These are the issues relating to the impact of electronic media on social behaviours and the discourses surrounding gender and technology. Each of these will be discussed below.

The Impact of electronic media on social behaviours

A wide range of literature exists which examines the relationship between media and society. In particular, a number of authors (McLuhan, 1964; Meyrowitz, 1985; Ong, 1982; Turkle, 1984) have argued that information and communication media shape our everyday world, not just through the messages they convey but also through the media which are used. In Chapter 1, reference was made to Logan’s (1995) argument that electronic media are re-shaping our cognitive styles. This type of argument is not isolated to recent changes in media for similar arguments have been made about changes in cognitive styles which accompanied the change from an oral society to a literate society whose dominant medium was print (Ong, 1982). As well, arguments have extended to the changes in social organisations and structures (Meyrowitz, 1985), changes in social
development (Crook, 1992 and 1998\(^6\)) and to the changes in the psychological self (Turkle, 1984) that are facilitated by different media.

While each of the above is of some importance to understanding the socio-cultural contexts of children's home computing, in this section on the macrosystem only the arguments and issues surrounding the changes to social behaviour and organisation will be further developed as they have particular significance for today's relationships between the home and society, and children and adults. They also have significance for understanding a changing role for schooling in today's and tomorrow's worlds.

Meyrowitz (1985 and 1996) among others ascribes to the theory that the three major forms of communication, the oral, the print and the electronic, have helped shape the societies of their time. He argues that in any given period of time, social identity, which rests not within people but within networks of social relations, is shaped by people's patterns of access to social information. Furthermore, access to social information is linked to access to social situations, and differential exclusion or inclusion in these social situations supports social roles and structures. He argues that changes in media forms and use change access to different types of information that in turn change social networks and hence social roles and structures. Media that segregate access to social information work to segregate roles, and those that integrate access tend to blur such roles. He characterises the differences between print and electronic forms of communication on the social segregation-integration continuum:

In general, print media tend to segregate what people of different ages, sexes and statuses know relative to each other and about each other, while electronic media, particularly television, tend to integrate the experiences and knowledge of different people.

(Meyrowitz, 1996 p.86)

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\(^6\) This reference was given to me in draft form when I visited Charles Crook at Loughborough University in 1996.
According to Meyrowitz (1985) the electronic media, particularly television, integrate experience and knowledge by altering the relationship between the ‘physical’ and the ‘social’ place by facilitating remote ‘experiences’ and access to knowledge. Physical isolation, for example in homes, poor communities, repressed societies or different nations, no longer totally defines social experience and knowledge. The poor can experience affluent lifestyles; the repressed, democratic political systems; and the comfortable and distant, the wars and massacres of another country, another continent. Furthermore, groups that have been excluded from social situations can access new information. Some of the information available to the educated and the elite is now more readily available to the masses. Children can no longer be totally excluded from what has in the past been the ‘secrets’ of the adult world: sex, violence, and the frailty of adults who lie, cheat, steal, abuse and kill.

It is clear that many obvious differences and barriers remain, the least of which is that many people and communities do not have access to electronic (nor print) media. Not withstanding this, Meyrowitz (1985) argues that the electronic media, by contributing to a greater sharing of information among distinct and geographically separated groups, facilitate the weakening of traditional group bonds and the blurring of differences. This, however, does not lead to identical experiences, behaviours and attitudes for all people. For while the world may be more homogeneous at the macro level, at the personal level, for many, greater choice and freedom allow for greater diversity. Examples of this notion of concurrent globalisation and individualisation can be seen in the services that are provided by cable television. The sheer mass of ‘global’ programmes that are available to subscribers allows each subscriber to tailor a personal viewing programme that would not have been available in the more restricted viewing available through free to air broadcast television.

This argument has a number of important implications for this study, particularly when consideration is given to the natural extension of this process through the advent of new computing and telecommunications technologies such as the interactive multimedia and the Internet. The very anarchic and all-encompassing
information systems provided by the Internet will surely push this trend to its limits, as families and children make easy two-way contact with experts, organisations and people of other cultures and lands, and access a wide range of information that has not even had applied to it the processes of regulation and censorship and the limitations associated with the cost of production and broadcasting that television has had.

The first of these implications relates to the notion of the blurring and differentiation of childhood. The second relates to the implications for homes, places where children in the past could be isolated and protected. These issues are discussed in detail in Section 3.2.1.3. The third relates to Meyrowitz’s (1985) proposition that these changes provide direct challenges to schooling. He argues that much of the organisation and many of the practices in schools are based on the social structures and informational flow of the literate, the print dominated, era. He has particular concerns regarding an age graded system that supports the gradation of information and the withholding of it based on children’s reading skills.

**Gender and technology**

It is commonly accepted today that technology, as a product, a process and as a form of knowledge is socially shaped. MacKensie and Wajcman (1985) argue that economic interests and the state, through its military expenditure, are important forces in this shaping. A number of feminist writers (Cockburn, 1992; Swichtenberg, 1989) also argue that relations of technology are gendered. In their approaches, patriarchy, power and domination are key elements in the relationship between gender and technology. This approach, according to its critics (Ormrod, 1995), structures femininity and masculinity as opposites in a dichotomy and focuses on the fixity and continuity of gender relations. It does not separate the biological sex of the person from their gendered identity. Thus it does not recognise the feminine within men, nor the masculine within women, nor takes account of the difference among women in terms of their ethnicity, class and culture (van Zoonen, 1992). In this study, the latter position is taken:
gender relations and gender identity are not fixed, solely by the biological sex of the individuals in the relationship. Below are some of the important findings of empirical work related to this theoretical approach which has come out of feminist studies of technology. These are:

- Women, in Western countries, through the division of labour, are generally excluded from the essential processes of design, production and control of technology (Cockburn, 1985 cited in Cockburn, 1992).
- Advertising and marketing related to new electronic technologies represent the computer as a masculine technology (Besser, 1989; Haddon, 1988b) and if women are featured, they are depicted as feminine and domesticated or glamorous and sexualised (Gray, 1987).
- Gendered discourses surrounding the initial production and marketing of a technology can be resisted and over-ruled through actual patterns of use, changing not only the social meaning but also subsequent production and marketing patterns. For example, the initial male/rational/business orientation of the telephone was swamped by the overwhelming use of this technology by women for emotional/social purposes. After some initial formal resistance from major companies who considered these uses undesirable, network expansions to homes began and the social features of the telephone became a major marketing feature (Rakow, 1988).
- In contrast to this, the alternative is also possible. Ungendered initial discourses about a new technology can be altered by the actual patterns of use that emerge. For example, Gray (1987) found in her research that men, who had control over the television viewing in the home, also appropriated the video recorder. Over time the video recorder (and remote control) became interpreted as gendered.
- Gendered relations of technology may vary over contexts. For example, Jouet (cited in van Zoonen, 1992) found that men and women had similar patterns of use of the French Teletel for professional uses, but different patterns for personal uses. In their personal lives the women used Teletel to help with their
housekeeping while men used it for leisure related activities such as game playing and holding conversations.

- A range of cultures surround computer use. At the extreme end of computer users are the hackers. They are an all-male community. In Turkle’s study (1984) they were involved in manipulation, control and winning. Turkle refers to this approach as ‘hard mastery’, an approach generally favoured by males. In contrast, Turkle termed the more artistic and co-operative approaches as ‘soft mastery’. This approach was more generally favoured by girls. It is worth noting that a Norwegian study (Hapnes and Sorensen, 1995) of an all male hackers’ community found both ‘hard’ and ‘soft’ mastery co-existing. The males, utilising the latter approach, were competitive yet cooperative, individualistic yet concerned for community, playful yet engaged in useful activity. Hapnes and Sorensen argued that the flexibility of the computer allows for the development of different cultures surrounding its use, all gendered in thorough and important ways but not necessarily in a male/female dichotomy.

The available research literature, discussed above, makes it clear that technologies in general and specifically computers are interpreted as gendered but that different gendered cultures do exist around computing in different contexts and that gendering may relate more to the socially constructed world than a biologically determined world. This final point provides a warning of the dangers of maintaining a deterministic and simplistic dichotomous view of the relationship between gender and computing and of ignoring within-group differences while focusing on between group differences.

The two areas of research, on relationships between media and social behaviour, and between gender and technology provide clear messages for the current study: the very use of new technologies reshapes the socio-cultural context of their use; and the relationship between gender and technology is complex and may vary over place and type of use, as well as within particular communities. These issues are carefully explored in the doctoral study.
3.2.1.2 Discourses surrounding domestic computers and computing

A number of different discourses surrounding domestic computers and computing have emerged since the early seventies. Murdock, et al., (1992) argue that these discourses, in concert with other factors such as material resources and social relations, influence specific patterns of use or disuse of domestic computers. Furthermore, he suggests that discourses often conflict with one another, particularly those from official and from commercial or marketing origins. Several discourses have been identified in the literature that are relevant to this study. These are the discourses of computers as a hobby; computers as the future; computers for education; computers as entertainment; computers as productivity tools; and computers as multifunctional devices. Each of these will be discussed in turn below.

Computers as a hobby

One of the first discourses to emerge was computers as a hobby. This began in the US in 1975 when the first personal computer on the market came in kit form with a complete lack of packaged software. Haddon (1988a) referred to this early computer as a ‘self referring’ machine because the user gained pleasure from owning and mastering the technology rather than from ‘using it’. Later, other discourses evolved which related to this notion of the joyful mastering of the technology. These discourses were centred on the notion of the computer as a programming and problem-solving device.

Computers as the future

Beginning in the mid seventies a powerful discourse began to emerge in many developed societies defining computers and computing as essential tools and skills of the future. For example, in Britain, 1982 was declared Information Technology Year and the slogan was “There is no future without IT.” (Haddon and Skinner, 1991).

This discourse led to significant public education programmes designed to improve the general computer literacy levels of citizens. One very successful
television series shown in many countries in the early 1980s was the Canadian Bits and Bytes series. In many countries there were also national initiatives to provide computer literacy programmes in schools, such as France’s Micros-in-Schools Project in 1970, the UK’s Microelectronics Education Programme in 1980 and Australia’s Computer Education Programme in 1984. Many of the diffusion studies of the early and mid 1980s identified the impact of this discourse on adults’ decisions to purchase computers for their households (Dutton et al., 1987; Caron et al., 1989).

This discourse continues today, as seen in the continuing media interest in the concept and through the number of advertisements for various hardware products that stress the importance of computers as the future, particularly for prospective employment. More recent research also confirms that this discourse continues to influence the purchase of domestic computers (Anson, 1996).

**Computers for education**

Discourses associated with the computer as an educational resource surfaced initially in the educational sector, with the development of mainframe computer systems, which delivered computer-assisted-instruction in the early seventies. Giacquinta, Bauer and Levin (1993) argued that towards the end of the seventies two other factors combined to revitalise this discourse in the US. These were the growing rhetoric about crises and the need for reform in public schooling and the advent of the Apple microcomputer system with its wide range of educational software. A number of separate discourses emerged from this combination of factors. These included: computers could improve children’s learning in schools; computers could help children learn independently of school; and computers could improve children’s school performance through their use in the home. These discourses were extensively used for the marketing of hardware and software throughout the 1980s, and still exist in the 1990s. Of interest is the resurgence of these same discourses around the novel technology of the Internet. Recent market research (Anson, 1996) indicates that these discourses, along with
the ‘computer for the future’ discourse strongly influence decisions about the purchase of domestic computers today.

Computers as entertainment

The discourse surrounding the computer as an electronic entertainment device was originally synonymous with electronic game playing and clearly directed at the children’s end of the market. In the mid 1980s, many computer companies were marketing low-cost computers which could do little else but load and run games (Murdock et al., 1992). Since then, as mentioned in Chapter 1, the leading edge of game-playing technology has migrated back and forth from the dedicated game-playing consoles to the computer. The involvement of the toy and film-based entertainment industry in the development of electronic game playing ensured that billions of dollars were involved in marketing this notion to families in all parts of the world. There were also strong links with arcade/parlour game playing and with integrating characters and situations in games, movies, television programmes and toy-based merchandising (Sheff, 1993).

Other discourses related to gendered technology (male domination), the protection of children and media violence have intersected with this discourse continually over the last ten years to generate a public concern about children, usually boys, playing violent games. At the same time the computers for education discourse has also intersected with this discourse to create notions of ‘educational games’ and ‘edu-tainment’ and to flood the domestic and school market with software which embeds the practice of academic knowledge and skills within a games format. This aspect continues to exist along with other discourses about entertainment. As part of a response to this discourse a number of leaders in the field of technology and education (Heppell, 1993; Negroponte, 1995; Papert, 1993) have given serious thought to how the ‘engaging power’ of electronic games can be harnessed for the improvement of education. More recently, the discourse has evolved to include the Internet and its potential to entertain. The term ‘surfing the net’, and ‘cybertainment’ are but a few of the phrases evolving in this discourse.
Computers as productivity tools

From the mid 1980s many computer producers marketed their machines as ‘useful’ domestic devices (Haddon and Skinner, 1991). While part of the claim for this rested with the science-fiction concept of the computer controlled home, this conception did not rely on a ‘multifunctional personal computer’, but rather, the existence of microchip-based household appliances and systems such as computer-controlled security systems or vacuum cleaners. Other claims derived their legitimacy from efficiencies located in offices, such as managing budgets, bank accounts or mailing lists. Again, it is interesting to note that in the early days this office software was purpose-built and not commonly available on the domestic computer. Yet despite this, the discourse played a major role in the purchase of the domestic computer and, as a number of observers recorded, in the early days it led to disillusionment from ‘naive buyers’ (Murdock et al., 1992) who found that the machine they had bought was unable to deliver such productivity. When printers and general-purpose software such as word processors and data base management programmes became readily available in homes, the capacity for productivity began to match the discourse. This ideal of personal productivity was strengthened by the notion of the home as an extension of the office or, in the case of children, an extension of the school. In these scenarios, serious tasks related to office or school, were capable of being carried out using a computer.

Computers as multifunctional devices

The discourse of the computer as a multifunctional device has been with the computer since its inception, albeit somewhat in the background to other ascendant discourses. For example, even with the marketing and social networks associated with the ‘computer as a hobby’, the notion of an open-ended programmable device was highlighted as the main difference between this electronic device and others that came before it.

As computing power and memory capacity grew, a wide range of ready-made software became available for domestic computers making the notion of multi-
purpose-use available to a broader range of users. However, this very feature created a marketing problem in that the domestic computer, unlike other domestic appliances, did not have a simple identity. Haddon and Skinner (1991) argued that the computer industry has repeatedly attempted to realise the vision of an ‘infrastructural’ machine regularly used in all households by all family members for a variety of purposes ever since.

All of these discourses still exist in some form today, with differing degrees of influence on the purchasing (and using) decisions of households. While Murdock et al., (1992) clearly see that these discourses create conflict and the need for negotiation within the home, Haddon and Skinner (1991) also point out that they combine in interesting ways to mask the true nature of the many uses of the computer. For example, he found that the self-referential conception often underpinned productivity use:

...a number of our interviewees had written or purchased ‘home management’ programmes which produced shopping lists or monitored central heating costs. Yet, their motivation resembled the hobbyist orientation of trying out these possible functions. The same type of open-ended experimentation often occurred in the case of applications derived from the office, such as database and spreadsheet software. This was particularly clear in the case of one interviewee who had brought and used word processing software, but had no printer to produce hard copy. (p.444)

Haddon and Skinner continue their argument that many goal-oriented activities have a hidden exploratory dimension and suggest that using time spent on a particular productivity application, for example word processing, may be misleading as a measure of ‘serious use’.

More generally, it is useful to consider whether the identified discourses surrounding computer use would be the same if viewed from the perspective of children. As with most aspects of domestic computing, much of the focus of the
studies quoted above, or of the data collected in those studies, is about adults.
When data on children is included, often it is adults’ accounts of children’s behaviour, as in the case of the penetration studies (ABS, 1994 and 1996). No literature was found that specifically focused on the discourses with which children, themselves, engaged.

3.2.1.3 Discourses and issues surrounding childhood

When contextualising this study in Chapter 1, reference was made to changes in childhood. These included the increasing ‘pedagogisation’ of childhood - preschools and playgroups (Zinneker, 1990); the significant decrease in children’s freedom to get around outside the home (Ward, 1994); the greater regulation of out of school hours outside the home, often structured with sporting, cultural and recreational activities; at the same time, less regulation of space and time in their own home (Ennew, 1994); and the decrease in time spent on unstructured leisure activities such as reading, and outdoor and indoor unstructured play (Ishagaki, 1986).

While television is still the dominant electronic medium (Cupitt and Stockbridge, 1996; Kubey and Larson, 1990), children are also experiencing decreasing control, scrutiny and conflict over their media activities as multiple televisions, radios and music systems enter homes and children’s bedrooms. An increasing number of children are now born into homes with computers and other electronic technologies as part of the furniture (ABS, 1994).

The family and the family home are also changing. The family home is now less bounded and unique because of the blurring of space and time through the use of modern communication and information technologies such as telephone, radio, television and most recently, the Internet (Meyrowitz, 1985). Today many children’s bedrooms are also linked to the outside-of-home world through these technologies. These and other changes in society are contributing to a continually changing conception of childhood.
As mentioned earlier in Section 2.3.1, it has only been in the last ten to twenty years that the study of childhood has been more widely recognised and the social and biological condition of childhood separated sufficiently to allow for serious theoretical and empirical work on the notion of the socially constructed child (James and Prout, 1990; Qvortrup, Bardy, Sgritta, and Wintersberger, 1994). This framework facilitates the investigation of changes in childhood. Two of these changes, particularly relevant to this study, are the changing discourses surrounding childhood and the changing relationships between adults and children. Each of these will be discussed below in terms of what contribution they make to the current study.

**Discourses of contemporary childhood**

The discourses surrounding contemporary childhood are complex and at times contradictory. The concepts of protection and exclusion seem to epitomise this complexity and contraction. On one hand children are seen as vulnerable, lacking power and as needing protection (Engelbert, 1994). On the other hand, society is seen to need protection from children who are seen by some as inadequately socialised beings with darker forces beneath a thin layer of civilisation (Barker, 1989, cited in Buckingham, 1994). For both these reasons, children are often excluded from places not specifically designed for them and/or supervised by adults. Furthermore, the concept of time, or more specifically ‘wasting time’, plays a part in the decisions adults make about where children can go and what children can do (Ennew, 1994).

In response to these and other discourses, today’s urban children are, in some senses, more restricted in their daily lives. Their out-of-school and out-of-home time is more ‘curricularised’ in terms of being taken up by structured activities, controlled and managed by adults where children learn ‘worthwhile’ skills and understandings. Often these relate to sport, music, performing and creative art and cultural activities. They are more restricted than their age cohorts of previous generations in terms of travelling around their out-of-home world (Hillman, 1991 in Ward, 1994). In Australia’s major cities even independent travel to and from
school has, in some cases, been reduced in favour of car transport provided by parents.

At the same time, for economic, technological and social reasons, many children’s at-home lives are less scrutinised and less controlled than ever. They spend longer periods inside the home unsupervised either because parents are not present or because their attention is elsewhere (Ennew, 1994). Furthermore, Moore (1986) argues that in response to the lack of control in the rest of their lives, when they have the opportunity, children opt for places and spaces independent of adult control or activities deemed as ‘wasting time’ by adults. This includes watching more television and playing more computer games than they should.

In the media-supported moral panic about television watching and game playing, the discourses of protection for and from children, exclusion from adult spaces (and restriction to children’s spaces), and ‘wasting time’ all make a contribution. This is best typified in the public discussions surrounding the ‘effects’ of exposure to sex and violence on screens, and the ‘value’ of popular versus traditional media/culture. An example of the latter being the concerns regarding the decline in reading books and the increase in interacting with screens. Often this debate is further polarised by the link between books and ‘classical literature’ and the screen and soapis or ‘mindless’ games. It is important to note these discourses are so strong that the resultant public moral panic is resistant to any evidence based on sound research about the presence or absence of ‘effects’ of these media on children’s behaviour (Buckingham, 1993b; Durkin, 1995). These discourses and their influence on public perceptions have a significant impact on the socio-cultural contexts of children’s interactions with the computer, particularly with game playing.

**Blurring of childhood and adulthood**

A number of authors discuss the notion that childhood is being re-defined in terms of its relationship with adults and the wider world. Postman (1983) referred to this change as ‘the disappearance of childhood’ and argued that the
responsibility for this change was with the media (mainly the content of television) and new ways of rearing children. Zinneker (1990) spoke about the shift in the intergenerational balance of power caused by the duality of increasing education and consumerism.

Meyrowitz, (1985) believed that children’s relationships with family and adults were changing primarily because television now provides greater access to outside-the-family perspectives from which to judge and evaluate family rituals, practices and beliefs. He argued that from an early age television provides children with alternative role models to parents of what adults are meant to be and do. Furthermore, many of the adult role models on television are so often ‘childlike’ or ‘anti-heroes’ and not to be respected or trusted.

Furthermore, because of movements in public policy in response to children’s rights, today’s children are treated more like little adults with roles, rights and responsibilities that are more similar to adults than ever before. Conversely, the increasing success of the use of ‘temporary insanity’ as a form of diminished responsibility as a reason for abdicating legal and moral responsibilities is but one indication that adults are calling on legal and social principles once reserved for children. Meyrowitz (1985) provided a list of other indications of the merging of childhood and adulthood. These included:

- the shift from the distinct dress and appearance of adults and children, for example the common casual dress of jeans, tee shirts and joggers;
- the involvement of children in discussion of topics from which they were once excluded, such as birth, death, sex and money and more recently sexually transmitted diseases, Aids, drugs, abortion and suicide;
- interest in the same leisure activities, for instance the same television shows and computer games;
- the notion of continuing adult education and changing careers;
- the increasing legal status of children, such as the rights to counsel and the notion that children can commit and be punished for adult crimes such as armed robbery and murder.
These changes do not in any way deny that adults still have much power, control and responsibility towards children. However, they do contextualise the popular notion that today’s children precede and possibly lead adults into the new information/computing age. Within homes, children’s interactions with computers may further or arrest this blurring of roles.

These broad discourses surrounding computers and childhood create a rich and complex socio-cultural context in which today’s children interact with computers. In essence they position computers, related technologies and children in particular ways within the broader society and within the domestic sphere. As such, they are central to any understanding of the relationship between children and domestic computers.

3.2.2 The exosystem

Earlier in Section 3.2.1.3, the exosystem was defined as the social settings that do not contain children but impact upon their experiences in immediate settings. In terms of this study the key settings in the exosystem which may impact children’s interactions with computers in their homes are those where adult and other family members interact with computers themselves, learn about computers or maintain social networks which enhance their understandings of computers. The most significant of these would be family workplaces and family schools or educational institutions. In this section, research focusing on each of these will be briefly dealt with to provide some insights for the purposes of understanding the social context of children’s computing.

As parents play a major role in resourcing, setting rules and practices and supporting children’s home computing, their social world and world of work outside the home is a major component of the exosystem which indirectly affects their children’s interactions with the computer in their home. Caron et al. (1989) have demonstrated the potential impact of previous knowledge of computers prior to purchase of the household computer. They found that households with naive buyers ended up with different patterns of use than those with informed buyers. For example, computers in the homes of naive buyers were more likely to
fall into disuse (by adults) soon after purchase. Because their data was collected in the mid 1980s when the actual hardware and software was less functional and harder to use, it is likely that differences similar to the ones they found would be evident today.

Research on adults’ uses of computers outside the home focuses on the workplace and the community. Australian research indicates that gender, educational background, and type of work impact on use (ABS 1996). While computer technology is widespread in many occupations, the multifunctional computer is less common. Much computing technology is, in fact, dedicated single-purpose machines. Examples include financial terminals in banks, point of sale terminals in shops and control systems in manufacturing and warehousing. Multifunctional microcomputers are restricted more to the desks of clerical and managerial personnel and professionals such as lawyers, teachers, architects and engineers (Times Mirror Centre for the People and the Press, 1994).

The Times Mirror Study in the US (1994) found that overall, women are more likely than men to use general purpose computers at work (62% to 49%). Such a result can be explained by considering the two groups of people that have access. Women dominate secretarial and clerical positions which are greater in number than the professional and managerial positions which men dominate.

Adult males are more likely to have access to networks and communities of computer users outside of their workplace than adult females. In the 1970s and 80s computer clubs played a major role in providing such networks (Bird, Goss and Bird, 1990). Today, the communities are more informal, but just as strong, as interests in computing and related activities have become a part of the male interchange at social gatherings.

Social class and gender also have a significant relationship with young adults’ access to computers through tertiary institutions. The demographics of the overwhelming majority of students attending tertiary institutions in Australia reflect a strong relationship with social class (Williams, Long, Carpenter and
Hayden, 1993). Gendering of access and expertise occurs more through personal interests and course and subject selection patterns (Clarke and Chambers, 1989).

A similar stratification is found in the schools sector. Sutton (1991), who reviewed ten years of research in US schools, found that there were inequities related to social class, ethnicity and gender. A recent international study of 120 countries, (Janssen Reinen and Plomp, 1994), also found significant inequities, particularly for gender. Similar inequities, in terms of access and participation have been found in Australian secondary schools as recently as 1992 (Chambers and Clarke, 1985; Crawford, Groundwater-Smith and Milan, 1990; Hickling-Hudson, 1992).

Although this is a brief review of the exosystem, it does point to significant characteristics of the social contexts of children’s computing in the home. Children from more wealthy communities are more likely to have access to parents and siblings with outside-home experience and expertise in computing. For those children who do have access to such expertise and experience, it is likely to be gendered albeit in complex ways.

3.2.3 The mesosystem

In this study, the mesosystem refers to the contexts in which the home interacts with the other environments in which children have direct experiences with computers. Hence mesosystems would include the primary schools and other community places where children might use or learn about computers or come across others using computers. A simple example might be the local library. This section will focus on the primary school as it is a dominant mesosystem in the lives of 5-12 year olds.

Much literature exists about children’s use of computers in primary schools. For the purposes of this study, it is divided into the literature on policies and practices, the literature on equity and the literature on home-school links. Each of these will be discussed in turn below.
3.2.3.1 Policies and practices within schools

Policy, programme and resource frameworks regarding the use of computers in schools has existed in Australia since the early 1980s. During the 1980s most education systems in Australia had mandatory policy and curriculum statements on using computers (Education Department of South Australia, 1987; Education Department of Tasmania, 1985; Ministry of Education Western Australia, 1988; New South Wales Department of Education, 1983; New South Wales Department of Education, 1986; Queensland Department of Education, 1983; Queensland Department of Education, 1990). They were similar in many ways. Most identified a variety of computer uses in schools such as computers for educational administration, learning and teaching about computers, learning and teaching with and through computers and computer-supported applications. These latter perspectives provided, what Sachs (1993) called instrumental and pedagogical views of the role of computers in teaching and learning. The pedagogical view generated a discourse in schools that did not exist in industry and commerce. Not only was the computer viewed as a productivity tool for administrators, teachers and learners but also as a medium that had the potential to enhance teaching and learning and in some ways change the teaching and learning processes as well as the curriculum.

In the 1980s, primary school policies tended to emphasise the use of computers to enhance teaching and learning across the curriculum, using rhetoric such as “teachers are to provide their students with learning experiences which will allow students to learn about computers by using them for learning.” (New South Wales Department of School Education, 1986, p. 4) Classroom access and practices varied enormously, but few students used more than word processors and programmes such as PRINT SHOP to publish writing, or maths games to practise a variety of skills (Fitzgerald et al., 1985). There were a small number of primary schools where integration of computers was widespread with strong pedagogical bases (Downes, 1987; Downes, 1988; Oakley, 1995).
In the late 1980s and early 1990s, many Australian states and territories had major overhauls of their total school curriculum. Educational computing policies in many states became subsumed under the area of technology studies. Sachs (1993) argued that within this context using computers became synonymous with using technologies as an end in itself (the instrumental view). The rhetoric of the technology syllabus reinforced the importance of learning about and using tools (technology as product). Teachers found little references in these syllabuses to the pedagogical purpose of using technologies to enhance teaching and learning. While syllabi in the other Key Learning Areas also mentioned the use of computers, they too focused on the instrumental role. This was most clearly seen in the area of writing, where teachers were encouraged to have their students write using computers, in the absence of frameworks for using word processors to enhance writing development (K-6 English Syllabus and Support Documents, 1994).

Regardless of significant changes in curriculum frameworks, and in levels of resourcing, there is little evidence that primary school computing has had a significant impact on the practices of teachers or the experiences of children in the primary years over the last fifteen years (Fitzgerald et al., 1985; Kinnear, 1995). Several studies have identified the difficulties that teachers face. These include lack of competence, insufficient numbers of computers, technical malfunctions, location of computers, timetabling, finding suitable software, insufficient time for professional development and lack of access to computer expertise during class time (Becker, 1991; Owen and Lambert, 1996; Janssen Reinen, Pelgrum and Plomp, 1995; Robertson and Green, 1990; Watkins and Brimm, 1985; Zammit, 1992; Davis, 1992). Teachers' attitudes to computers have also been the focus of study. A number of studies have found that many teachers identify a list similar to the one above when explaining their concerns about implementing computer use in their classrooms (Fitzgerald et al., 1985; Happs and Kinnear, 1990), while others have found that a significant number of teachers, particularly elementary school teachers, actually suffer from technophobia (Rosen and Weil, 1995) In contrast, Sherwood and Buchanan
(1993) in a national survey of Australian teachers found that a major attribute of teachers who were successful users of computers was their consideration that using computers in their teaching had made a significant and positive difference to the way they taught. Importantly, these teachers reported that they were motivated by the educational potential of computers more than by a desire to prepare students for a technological future. Their study did not explore these notions further. No other empirical studies were found that focused on Australian teachers' belief systems.

Given the various findings about teacher attitudes, concerns and beliefs it is not surprising that what is happening in school is patchy. Shears (1995) found that even now, more than ten years after the introduction of computers into schools, few teachers are seriously involved with computer use and common use is still heavily centred around educational games and word processing. Of more concern is the fear that the use of these applications does not improve the quality of teaching and learning. Snyder (1994 and 1995) has found evidence to suggest that when computers are used for word processing, they are mainly being used as tools for children to recopy existing text as good copy. She argues that used in this way the computer only affects the production of writing rather than the process. As such, it acts as a productivity tool rather than as a learning tool. Similarly, while there is much evidence to suggest that educational computer games, when used effectively can have positive cognitive, linguistic and social benefits (Durkin, 1995), there is continuing concern that game playing is often used merely as a motivational tool within a structured unit of work or at other times as a leisure-based reward for early finishers or well behaved children.

While the primary goal of this doctoral study is to better understand the reciprocal relationship between the child and the computer within the socio-cultural context of the home, a part of the study will focus on what is happening in the schools of the children in the study, and on teachers' belief systems about how and why computers could be used. Importantly, these will be investigated through children’s views of school computing and of the relationships between home and school computing as well as through teachers’ views. Such a focus can
be justified, not only in terms of the reflexive relationship between home and school, but also because the secondary goal of the doctoral study is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools.

3.2.3.2 Equity

The findings on inequity of access and use in secondary schools, mentioned above, are also applicable to primary schools (Sutton, 1991). Many researchers have investigated the stereotyping of computing as a male activity (Clarke, 1987; Shashaani, 1994; Siann et al., 1990; Todman and Dick, 1993). Some authors have suggested that teachers subconsciously provide more opportunities for boys to learn about and use computers (Knupfer, 1993; Shashaani, 1994) and that often the software used is gender-biased (Shashaani, 1994).

In the Australian context, Fitzgerald et al. (1986) found inequalities in school resources and access by primary students across different socio-economic and geographical communities. While more recent data does not exist for primary schools at a national level, there have been a number of school- and classroom-based studies that confirm that inequities still exist in the 1990s, particularly in regard to gender (Hedgcoe, 1991; Kinnear, 1995). These latter studies make a number of important contributions to the context of the current study. These include the findings that:

- both boys and girls had positive attitudes to the use of computers in the classrooms, with boys generally having more positive attitudes than girls;
- the lack of whole class activities and the lack of supervision and of strategies for ensuring equitable access allowed boys to dominate classroom computers;
- the misconceptions by teachers that lack of use was related to lack of interest, rather than lack of access, facilitated lack of action about inequities.

In this doctoral study, children’s perceptions of access and use at school will include a focus on issues related to equity, particularly through the eyes of the children, themselves.
3.2.3.3 Home-school links

Few studies of primary schools were found that looked at the relationship between home access and school use. A number of studies of secondary schools suggest that having access to computers at home improved attitudes towards and use of school computers, and that this was especially so for boys (Bannert and Arbinger, 1996; Janssen Reinen and Plomp, 1994; Martin, 1991; Robertson and Green, 1993; Shashaani, 1994). Todman and Dick (1993) found similar results for primary school children, but also found that positive teacher attitudes were strongly correlated with children’s positive attitudes, particularly in grades three to seven.

A small number of authors have addressed the relationship between home media and primary schools from other viewpoints. These include the findings that metaphors and images in games extended to real and classroom life (Provenzo, 1991); and children as young as six and seven differentiated between the technologies of playing and the technologies of learning (Qvarell, 1989).

Only one study was found that looked at the impact of school computing on home use. In this study Giacquinta et al. (1993) investigated children’s home-based academic computing in the mid 1980s. Academic computing was defined as the use of educational software to improve achievement in school subjects such as reading, mathematics and history. Her basic findings were that there was almost a total absence of academic computing and only modest amounts of educational computing, such as programming and word processing. Among the reasons offered for this lack of academic computing was the schools’ emphasis on other forms of computing, the poor communication between the home and the school and the socio-cultural context within the home.

Overall, the literature on computers and schools highlighted a range of issues on which the doctoral study needs to focus. These include teachers’ motivations and practices, particularly concerning the use of computer games and computers for writing; children’s views of access to and use of computers at school; and the relationships between home and school computing.
3.2.4 The microsystem

The microsystem refers to the home itself. Within this microsystem the child is a member of a domestic community and may also be a member of a computing community. The roles that other family members play in the domestic computing scene will help shape and be shaped by the relationship the child has with the computer. Secondly, the computer is only one of a number of the electronic information and communication technologies in the home. Each of these other technologies take up family time, household space and help define the context in which the domestic computer exists. The following review will initially focus more broadly on the information and communication technologies in the home and then on the studies of family or domestic computing.

3.2.4.1 Technologies in the home

In developed countries since the second world war there has been an overall increase in the diversity of electronic information and communication technologies in homes. Two themes, relevant to this study, emerge from the literature that examines these technologies.

The first theme relates to the fact that new technologies do not simply or completely replace old technologies (Hirsch, 1998)\(^7\). As new technologies are added, older technologies find continuing roles. For example, even though radio has been displaced by television as the main entertainment technology in the home, it still remains a dominant technology, albeit in different forms and for different purposes. These newer forms include walkmans, and newer uses include listening to talkback current affairs programmes while undertaking other activities such as bathing or tackling housework (Moores, 1988). A further example relates to the continuing role of books even though for most children television has become the dominant source of entertainment and information (Kubey and Larson, 1990).

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\(^7\) This chapter was given to me in draft form when I visited Eric Hirsch at LSE, London in 1996.
The second theme relates to the reflexive relationship between the technology and the socio-cultural context of the home. Generally, research has demonstrated that the way these new technologies have been incorporated has been affected by cultural and social differences, particularly in their patterns of use, and in turn, how their incorporation has helped shape daily family lives. Morley and Silverstone (1990) provide a number of examples of these relationships, which are relevant to the study of home computing. These are:

- the amount and design of available living space influences how and by whom these technologies are used. For example the existence of ‘specialised’ space impacts modes of viewing television;

- the introduction of these technologies affects the conceptions and social organisation of time within the family. For example, domestic radio provided families with access to synchronised national time and the programming schedule of broadcast television influenced the schedule of family events;

- a number of these technologies have had a significant impact on the shift of leisure time from an outside-the-home activity, such as in streets, cinemas or pubs, to an inside-the-home activity. For example, while the introduction of radio is linked to the beginning of this shift, more recent technologies such as the telephone and the television have further increased the scope of home-based leisure;

- gendered relations and roles within the family have also been impacted by the incorporation of these technologies. Even the radio, in its first incarnation, the crystal set with headphones, increased the separation of men and women in the home (Moores, 1988). Moores points out that it was the advent of the radio with loudspeakers, packaged as an attractive piece of furniture, that allowed this technology to become part of the living room, drawing family members together. Studies of other technologies, such as telephones, televisions and video recorders also reveal differential positioning of the male and female household members.
A significant amount of research exists on children and television within the home. Some of the basic findings include:

- children are not ‘couch potatoes’, they actively make sense of what they watch. Older children are also aware of some of the techniques used to engage their interests (Buckingham, 1993a);
- socio-economic circumstances, mediated through families’ conceptions of time and the value of time, influence television watching habits and behaviours (Jordan, 1992);
- there has been a shift in responsibility from parents to broadcasters to the state with the development of censorship and regulations regarding scheduling and content classification. At the same time there has been an explosion in the number of multi-television homes, some of which have sets in children’s bedrooms. In these cases parents are even less involved and able to supervise children’s television viewing (Andreasen, 1994).

These findings related to technology in general and television, in particular, help define the contexts of children’s computing in the home. They highlight the complexity of the relationship between domestic technologies and their use and remind the reader that the relationship children have with computers will be embedded within their relationships with a range of technologies in the home.

### 3.2.4.2 Computers in the home

A wide range of research has been conducted that looks at the socio-cultural context of computing within the home (Bird et al., 1990; Caron et al., 1989; Dutton et al., 1987; Haddon and Skinner, 1991; Haddon, 1992; Hirsch, 1992; Kominski, 1991; Livingstone, 1992; Morley and Silverstone, 1990; Murdock et al., 1992; Silverstone, Hirsch and Morley, 1992; Steinfield, Dutton and Kovanic, 1989; Wheelock, 1992). The timing of most of this research places it in the early years of domestic computing when hardware and software were relatively limited and most users would be considered innovators or early adopters. While children played a part in many of the families in these studies, they were rarely the focus. Few studies were found that focused on children’s interactions with computers at
home. As mentioned earlier the Giacquinta study (Giacquinta et al., 1993) was one of the few that did. A number of findings and issues that arose from this study will be discussed later. The following discussion will look at some of the findings of the studies that focused more generally on the family. Some of the important results were that:

- many families who purchased computers had no specific applications in mind, rather, they had a general sense of the importance of the technology for the family or their children’s future. There was little correspondence between the anticipated uses and the actual uses of the purchased computer (Caron et al., 1989);
- computers purchased and used primarily for business-related purposes were less likely to be fully integrated into other aspects of family life (Dutton et al., 1987);
- families where the computer was well integrated, at least in the lives of some family members, had at least one member who had a support network either through social connections, the workplace or users’ groups (Dutton et al., 1987);
- different members of the household used the computers in different ways. The main uses of computers in the ‘naive buyer’ households were game playing and learning about the computers. In contrast, the other two groups, which were mainly comprised of ‘informed buyers’, had a balance of uses which also included work-related purposes (Caron et al., 1989);
- gender played a significant part in the differentiation of family members’ use of computers. (Caron et al., 1989; Livingstone, 1992; Tinnell, 1985; Wheelock, 1992);
- the process of adoption and adaption or re-appropriation of the computer in the family by various family members was influenced by a range of factors. These included the gendered roles within families, family dynamics, negotiations around the various discourses of domestic computing, and the computer-related social networks of various family members (Caron et al.,
1989; Dutton et al., 1987; Livingstone, 1992; Murdock et al., 1992; Rogers, 1983; Tinnell, 1985; Wheelock, 1992);

- the integration of the computer into the home influenced and altered patterns of family interactions. For example, Bird et al. (1990) found that fathers decreased the time in household work and increased participation in community activities and computer club meetings. There was also some increase in interactions between fathers and children that may have been facilitated by the computer. There were shifts in other time allocations as well, including changes in leisure time activities (Haddon, 1992).

Many of the issues identified above are associated with the dynamics of family life. It is reasonable to speculate whether some of these patterns may have changed as the technology itself has changed over the last few years. Although the focus of the current study is on children’s interactions with computers, it will be important to contextualise this use in a more contemporary framework, hence the doctoral study will contextualise family computing in the mid 1990s in order to better understand the social context of children’s home computing.

The only study found which focuses on children’s use in the home identified a range of factors which influence children’s use of home computers (Giacquinta et al., 1993). These included: parental encouragement and assistance; school emphasis; sibling and peer support; early computing experience of the child; available resources within the home; and the child’s current receptivity towards academic computing. In some ways, this list may be limited because the study narrowly focused on academic computing. In their study little, if any, attention was paid to the other uses of the computers and the family dynamics surrounding these uses. Nevertheless this list, combined with issues identified in the more general literature, formed the basis of the issues to be explored in the doctoral study with children and parents about home computing.

3.2.4.3 Uses of household computers

As mentioned above overseas studies have detailed a range of uses of household computers. These include recreational, work and study-related uses. The
Australian Bureau of Statistics [ABS] studies (1994, 1996) revealed a similar set of uses. In the latter ABS study respondents were asked to list in order of importance up to three main uses of the household computing equipment. Table 3.3 presents the data for respondents from households with dependants.

From this table it is clear that in households with dependants there was a wide range of uses with game playing, use for educational/study purposes and use for work purposes being the most common. Consistent with the low ownership of modems in Australia, use of online services, email or the Internet was not a common main use of the household computer.

<table>
<thead>
<tr>
<th>Main Uses</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playing computer games</td>
<td>25.5</td>
</tr>
<tr>
<td>Using for education/study purposes</td>
<td>38.0</td>
</tr>
<tr>
<td>Doing work (business/employment/paid)</td>
<td>23.0</td>
</tr>
<tr>
<td>Keeping personal or family records</td>
<td>8.0</td>
</tr>
<tr>
<td>Using email/Internet/other online</td>
<td>3.5</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

These uses varied from the patterns of main uses in households without dependants where game playing and using the computer for educational and study purposes were less common and use of all other activities relatively more common. This is to be expected given the absence of dependants who are the game players and who attend schools and universities.

These patterns are consistent with the results of overseas studies discussed above (Caron et al., 1989; Times Mirror Centre for the People and the Press, 1994). This suggests that while hardware, software and network capabilities of household computing are becoming more powerful and diverse over time, and
the number of households using computers is increasing, the main categories of uses, apart from the programming, of computers are remaining constant.

What cannot be discerned from the ABS studies (1994, 1996) and the previous overseas studies is whether the nature of the activities and tasks undertaken in the name of game playing, educational/study use, work-related use is indeed changing in line with the greater options available because of the increasing power and sophistication of the domestic computer and its associated equipment. This information, particularly about children, is critical if a greater understanding is to be reached about children’s interactions with the household computer. It is on this area that the doctoral study needs to cast light. The ABS study (1996) was also able to differentiate types of uses and average time spent across ages and gender of family and members. These findings are presented in Table 3.4, 3.5 and 3.6.

Table 3.4 indicates that the percentage of household members using computers increased with age until the mid teens and then decreased to adulthood. Gender

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>% use</th>
<th>% games</th>
<th>% ed'/y studies</th>
<th>% work</th>
<th>% other</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>male</td>
<td>32.6</td>
<td>30.6</td>
<td>23.0</td>
<td>0.0</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>28.7</td>
<td>24.5</td>
<td>23.6</td>
<td>0.0</td>
<td>1.4</td>
</tr>
<tr>
<td>10-14</td>
<td>male</td>
<td>47.5</td>
<td>44.2</td>
<td>51.5</td>
<td>0.1</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>47.0</td>
<td>39.7</td>
<td>58.2</td>
<td>0.0</td>
<td>3.3</td>
</tr>
<tr>
<td>15-17</td>
<td>male</td>
<td>49.3</td>
<td>43.5</td>
<td>56.8</td>
<td>0.8</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>48.1</td>
<td>32.7</td>
<td>57.7</td>
<td>1.5</td>
<td>6.5</td>
</tr>
<tr>
<td>18-24</td>
<td>male</td>
<td>30.5</td>
<td>21.7</td>
<td>25.3</td>
<td>6.7</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>27.1</td>
<td>12.3</td>
<td>25.9</td>
<td>6.6</td>
<td>9.5</td>
</tr>
<tr>
<td>25+</td>
<td>male</td>
<td>22.3</td>
<td>9.5</td>
<td>8.5</td>
<td>17.6</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>15.4</td>
<td>5.3</td>
<td>6.6</td>
<td>9.9</td>
<td>9.2</td>
</tr>
</tbody>
</table>

The data in this table was calculated from data in two unpublished tables obtained from the ABS called: Activities of household computer users by age and sex, 1996, and Main activities of household computer users by age and sex, 1996.
differences were noticeable in younger children, young adults and adults and almost non-existent in children in the 10 - 17 age range.

The range of computer uses increased with age. School age children and teenagers used the computer for game playing and educational/study activity. Adults used the computer for work-related uses, personal and household uses, and online uses. Gender differences were evident in the lower percentage of females, across all age groups, who participated in game playing. Male participation in game playing varied with age, peaking with older children and teenagers. Similarly, male online use peaked in the teenage years. Male adults over twenty five were more likely than their female counterparts to use the household computer for work purposes.

From Table 3.5 it is clear that the overwhelming majority of game-playing household members spent, on average, one to five hours a week playing games.

**Table 3.5 Average hours per week that game players spent playing games**

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>less 1 hr</th>
<th>1-5 hrs</th>
<th>6-10 hrs</th>
<th>over 10hrs</th>
<th>don't know</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>male</td>
<td>11%</td>
<td>71%</td>
<td>14%</td>
<td>3%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>female</td>
<td>17%</td>
<td>77%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>10-14</td>
<td>male</td>
<td>8%</td>
<td>68%</td>
<td>17%</td>
<td>6%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>female</td>
<td>17%</td>
<td>69%</td>
<td>10%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>100%</td>
</tr>
<tr>
<td>15-17</td>
<td>male</td>
<td>12%</td>
<td>59%</td>
<td>18%</td>
<td>7%</td>
<td>4%</td>
<td>100%</td>
</tr>
<tr>
<td>female</td>
<td>28%</td>
<td>58%</td>
<td>12%</td>
<td>0%</td>
<td>2%</td>
<td>2%</td>
<td>100%</td>
</tr>
<tr>
<td>18-24</td>
<td>male</td>
<td>12%</td>
<td>56%</td>
<td>20%</td>
<td>8%</td>
<td>4%</td>
<td>100%</td>
</tr>
<tr>
<td>female</td>
<td>24%</td>
<td>63%</td>
<td>7%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>100%</td>
</tr>
<tr>
<td>25+</td>
<td>male</td>
<td>19%</td>
<td>60%</td>
<td>13%</td>
<td>6%</td>
<td>2%</td>
<td>100%</td>
</tr>
<tr>
<td>female</td>
<td>22%</td>
<td>62%</td>
<td>11%</td>
<td>3%</td>
<td>2%</td>
<td>2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

9 The data in this table was calculated from data in a series of unpublished tables obtained from the ABS called: Average hours spent per week using computers to play games by age and sex, 1996 - Tables 1-6 controlling for 135 = none, less than 1, 1-5, 6-10, and more than 10 hours
This was true even in the three male age groups spanning ages from ten to twenty-five years. These groups are most commonly identified in popular media as the enthusiasts and addicts. It is true to say, however, that these groups did provide the greater percentages of game players who played for more than six hours a week, and were the only groups to have substantial numbers of players playing more than ten hours a week. While the majority of female household members also spent an average of one to five hours a week playing games, overall, they spent less time than their equivalent male age cohorts did. Almost no female household members played games, on average, more than ten hours per week. Both male and female patterns of game playing match results of a study done ten years ago in the United States of America (Anacarrow, 1986). No recent comparable study was located.

Table 3.6 reveals that there were household members in all age groups who only played games on the computer. These members were more likely to be males.

**Table 3.6 Average hours spent per week using the computer for non-game activities**

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>none</th>
<th>less 1 hr</th>
<th>1-5 hrs</th>
<th>6-10 hrs</th>
<th>over 10 hrs</th>
<th>don’t know</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>male</td>
<td>36%</td>
<td>19%</td>
<td>40%</td>
<td>4%</td>
<td>1%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>24%</td>
<td>21%</td>
<td>50%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>10-14</td>
<td>male</td>
<td>15%</td>
<td>15%</td>
<td>57%</td>
<td>9%</td>
<td>1%</td>
<td>3%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>9%</td>
<td>10%</td>
<td>67%</td>
<td>10%</td>
<td>3%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>15-17</td>
<td>male</td>
<td>8%</td>
<td>10%</td>
<td>51%</td>
<td>18%</td>
<td>11%</td>
<td>2%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>3%</td>
<td>6%</td>
<td>60%</td>
<td>22%</td>
<td>8%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>18-24</td>
<td>male</td>
<td>11%</td>
<td>7%</td>
<td>41%</td>
<td>18%</td>
<td>20%</td>
<td>3%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>3%</td>
<td>6%</td>
<td>48%</td>
<td>28%</td>
<td>14%</td>
<td>1%</td>
<td>100%</td>
</tr>
<tr>
<td>25+</td>
<td>male</td>
<td>6%</td>
<td>5%</td>
<td>41%</td>
<td>22%</td>
<td>22%</td>
<td>2%</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>5%</td>
<td>7%</td>
<td>55%</td>
<td>19%</td>
<td>13%</td>
<td>1%</td>
<td>100%</td>
</tr>
</tbody>
</table>

10 The data in this table was calculated from data in a series of unpublished tables obtained from the ABS called: Average hours spent per week using computers for non-game activities by age and sex, 1996 - Tables 1-6 controlling for 135 = none, less than 1, 1-5, 6-10, and more than 10 hours.
of all ages or young children of both genders. The overwhelming majority of household members used the computer for non-game-playing activities on average for one to five hours per week. It is worthy of note that this parallels the amount of time spent playing games.

Finally, in contrast to patterns of time spent playing games, gender differences are almost reversed in the sense that, in general, female household members spent more time than their male counterparts using the computer for non-game-playing activities. Only in the adult age group does this pattern break down, with males spending more time than females. These results are consistent with earlier studies in the United States which also found that in general girls spent more time on non-playing computer tasks than boys (Giacquinta et al., 1993)\textsuperscript{11}.

These four trends are important as they help define the socio-cultural contexts of children’s household computing in the mid 1990s in terms of the age and gender patterns of role modelling and expertise-based support available, and also by presenting children’s uses in the context of other household members’ uses.

3.2.4.4 Children’s access and use

Most data relating to children’s access to computers in homes is drawn from demographic studies of household ownership. It is generally inferred that the same factors that relate to household ownership, that is, socio-economic factors, geographical location and family type, also relate to children’s access. Similarly, information about the range of children’s uses of computers in homes is drawn from a few demographic studies that included specific information about children’s use in their household surveys. Sometimes this information did not differentiate between children and teenagers or young adults (Times Mirror Centre for the People and the Press, 1994) and, where it did, the age groupings used varied from study to study. For example, the Apple Computer Australia study (1996) used the groupings eight or younger and nine to twelve years of age;

\textsuperscript{11} While this appears to be a relatively recent study, the data in this study was collected in the mid-eighties.
the ABS Studies (1994 and 1996) used five to nine and ten to fourteen years. This presents some difficulties in analysing the results of the various studies in terms of their contribution to the current study, as this study focuses on five to twelve year olds, that is, those children attending primary schools in New South Wales.

Furthermore, in these studies the data was collected mainly by asking adults to answer on behalf of the children in the family (ABS, 1996), or through extrapolation from general household information. Sometimes, where one or more children were in the household, the adult had been asked to provide information about only one child, the child who most frequently used the computer (Times Mirror Centre for the People and the Press, 1994). The issues and problems surrounding the use of adults as informants about children’s activities will be discussed more fully in Chapter 4.

A small number of studies exist which use ethnographic approaches to look specifically at children’s use of computers in homes (Gripshover, 1984; Giacquinta et al., 1993). These are supplemented by a number of ethnographic studies that focus on the family and include, but do not focus on, children within the family (Hirsch, 1992; Livingstone, 1992; Wheelock, 1992).

A number of issues relating to children’s use of computers in the home have arisen from all these studies. These issues have been identified in earlier sections of this chapter. Here, they will be expanded only in ways that directly relate to children between five and twelve years of age, as this age group is the focus of this study. These issues relate to the identified relationships between age, gender and family type; and the differences in use.

**Age, gender and use**

The ABS study (1996) estimated that in 1996, 31% of five to nine year-olds and 47% of ten to fourteen year-olds in Australia used computers in their homes.\(^\text{12}\)

\(^{12}\) These figures were taken from an unpublished table: Household computer usage by age and sex, 1996.
Table 3.4 indicated that there were some gender differences in use. In the younger age group, the percentage of boys (32.6%) was higher than the percentage of girls (28.7). In the older age group, the difference was minimal (47.5% to 47.0%).

Older children (usually described as eight or nine to twelve or fourteen year olds) as well as teenagers were more likely than other family members to be computer users (Times Mirror Centre for the People and the Press, 1994; Apple Computer Australia Pty Ltd, 1996; ABS, 1996). Older children, were also more likely than younger children to be described as people who use the household computer most (Apple Computer Australia Pty Ltd, 1996).

The purposes for which children use computers varied with age. Table 3.4 indicated that game playing was the main activity of younger children and the percentage of children playing computer games increased with age. Few younger children used computers for educational/study purposes but the percentage doing so increased dramatically with older children. Tables 3.5 and 3.6 indicated that the amount of time spent on game and non-game activities varied with age. These differences are more clearly illustrated in Figures 3.1 and 3.2 presented below.

![Figure 3.1 Average weekly time 5 to 9 year old children spent using the computer](image)
Figure 3.1 indicates that younger children, aged between 5 and 9 years, spend far more time playing games than using the computer for other purposes. Importantly, it also highlights that a significant proportion of younger children only play games. The gender differences are evident but slight. Boys spend more time than girls playing games, and girls spend more time than boys on non-game activities. The greatest gender difference is in the percentage of boys who only play games (36%) compared to the percentage of girls (24%).

![Percentage of children](chart)

**Figure 3.2 Average weekly time 10 to 14 year old children spent using the computer**

Figure 3.2 indicates that the pattern of time spent is slightly different for older children, aged between 10 and 14 years. Both older boys and girls spend more time on non-game activities than their younger counterparts. Older girls, who do use the computer for games and non-game activities spend about the same amount of time doing both. Older boys, on the other hand, still spend more time playing games, though the difference is less than it is with younger boys.

These gender and age differences are confirmed by other ABS (1996) data about children’s main use of the computer. The study found that a greater percentage of boys (of all ages) have game playing reported as their main activity, while the girls’ main uses varied with age. Younger girls were reported to have game
playing as their main use, while girls ten years and over had educational or study-related uses as their main use. It is important to note that having educational or study-related uses as a main use increased dramatically for both boys and girls as they got older, but for boys it only began to surpass game playing as a main activity after the age of fourteen.

The Australian Broadcasting Authority Study (Cupitt and Stockbridge, 1996) also provided information about the range of uses for which children of different ages use computers. Table 3.7 presents their findings.

Table 3.7 Uses of computer by age in the Australian Broadcasting Authority Study\textsuperscript{13}

<table>
<thead>
<tr>
<th>Activities</th>
<th>Age of Children in Years</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=66</td>
<td>n=72</td>
<td>n=77</td>
<td>n=74</td>
<td>n=77</td>
<td></td>
</tr>
<tr>
<td>Games (educational &amp; entertainment)</td>
<td>80%</td>
<td>83%</td>
<td>79%</td>
<td>72%</td>
<td>69%</td>
<td></td>
</tr>
<tr>
<td>Typing</td>
<td>47%</td>
<td>60%</td>
<td>58%</td>
<td>64%</td>
<td>71%</td>
<td></td>
</tr>
<tr>
<td>Finding information using CD-ROM</td>
<td>6%</td>
<td>17%</td>
<td>17%</td>
<td>27%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Drawing</td>
<td>15%</td>
<td>11%</td>
<td>9%</td>
<td>16%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Internet/bulletin boards</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>4%</td>
<td>3%</td>
<td></td>
</tr>
</tbody>
</table>

In this study there were a greater number of categories of uses than in the ABS study but these categories did not clearly differentiate among the different purposes of the activities, for example, each category of activity could represent either a leisure or an educational/study-related use. Notwithstanding this, a strong pattern of change over age still emerged. The Australian Broadcasting Authority study found that the percentage of children using the computer for typing\textsuperscript{14} and

\textsuperscript{13} This table presents only a part of Table 20 found on p. 161 (Cupitt and Stockbridge, 1996). The original table presents data for ages from eight to seventeen. Within this range, differences in game playing, typing, Internet and Other uses were significant to the 0.01 level using the t-test for independent means.

\textsuperscript{14} In the ABA study the term 'typing' refers to a wide range of writing activities using word processors and other software.
finding information increased with age while game playing decreased. The lack of increase in game playing contradicts the results of the other studies mentioned above. While the sample size in the Australian Broadcasting Authority study was considerably smaller than either of the two ABS studies, its data was based on diaries kept by the children. In the two ABS studies, the data was based on adults’ statements about children’s use. Thus, it is not a simple matter to determine which trend might be the more accurate.

In the Times Mirror Study (1994), a different classification of uses was employed and the following gender differences reported. More girls used the computer often for school work and word processing than boys did. Boys and girls were about equally likely to frequently play educational games and draw pictures. Many more boys than girls played non-educational games. Interestingly when summarising gender findings, the report indicated that “The gender gap among children using home PCs today is modest” (Times Mirror Centre for the People and the Press, 1994, p. 9). The ABS (1996) and the Australian Broadcasting Authority (Cupitt and Stockbridge, 1996) findings seem to contradict this statement. No data relating gender and age was available in the Times Mirror Study (1994), though it is important to remember that, as alluded to earlier in this study, the term children included teenagers to seventeen years of age.

It is clear that in order to understand better the interactions of children and computers, particularly with regard to age, a consistent framework of uses needs to be developed to differentiate between purposes, uses and activities. The development of this framework is one of the major contributions of this doctoral study.

3.2.4.5 Family type and children’s computer use

Apart from the relationships that can be inferred about children’s access to computers in their households through the various demographic studies of households (ABS, 1994 and 1996; Cupitt and Stockbridge, 1996; Times Mirror Centre for the People and the Press, 1994), only one of these studies refers to the relationship between how children use computers within their homes and the
demographics of the family within which they live. The Times Mirror study (1994), while providing little detail, stated that while socio-economic factors impacted on children’s access to household computers they had no impact on how often and for what purposes children used them. No demographic studies that examined the relationship between a family’s ethnic or language background and children’s uses of computers were located.

3.3 Studies of children and computers

One remaining area in the literature, which needs to be considered is the general literature on children and computers. This literature generally focuses on one of two areas, either children’s game playing in a variety of contexts using a computer, a video-games machine, an arcade machine or a portable hand-held device, or children’s attitudes towards, perceptions about and uses of computers, with particular regard to educational or outside of home settings.

3.3.1 Children and game playing

Much research exists on children and electronic game playing. Mainly it occurred in the early and mid 1980s in America and Europe, when game playing was the preserve of young adolescent males in arcades. Since then, the research has broadened to include game playing at home and at school. Recently Durkin (1995) has completed a major review of this literature. In this review, he identified the following themes: negative effects, positive effects and characteristics of game players.

Among the research on negative effects, Durkin found allegations about addiction, aggression, poor health, poor school performance and the impairment of family life. In general, he found little empirical evidence to support public concern about these matters. In fact, he found that although game playing was popular with young children, compared to other leisure activities, it took up relatively little of their total leisure time. These findings have been supported by the Australian Broadcasting Authority. Figure 3.3 presents their findings (Cupitt and Stockbridge, 1996).
Figure 3.3 Proportion of time spent on leisure and homework activities in the Australian Broadcasting Authority study.

The study found that only about 5% of Australian children’s leisure time was spent playing electronic games. By far the most time consuming leisure activity was watching television, followed by general play, going places and playing sport. Interestingly, the time spent playing games is about equivalent to the time spent reading. These findings clearly support the argument that while electronic entertainment is a significant part of the lives of many children, it is, in fact, the television and not electronic game playing that dominates electronic leisure activities. For this reason, many of the claims about changes in children’s lives, particularly those that claim different world views must be carefully scrutinised.

Durkin (1995) concludes that a very small number of children may have excessive involvement with computers, but often this is a temporary problem. The ABS study (1996) bears out the first of these findings; Table 3.5, (p.81) indicates that less than 8% of all game players play for more than 10 hours per week. With respect to aggression, Durkin cautions that anti-social behaviour needs to be understood in terms of the broader social context and the complex array of variables beyond media exposure that are associated with such behaviour.
When talking about the research on positive effects of game playing, Durkin (1995) points out that much of the focus has been on cognitive abilities, symbolic representation and motor skills. In each of these areas, there are well-designed studies, which show gains following the use of specific software. In the area of social development, Durkin’s review found social involvement with computers was higher with electronic games than other media use. He also reported a number of studies that indicated that in some homes, game playing improved intergenerational relationships and increased joint activity. Importantly, Durkin found that there was some evidence that familiarity with computer games promotes more positive attitudes towards computers. His findings, however, did not support the rhetoric regarding fundamental shifts in children’s thinking capacities, nor their ability to process ideas in parallel (Heppell, 1993; Heppell, 1994).

Durkin’s (1995) review of the literature on the characteristics of game players confirmed that game playing is still the domain of the male. The studies that he reviewed were mainly conducted from the early 1980s to the early 1990s. More recent research suggests that now that computers are a part of the family furniture, more girls are participating in playing computer games (Cunningham, 1994). A number of researchers (Cupitt and Stockbridge, 1996; Haddon, 1994; Wheelock, 1992), however, found that this participation was restricted to the social context of the home, with girls playing with family and friends who came to their home. Generally, girls did not engage in the wider ranges of activities that boys did. They did not engage in social talk about games outside the home; they did not engage in the exchange of software; they did not read magazines nor visit shops; nor did they have much say in which games were purchased within the homes. Interestingly, Buckingham (1993b) found that while girls were less enthusiastic and committed to game playing, they were reflective of its place in their lives. They were critical of boys and saw themselves as having better things to do with their time.

Durkin’s review (1995) also reported that there was no evidence to suggest that game players had exceptional personalities or psychological characteristics.
Importantly, in terms of the game playing in the home, he found evidence that there were no differences in the perceptions of parents and children regarding the influence of computer games. At the end of Durkin’s review, he called for Australian research to complement the wide array of American and European research and to separate arcade and home-based game-playing activity. In particular, he singled out the need for research with families which explored both children’s and parents’ perceptions and experiences. This doctoral study will address these areas.

Extensive as it was, Durkin’s review (1995) did not address a range of issues related to the socio-cultural contexts of children’s game playing and to the notion of ‘play’. Each of these will be discussed in turn.

A number of authors have pursued the notion that children’s interactions with computers and computer games mediate their understandings of their culture. Bowers (1988) argued that computers amplify and reduce aspects of culture. Provenzo (1991) found that particular metaphors and images associated with game playing featured as part of the cultural configurations of many children, and at times transferred to the classroom where they spoke of ‘levels’ of learning and getting to the next level. Smith, Curtin, Newman (1995) found, in a study of Australian primary-aged school children, that the computer game-playing culture is a socialising site for the development of children’s needs, interests, conceptions and aspirations about the world. These notions will play a significant part in this doctoral study, particularly in regard to questions such as how does the culture of children’s game playing mediate their other interactions with the computer?

In regard to play and computer games, little literature was found. Baird and Silvern (1990) identified the electronic game environment as a play environment that elicits various forms of play. They argued that electronic games allow children to control essential outcomes such as success, scoring and progression to higher levels and that they contain elements of challenge, chance, fantasy and curiosity. Furthermore, they provide an environment where children can assess
performance and use the results to modify behaviours and influence outcomes. As game playing is essentially an elective activity, children who choose to play are intrinsically motivated to play, learn and excel. These elements combine to create a powerful child-controlled learning environment. The commonality of children playing computer games in the home reinforces the need to seek answers to the question posed in the previous paragraph with particular regard to further understanding how the culture of game playing mediates their interaction with computers in non-game-playing environments.

3.3.2   Children's attitudes towards and conceptions of computers

A number of studies focus on children's attitudes towards computers. (Chambers and Clarke, 1985; Clarke, 1987; Hughes, Brackenbridge and Macleod, 1987; Kinnear, 1995; Martin, 1991; Shashaani, 1994; Siann et al., 1990; Todman and Dick, 1993; Yelland, Wojcik and Newell, 1993). In the main, these studies have found that primary and secondary school children have a positive attitude towards computers, that boys have more positive attitudes than girls, and that children's attitudes are gender-stereotyped, in the sense that girls and boys think that boys have more positive attitudes. In contrast, Yelland et al. (1993), who worked with six-year-olds, did not find these gender differences. They argued that younger children might not be fully exposed to the peer pressure associated with gender exclusive activities.

Several of these studies, explored the gender differences in the light of a range of other variables. They found that gender interacts with the relationship between usage and attitude, such that usage is a better indicator than gender (Chambers and Clarke, 1985; Siann et al., 1990). Similarly, there is a complex relationship between ability, attitude and performance. For example, Clarke (1987) found that computing performance was more strongly related to ability for boys and to attitudes for girls.

The school-computing context was also found to make an important contribution to attitude, and again, it is linked in complex ways to gender. Clarke (1987) found that the nature of the school-computing context was an important variable.
in the development of attitudes and achievement of girls, but not for boys. Kinnear (1995) found that in one classroom unstructured classroom practices led to boys dominating computer access and use. Consequently, girls participated less in classroom computing activities. This resulted in both boys and teachers perceiving that girls had less interest in computers than boys did. In a second classroom where more structured and equitable access existed, these perceptions were not as strong. Importantly, at the end of a twelve-month period, girls in the former classroom had poorer attitudes to computers than those in the latter classroom.

The complexity of the relationship between gender and attitude is further explored in work by Spender. Spender (1995) argued that no matter what computing behaviour girls exhibited, it was interpreted by others as less positive than boys. She cited the original interpretation of research by Willis (cited in Spender, 1995, p. 179). The behaviour of girls choosing to work through computing exercises versus boys choosing to play and muck around was interpreted as evidence of girls’ lack of confidence. Spender, sceptical of this interpretation, presented the reverse scenario to a group of teachers: girls choosing to play and muck around and boys choosing to work through exercises. These teachers interpreted this as evidence that girls lacked the same degree of confidence as boys.

Other research exists about children’s attitudes to computers. This research focuses on children’s views and conceptions of computers, in a more broad sense than the research above. Two pieces of such research have particular significance to this doctoral study.

The first is the work of Qvarnell (1986 and 1989). She also found that children’s experiences with computers in school and away from school influenced their conceptions of computers. Her work strongly influenced many aspects of this doctoral study as it introduced the author to the concept of affordance. Qvarnell focused on understanding how children themselves perceive and conceive the possibilities and functions of computers. She found that children thought
differently about computers at school and out of school and that they had different conceptions of working, learning and playing at school and out of school. Furthermore, she found that while children did conceive of the computer in terms of work and play, they did not conceive of it as a thinking machine. This latter finding is in direct contrast to the findings of Turkle (1984) who argued that children did conceive of the computer in this way. Qvarell interpret her findings as evidence that the computer afforded rather more moderate possibilities than Turkle suggested. She also argued that children’s personal experiences with computers both in and out of school hide and reveal different affordances of the computer. Qvarell was particularly concerned that children’s experiences both in and out of school, and their conceptions of learning and work in school, might contribute to them rejecting the affordance of the computer as a tool for learning and problem solving.

Ainsa, Murphy, Thouvenelle and Wright (1994) also focus on the different conceptions children hold about work, play and the computer. They cited research by King (cited in Ainsa et al., 1994) which found that children who can control their own computer use tend to see their activities at the computer as play while children who are told what to do on the computer see the experience as work. They argue, however, that the distinction between work and play disappears in the context of young children using computers in early childhood settings, when appropriate and engaging software is available and children’s selections are intrinsically motivated.

Overall, the research on children’s attitudes and conceptions provides clear direction for the doctoral study. Firstly, the study will avoid the tendency to polarise boys and girls, a priori, and will carefully focus on identifying a range of variables that may influence children’s access, use and ways of using computers. Secondly, the study will work with the notion of the computer as a conceivable and useable phenomenon and directly explore children’s conceptions through the use of the concept of affordance.
3.4 Implications for the refinement of the focus of the study

From the above literature review it is clear that the study as originally conceptualised is timely, significant and original in terms of its goals and theoretical framework. At the end of Chapter 2 the primary goal of the study was defined as one of better understanding the reciprocal relationship between the child and the computer within the socio-cultural context of the home, the microsystem. Key concepts and relationships within the framework included the reflexivity of the relationships between the three entities, the child, the computer and the socio-cultural context of the home. This reflexivity accords agency to the child and affordances to the multifunctional computer within a socio-cultural context which both enables and constrains. Thus, three main sets of questions were posed. A fourth set of questions was added in respect of the doctoral study’s secondary goal to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools. The four questions were:

1. What computing resources exist in children’s homes? What affordances do these resources enable?

2. What are the socio-cultural contexts of children’s home computing? What discourses and family practices surround children’s uses of computers? How do these discourses and family practices interact with children’s perception of affordances and their use?

3. What is the nature of children’s uses of the home computer? What affordances of the domestic computer do children perceive? How do children’s interactions with the computer in their home shape these affordances?

4. What are the discourses about educational computing in which primary-school teachers participate? How do the computing experiences children have at school differ from those in their home?

The literature review has also brought forth a range of issues and factors that need to be considered in the shaping of the detail of how the study answers these questions. These will be discussed in turn below.
The Australian as well as international literature presented a clear relationship between computing resources in the home and the socio-economic status of the family, especially in regards to the type of peripheral devices such as printers, CD-ROM and modems.

In terms of the socio-cultural contexts, factors which help shape the contexts of children’s computing include parental and sibling use; the availability of expertise and support for the children’s computing; the family’s and the child’s lifestyle, particularly with regard to use of leisure time and other electronic technologies; and the gendered nature of family dynamics. Other important factors to emerge from the literature that may shape children’s interactions with computers are the age and gender of the child. Importantly, the literature points to key issues involved in the exploration of the gendered nature of family’s and children’s computing. Most of the empirical literature addressing the gender issue concentrated on the between group differences without due recognition to the within gender differences. This need for recognition that gendered differences are socially constructed and vary between contexts will be considered when framing the process for investigating gender within the study.

The literature does not present a clear picture of what children actually do with computers in their homes. While national data on usage exists, it does not go beyond general descriptions of use such as game playing, educational and study-related uses. Throughout the literature, there were different ways of defining use but few were able to capture or describe the richness of children’s interactions. The current study will address this through the development of a framework of uses that takes account of purpose, types of software, computing environments and the actual nature of the task performed. When focusing on the school, clarification will also be sought as to the nature of the use of games and using computers for writing.

Little was found in the literature regarding the discourses in which teachers participate. Through the fourth set of questions, the doctoral study will seek to identify such discourses.
Finally, the literature confirmed that the historical context of the study would be very important when interpreting the results of the study. The technology, families and childhood are changing at a time of rapid increase of diffusion of computers into homes. Some authors argue that society itself, its social organisation is changing because of the nature of these new technologies. These arguments will need to be remembered when the implications for schooling are discussed.

3.5 Some methodological considerations

A range of methodological issues was also raised in the literature review. The most significant of these was the silence of children’s voices in the empirical literature. So often, parents, teachers and other adults answered and described on behalf of children. Only a small number of studies sought children’s views, opinions and descriptions of their interactions with computers and most of these restricted themselves to studies of children’s attitudes to computers. A key feature of this current study will be the centrality of children as informants on the wide range of issues related to their interactions with computers in the home. A number of other less important methodological issues were raised in the literature. These will be dealt with in the following chapter on methodology.
Chapter 4. Methodology

Chapter 4 presents a description of the methodology of the doctoral study. It begins with an overview and rationale for a multi-method, multi-staged design. Following from this is a brief discussion of the issues related to the design of the study. Finally, the details of each step in the three stages are outlined.

4.1 General description and justification of methodology

As mentioned in Chapter 2, it is a significant feature of this study that the original research idea was conceived in response to an observed phenomenon in the lives of children in the classes of the author’s graduate students (Downes, 1994). The actual research was initiated when a funding opportunity became available to explore this phenomenon more carefully over a wider cross section of urban children. The funding also enabled the employment of a number of research assistants to work on the project. Hence, throughout this chapter there will be references to multiple researchers.

One of the essential features of this ‘problem-based’ approach is the need to situate the inquiry within theoretical and methodological frameworks that best support the elucidation, explication and interpretation of the ‘problem’. In contrast to this approach, many research studies are conceived within or from a researcher’s strong commitment to a particular theoretical and/or methodological stance. These researchers often associate particular methodologies with selected research paradigms that vary at the epistemological and theoretical level. This is the approach presented in most research methods texts and espoused in many
research methods courses. Within this approach the divide between different research methods, particularly qualitative and quantitative methods, and their associated paradigms, is usually seen as unbreachable and the idea of mixing methods associated with the different paradigms is seen not only as useless but lacking in fidelity to an underlying ideology which attaches to a particular paradigm.

A number of researchers from diverse fields (Denzin, 1978; Goetz and LeCompte, 1984; Brannen, 1992; Hammersley, 1992) challenge these implications and argue that the methodologies and data types, although clearly influenced by particular theoretical and epistemological stances, can be separated from these concerns and combined in different ways for use with particular questions or problems. They argue that a combination of different approaches and methodologies can provide different perspectives on the same phenomenon and further, that the data from the different sources is complementary and can be combined to provide rich information on different aspects of human experience.

Hammersley (1992), argues that often the distinctions between the various methodologies are artificial. For instance, when talking about inductive versus deductive approaches he argues that in all research, researchers move from ideas to data as well as from data to ideas. This includes researchers using grounded theorising\(^{15}\) as well as those who use the hypothetico-deductive methods. Furthermore, he suggests that the more important differences are between exploratory studies, studies designed to build theories and those more concerned with testing hypotheses. He concludes that determining which of these three approaches is most appropriate depends more on the purpose or stage of the research and the development of the field than on a commitment to a particular paradigm.

This doctoral study uses a multi-method approach to take account of the need to stage the study. It moves from an exploratory component through to an

\(^{15}\) see Strauss and Corbin (1990) for a definition of grounded theory.
interpretive one which is designed to build theory. In this sense, the overall
design could be described as a multi-staged cumulative design that employs a
multi-method approach.

In taking this approach, where no traditional paradigm is central to the study, the
author does recognise that her previous experiences have shaped a particular
view of the world and of the particular phenomenon under investigation. The
very fact of choosing to use a multi-method approach which recognises multiple
perspectives and different ways of explaining human experience clearly identifies
an epistemological stance which recognises relative truth. This stance is
consistent with the development of a blended theoretical framework in Chapter 2
where childhood is conceptualised as socially constructed, technology as having
‘affordances’ derived from both its instrumental and symbolic meanings and
society (and the home, in particular) as both constraining and enabling the child
and the affordances, while leaving space for the agency of both.

The consistency between epistemological stance, the use of a blended theoretical
framework and a mixed method approach completes the necessary coherency of
goal, theoretical framework and methodology. The coherency is essential if the
multi-method approach in this study is to be seen as more than an opportunistic
form of grasping at convenient methods. The following overview of the purposes
and methods of each of the stages further illustrates this coherence. More detailed
descriptions of each stage of the study, providing information such as sample
size, will be presented in Section 4.3.

Stage One seeks to explore and define the richness of the physical and social
environments of children’s home computing and the range of uses for which
children use the computer. Discussion groups of purposefully sampled children
are used as the source of data for this stage. The analysis of this stage leads to the
development of a framework of uses as well as the identification of possible
factors that may differentiate children’s interactions with computers. While the
literature review identified potential factors, such as age and gender, a feature of
the discussion groups is a minimalist approach to what could be considered as
these *a priori* factors. This is to maximise the opportunity for the ‘voices’ of the children to be heard and novel insights gained.

**Stage Two** extends and quantifies some of the insights from Stage One. In particular, the commonalities and differences in children’s experiences across a wide range of families and communities are explored more systematically. The analysis of these commonalities and differences provides insights into children’s agency as well as the constraining and enabling features of their homes. Some of the factors identified in the initial analysis of Stage One and in the literature review are used as key independent variables within a survey method designed to explore some emergent hypotheses. However, this still remains a broadly inductive approach as this hypothesis testing does not take place in the conventional sense because the tension of the agency/structure continuum requires that the variations within groups continue to be explored fully while variation between groups is being documented. In order to do this both quantifiable and qualitative data is collected in the structured interviews.

**Stage Three** builds on the previous stages and focuses on developing a middle-range theory about the reflexive relationships involved in the interactions of children, computers and homes. In order to do this a small number of children’s interactions with computers are studied in detail. Data collection involves semi-structured interviews with children, their parents and their teachers and diaries of children’s computer use.

It is worth noting that the results of each of these phases, though adding a cumulative perspective to the overall study, will not be treated separately but rather, they will be presented and interpreted conjointly.

### 4.2 Issues relating to the design of the study

Key issues relating to the design of the doctoral study are the use of children as informants, the methods used in the study, and the credibility of the study. Each of these will be discussed in turn below.
4.2.1 Children as informants

One of the dominant features of the design of this study is the centrality of children as informants on the wide range of issues related to their interactions with computers in the home. This is in direct contrast to the majority of related studies which use adults as informants about children and their lives or regard children as ‘objects’ of study, as is the case in most of the studies on ‘the effects of’ games, computing and/or families ‘on children’.

In particular, much of the qualitative research on domestic computing relies on adults as informants about children’s experiences. In studies where children have participated in focus groups or interviews often the selection of children is confined to teenagers (Times Mirror Centre for the People and the Press, 1994) or at best skewed towards these older age groups (Giacquinta et al., 1993). The bringing of this ‘silence of children’s voices’ to an end is considered one of the major contributions of the doctoral study. It is also seen as an essential component of the overall design of the study because seeking to understand the perspectives of the children is essential if we are to describe, explain and interpret their behaviour effectively. Using children as informants raises a number of ethical and methodological issues. These issues will be discussed in turn.

4.2.1.1 Ethical issues

While ethics is a topic commonly discussed in educational research, few discussions specifically focus on the ethics of social research with children. Alderson (1995) and Morrow and Martin (1996) are examples of the few who do. Generally, children are mentioned in a few paragraphs usually to do with consent and protection of respondents. In the former, the recommendation relates to seeking the informed consent of parents or adults acting ‘in loco parentis’. In the latter, again, it is the view of adults that is sought regarding the resolution of duty of care. These approaches are based on two conceptions of children; children as vulnerable and children as incompetent. While there are arguable links between children’s vulnerability and their physical weakness, their lack of knowledge and
experience and the structural problem of lack of political and economic power (Lansdown cited in Morrow and Martin, 1996), the link between vulnerability and incompetence is not defensible. Morrow and Martin argue that it is more a case of a culture neither listening to children nor valuing their viewpoints. A number of researchers have found that children are capable of understanding complex matters and giving reliable testimonies (Fielding and Conroy, 1992; Spencer and Flin, 1990). Waksler (1991) argues that it is more productive to think of children as having different rather than lesser competencies. When these different competencies are taken into account, children are capable of making informed decisions.

In this study, a number of strategies are used to address the issues of consent and protection in a child-centred approach. The study employs strategies which seek each child’s consent in a way understandable to the child and provide a ‘real’ choice (as perceived by the child) to participate or not. These strategies are presented in Section 4.3. The issue of the rights of a child to protection is dealt with through the management of the relationship and the meetings between the child participant and the researcher. The issue is one of the careful management of the difference in authority and power ascribed to the adult researcher and the child participant. John (1996) argues that the productive approach is to consider the strategies employed in the area of social research with minority groups, because the difference in power, voice and participation likens children to the more traditionally recognised minority groups. In this way, strategies already known, which increase participation and empowerment, might be applied to the relationship between children and adult researchers. Practical strategies for addressing these types of issues were implemented in each stage of the doctoral study. They are presented in Section 4.3.

4.2.1.2 Methodological issues

Two major methodological issues for the doctoral study also arise out of the use of children as informants. One relates to the belief by some researchers that children possess characteristics that make them different and problematic as
informants in research; the other to the use of the school as a site of participation. Both of these will be discussed below.

**Children as different from adults as informants**

Some researchers, particularly those who work within paradigms that conceptualise the child as a developmentally immature adult, believe that children are not capable of being reliable informants in research. In general these researchers argue that the younger the children the greater the problem with their participation. Some of the commonly described characteristics deemed to contribute to the problem are their inability to think and interact at a propositional level, their inability to understand what is being asked of them, their inability to articulate their understanding of something that they may not have expressed before, their inability to tell ‘truth’ from fiction, and their eagerness to please adults, particularly in a school (Mayall, 1994a).

Contrary to this belief that these characteristics differentiate children from adults as research participants, many childhood studies researchers (Mayall, 1994b; Oakley, 1994; Solberg, 1996) believe that these are essentially the very same issues. Consequently all researchers need to take account of these issues regardless of the age of the participants and that attending to these issues on behalf of all participants is a professional responsibility. Oakley (1994) takes this line of argument even further through her proposition that mainstream research with adults has not always attended to these matters, and through the identification of special groups of ‘the researched’ such as women, ethnic minorities or children, issues such as these were thrown into relief and have resulted in higher ethical and professional standards being used right across the spectrum.

This discussion draws attention to the fact that all self-accounts are socially constructed, they are mediated through the participant’s experiences and are influenced by the setting in which the accounts are told. Ultimately, the issue is what kind of knowledge is it possible for the researchers to gain about the researched and what ‘truths’ are being sought by the researcher. In this study
when more ‘information’ is sought, reliability checks are used within the discussion or sought through access to similar data from other participants or to different types of data. Later in Section 4.2.3, p111, there is a detailed discussion about strategies for enhancing the overall reliability of the study.

A range of other strategies was employed to take account of the fundamental questions regarding the relationship between the researcher and the participant but not in a way that highlighted the ‘childlike’ qualities of the informants. This is not to imply that due care was not taken to address specific issues, but rather, throughout the study the same principles were applied to all participants, adults and children alike. Simple examples of this can be seen in the way the researchers, as part of their greeting of all participants, reminded them of their rights to not take part, to withdraw at any time or to choose not to answer any particular questions. Furthermore, researchers took care to sit in a way so as to provide ‘comfortable’ eye contact for participants, which in some cases required the researcher to sit on a low chair or on the floor during discussion groups.

**The school as a site of participation**

Schools were chosen as the site for interviewing and holding discussion groups with children for a number of reasons. These included the convenience to the researcher of having large numbers of children on site and of access to a range of physical locations where discussion groups could be held; the convenience to the families through the minimisation of the disruption to their lives at home, and the convenience to the participants who are generally known to be happy to give up ‘class time’ to participate in research. Furthermore, the choice of the school provided a separation from the site of participation, the home, and from parents who might, through supervising the researcher’s contact with the child within the home, take an unplanned part in the interview. It was assumed that separating the child participants from their homes and parents allowed for greater opportunities on the part of the children to share their ideas and perceptions without interruptions and with greater confidentiality.
Part of each discussion group and interview also sought children’s views about computing in the school. In order to provide the same sense of ‘separation’, children were withdrawn from their classroom and located in a physical space where teachers and other adults in the school were not be able to hear or take part in the conversations between children and researchers.

One important issue that arose through the use of the school as the site of participation was the possibility that this site provided a strong influence on the nature of children’s responses in discussion and interviews. The school site strongly defines the relationships between adults and children as teachers and learners. In this relationship teachers define children’s responses as correct or incorrect, and question and answer sessions may be viewed by children as ‘test’ situations. The doctoral study needed to break this nexus as far as possible. This was done in a number of ways.

Firstly, each time researchers introduced themselves, they identified themselves as a visitor and a person interested in ‘learning from’ the children about a topic in which the children hold a special expertise and knowledge, that is, what they do with computers in their homes. The researcher also stressed that the best answers were those that came from the everyday experiences of the children in their homes (and schools).

Secondly, the structure of the questions in both the discussion groups and interviews was designed so that children ‘anchored’ their answers in their own experiences through providing an example of a task they had undertaken or detailed descriptions of a process they had used. For example, when talking about the computing equipment in their homes, children were asked to detail what equipment they had, what it looked like, where it was kept, any brand names they could remember and/or how they or others used it. Not only did this approach take the child back to their own personal experiences, it also allowed researchers to do reliability checks and to identify areas of doubt or confusion in their own minds or the minds of the children and to seek clarification with other questions.
4.2.2 Key data collection methods

Over the three stages of the study, different data collection methods were used. In Stage One discussion groups were used, in Stage Two structured interviews, and in Stage Three semi-structured interviews and computer-use diaries. Each of these methods is discussed below.

4.2.2.1 Discussion groups

The use of the term discussion group rather than focus group was a deliberate decision to highlight some differences between the method that was used in Stage One and the common characteristics of focus groups. Beck, Trombetta, and Shane (cited in Vaughn, Shay Schumm, and Singagub, 1996, p. 4) define focus groups as “an informal discussion among selected individuals about specific topics relevant to the situation at hand”. This definition applies equally well to the discussion groups that were part of Stage One of the study.

There are other commonalities between the discussion groups in Stage One and focus groups as described by Vaughn et al. (1996). These are the relatively small size of the group, between 6-12 members; the relative homogeneity of the members, in terms of age and parental description of computer use; and a trained moderator with prepared questions and probes. The major difference lay in the goal of focus groups. Vaughn et al. describes the goal as eliciting “perceptions, feelings, attitudes and ideas about a selected topic” (p.5). A major goal of the discussion groups in Stage One was eliciting rich and diverse descriptions of the social and physical environment in which children use the computer and the variety of ways that they use it. While such descriptions may include perceptions, feelings and ideas and reveal attitudes, these were not the main goal. While this difference may seem minor, it was felt to be sufficiently important to note it with a different term.

In Stage One of the study, discussion groups were thought to be more appropriate than individual interviews because it was assumed that the interaction between the children or, at the very least, the listening to others’ responses would
stimulate additional comments either confirming, adding to or varying previous comments. During the discussion groups, prompts seeking similar and different experiences, activities or situations were used to stimulate diversity.

4.2.2.2 Structured and semi-structured interviews

Structured interviews were used in Stage Two of the study within a survey context for identifying patterns of commonality and difference across the children sampled. The structure provided the opportunity for a range of comparable information to be collected from all participants. However, the interviews were less structured than normally found in the standardised opinion-poll style verbal questionnaire. These structured interviews typically have a carefully ordered and worded interview schedule, with a predominance of closed multiple choice questions (Minichiello, Aroni, Timewell and Alexander, 1995).

The interviews in Stage Two were based on a common schedule with a predetermined order of questions, however, the actual interaction between the researcher and the participant moved between that of conversation and question and answer. The question and answer mode generally covered simple questions such as “Do you use the printer?” while the conversational mode was used to probe such topics as how it was used, for what purposes and what rules governed its use. In this sense, the interview had both a deductive and an inductive component and, at times, the participant had some control over the flow of conversation. In recognition of this duality, simple answers and notes were recorded on the interview schedule as the interview progressed but the interview was also audiotaped so that rich and complex responses could be transcribed.

In Stage Three of the study, semi-structured interviews were conducted with a small number of children, parents and teachers. Minichiello et al. (1995) defines semi-structured interviews as interviews where

an interview guide or schedule is developed around a list of topics without fixed wording or fixed ordering. The content of the interview is focused on the issues that are central to the research
question but the types of questioning and discussion allow for greater flexibility than does the survey style interview. (p.65)

This form of interview allows for a more in-depth examination of the participants’ perceptions, feelings, attitudes and beliefs about a smaller number of topics. It was appropriate to Stage Three as it provided the opportunity for the progressive focusing of topics within and between interviews that was needed within this interpretive phase of the research.

In a number of families, both parents chose to be part of the interview. In these cases each parent chose when to contribute to the conversation. In these paired interviews some of the dynamics of focus groups were evident, particularly in terms of stimulating further comment and offering multiple perspectives.

4.2.2.3 Computer-use diaries

Computer-use diaries were used in Stage Three as one of the data collection methods. Each time children used the computer within a selected two-week period they recorded the date and time, the nature of the activity and with whom they undertook the activity. At the time the diary was collected, a brief conversation based on a diary check was held with the child. During this conversation, the child was prompted for extra details that were recorded by the researcher on the entry in the diary.

Omissions from and slight inaccuracies in the diary were not an issue as the data was not used to count or compare time or types of tasks. This type of information was already available from the Australian Broadcasting Authority’s (Cupitt and Stockbridge, 1996) national study. The data in the diary was used for a number of other purposes. Firstly, it provided a series of pictures of individual children’s range of use of the computer. Secondly, it was used to provide stimulus material for further discussion with the child about his or her use of the computer. It was anticipated that the act of completing the diary would focus the child’s attention on the nature and social context of the task. This, in turn, would facilitate greater discussion during the subsequent interview. The completed diary would also
provide a written record of activities upon which the child could reflect, when prompted during the interview.

4.2.3 Credibility of the study

All research, regardless of its purpose and methodology, is concerned with producing credible outcomes that constitute valid and reliable knowledge. What varies with purpose and methodology are the terms used to define how credibility is sought, the actual operational definitions of the terms used, and the processes used to establish or improve such characteristics described by the terms.

Among researchers who use multiple methods or qualitative methods (Sherman and Webb, 1988; Hammersley, 1992) much discussion exists on the appropriateness of using reliability and validity, terms used in the quantitative paradigm, as a way of describing indicators of credibility. Others (Goetz and LeCompte, 1984; Minichiello et al., 1995) make the effort to use these terms but develop conceptualisations of the terms which are more relevant to the nature of their studies.

Even when other terms are used, such as trustworthiness (Lincoln and Guba, 1985), all researchers strive to develop strategies that allow other researchers to make judgements about the quality of the study in terms of the quality of the decisions made during the study and the outcomes reached.

In this doctoral study the terms reliability and validity are used to address the issues associated with establishing the credibility of the study. In doing so, the definitions of these terms remain reasonably close to the more traditional definitions found in the general literature. Reliability is about replicability in the sense of others being able to repeat the processes and findings if they could repeat the study; and validity is about interpretations or conclusions accurately representing empirical reality or realities as contextualised by the study. Furthermore, the ideas of both external and internal reliability and validity are used as they provide useful frameworks for considering the wide range of issues
associated with the particular approaches used within the doctoral study. Each of these will be discussed below.

4.2.3.1 *External reliability*

The concept of replication is central to the definition of reliability. The replication of studies, particularly qualitative studies and multi-method studies with strong contextualised components, is difficult to achieve in practice and some would even argue of little practical value (Minichiello et al., 1995). More relevant to qualitative research is the concept of replication of methodology. At the core of this form of replication is the provision of a fully documented account of research decision-making and other processes so that readers and subsequent researchers can undertake a similar study in different settings. (Goetz and LeCompte, 1984; Minichiello et al., 1995).

Goetz and LeCompte (1984, pp. 214-217) propose that subsequent researchers need access to sufficient and clear detail in each of the five following areas:

- The researcher’s role and status within the group/s investigated;
- The types of people who served as informants and the decision process invoked in their choice;
- The physical, social and interpersonal contexts within which data is gathered;
- The theoretical premises and defining constructs that inform and shape the research;
- The data collection techniques and the strategies used for analysing the data.

While the above list may seem obvious to some researchers, Goetz and LeCompte (1984) argue that all too often qualitative researchers provide too little detail in their reports, particularly in terms of the detail needed for subsequent researchers to reconstruct the analytic strategies. In the following sections, information about each of the above is provided in sufficient detail for subsequent researchers to understand the decisions and processes used within the three stages of the study. Chapter 2 has already provided the detail of the theoretical premises that informed the research.
4.2.3.2 Internal reliability

Internal reliability in multi-method or qualitative research is related to the ability of readers or subsequent researchers to make the judgement that given the data collected, the results of the study make sense, are consistent and are dependable (Lincoln and Guba, 1985).

Again, it is Goetz and LeCompte (1984 pp. 218-220) who provide a useful list of strategies to enhance internal reliability. These are:

- The use of low inference descriptors and the provision of sufficient ‘raw data’ to allow others the means to accept, reject or modify a researcher’s conclusions;
- The use of multiple researchers who undergo extensive prior training and who discuss the meaning of what has been observed, what coding systems are to be used etc., until agreement has been reached;
- The use of local informants to confirm that descriptions, interpretations and explanations are consistent with both the researchers’ and the informants’ views;
- The corroboration of findings by researchers operating in similar settings, either by integrating descriptions and conclusions from other researchers into the presentation of results and interpretations, or by analysing and integrating findings from relevant studies conducted concurrently with the researchers;
- The mechanical recording of raw data with audio or video recorders, photographs etc to preserve data that is un-abstracted in any way and to allow for subsequent re-analysis.

A number of other researchers would add a further criterion: the building of an audit trail of the data analysis (Lincoln and Guba, 1985; Maykut and Morehouse, 1994). In the doctoral study, each of these strategies is implemented in ways appropriate to the stage of the study and the method of data analysis. Some of these strategies are listed below.

- Well trained multiple researchers were used in all stages of the study and regular meetings of researchers were held to allow for consensus building;
• The findings of the two national studies (Australian Bureau of Statistics, 1996; Cupitt and Stockbridge, 1996) which were concurrently conducted with the doctoral research and were analysed in detail in Section 3.1 are integrated into the descriptions and interpretations in later sections;

• All focus groups and interviews were recorded. The former were videotaped and the latter audiotaped. All transcriptions were checked against the original recordings;

• Member checks were used with the informants in Stage Three of the study, the sheer numbers involved in Stages One and Two precluded member checks;

and finally

• in the results chapters, sufficient raw data will be integrated into the reports of the interpretations to provide readers with the necessary material to make their own judgements.

As internal reliability is a necessary (but not sufficient) condition for internal validity, these strategies also contribute to the internal validity of the doctoral study.

4.2.3.3 Internal validity

Internal validity is variously defined in the mixed method and qualitative literature. Goetz and LeCompte (1984) refer to internal validity as the extent to which observations, derived constructs and interpretations are authentic representations of some ‘reality’ or, as Lincoln and Guba (1985) would argue, multiple realities.

Triangulation is one of the commonly used strategies to improve internal validity. It refers to the combination of several types of data, of data collected with different methods or of data from several sources. Glaser and Strauss (cited in Goetz and LeCompte, 1984) argue that it prevents the researcher from accepting too readily the validity of initial impressions, observations and interpretations. They believe that it enhances the scope, density and clarity of constructs developed in the course of the investigation.
Triangulation is achieved within the doctoral study in a number of ways. These include the use of multiple methods, multiple data sources and multiple researchers. Each of these will be discussed in turn below.

**Multiple methods**

The multi-method approach of the doctoral study is one of its dominant features. Methods include discussion groups, individual structured and semi-structured interviews and computer-use diaries. These methods combine in different ways to strengthen the internal validity of the study. For example, many of the children’s ideas and descriptions that were originally raised through the focus groups were revisited in the structured interviews. This juxtaposed data that was collected initially in a group situation with data that was collected individually, thus allowing for the different settings in which the accounts were given. In moving to Stage Three, for the small number of children involved, the structured interview was combined with the computer-use diaries to provide a denser picture of the children’s uses of the computer which were further explored in their final semi-structured interview.

**Multiple data sources**

Multiple data sources were used in different ways throughout the study. In the analysis of the exploratory and explanatory stages, the findings of the two concurrently conducted national studies (Australian Bureau of Statistics, 1996; Cupitt and Stockbridge, 1996) are integrated with the results of the doctoral study.

In the final stage of the study, children’s, parents’ and teachers’ accounts were used to provide multiple perspectives on children’s home computing thus adding depth and additional perspectives on the interactions between children, computers and the home and to the consequent theory being generated.
Multiple researchers

As mentioned in the introduction to this chapter, the doctoral student employed research assistants at various stages in the study. The use of multiple researchers helps limit the bias that can be introduced by a single investigator. In each of the stages, several researchers were involved in the data collection, coding and analysis of the data. This allowed different investigators to compare their perceptions and interpretations in order to crosscheck for introduction of their own bias and to establish a consistency of concepts for coding and analysis. The details of their involvement in the study will be provided later in this chapter when the three stages of the research are described.

4.2.3.4 External validity

The external validity of the study is of great importance, as the secondary goal of the doctoral study is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools. For this to happen, educators, teachers and other researchers must see the findings of the study as applicable beyond the contexts of the actual study itself. Mischler (1990) extends this idea when he proposes that the ultimate test of trustworthiness (used in the sense of validation) “is whether other researchers believe in the findings strongly enough to act on them” (p.417).

The design of the study has addressed this need for external validity in a number of ways. Firstly, the study benefits from being juxtaposed with two national studies that provide population-based findings within which the results of the doctoral study can be interpreted. Secondly, the combination of Stage One and Two findings provides a reasonably large representative sample of urban children in an Australian capital city (220 children in Stage One and 276 children in Stage Two). Children are drawn from communities with differing social, economic and cultural backgrounds and from schools of different types belonging to different education systems. The size and purposeful sampling procedures provide for both the diversity and the representativeness needed to allow some generalisability to be claimed but, more importantly, provide a sound basis for the generation of a
useful theory of children’s interactions with computers in their homes. These two strategies recognise that the enumerative components of the findings as well as the theoretical components need to address generalisability in a way not commonly done in studies that situate themselves purely within a qualitative paradigm.

Other strategies used in the doctoral study to improve external validity relate to improving the comparability and translatability of the study. These two terms refer to characteristics that Goetz and LeCompte (1984) identify as affecting the external validity of multi-method or qualitative research. The first of these draws on the strategies in place to improve the external reliability of the study. These ensure that other researchers and educators have sufficient description and definition of the components of the study to use the results as a basis of comparison with other studies addressing related issues. The second relates to the accessibility of the theoretical frames, definitions and research techniques used in the study. Goetz and LeCompte argue that a study is of little use to others if its theoretical base or constructs are so idiosyncratic that they are understood only by those who take part in the study. The degree of detail and argument in Chapter 2, which outlines the development of the theoretical framework for the study, enhances accessibility to the theoretical frames. Similarly, the detail in this chapter on research methods enhances similar accessibility to the research techniques.

4.3 Design of the study.

As described earlier, the doctoral study is multi-staged and multi-method, moving from an exploratory through to an interpretive stage. Stage One began in early 1995 and Stage Three was completed in late 1996. Each stage had a data collection phase, an initial analysis phase, and a preliminary report phase. In each stage, the time frame between data collection and preliminary report stage was very brief. This constraint stemmed from the requirements of the funding institution, Compaq Computers Australia, who had set deadlines for the release of the preliminary reports to the press. The doctoral student was happy and
willing to meet these almost impossibly tight deadlines as they represented the only contractual obligation for the funding. Funds totalled $28 000 over the duration of the project. These deadlines, however, did mean that subsequent phases were being designed and data being collected, at least in the case of Stage Two, before an in depth analysis of the data from Stage One was possible. Table 4.1 outlines the time frame for each phase of the study.

**Table 4.1 Time line for the study**

<table>
<thead>
<tr>
<th></th>
<th>Data Collection</th>
<th>Initial Analysis</th>
<th>Publication of preliminary results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage One</td>
<td>April - May 1995</td>
<td>Aug - Sep 1995</td>
<td>October 1995</td>
</tr>
</tbody>
</table>

Each of the preliminary analyses identified lightly theorised themes and issues and in the case of Stages One and Two a framework for describing children’s uses of computers. The indepth analysis of these themes and issues, that gave rise to the middle range theories developed in this thesis, occurred from January 1997 through to July 1998.

Throughout the study, there was a common system for gaining permission to undertake each stage of the research. In each stage, the first step was the obtaining of approval for the research from the University of Western Sydney Macarthur’s Ethics Review Committee (Human Subjects). The second step was the gaining of permission from the relevant school systems to approach potential participating schools. The third step was the gaining of the approval and support of the relevant school principals to undertake the research in their schools. As part of the process of gaining this approval and support, the researcher agreed to provide general feedback and a copy of the written report to the schools.

Once permission was gained to work in particular schools, the initial contact with parents was through a package sent home with all children in the school. In
Stages One and Two, the package contained three documents a letter of introduction, information about the study and a consent form. These documents in the parents' package were available in each of the following languages English, Arabic, Cambodian, Chinese, Khmer, Korean, Polish, Spanish, Ti Shi and Vietnamese. Translations were carried out by NATTI certified translators from the Language Acquisition Research Centre at the University of Western Sydney Macarthur. Examples of the English version of these documents are presented in Appendix A. In Stage Three, the permission process within the school was more complex. It is reported in detail in Section 4.6.3, p. 132.

The consent form for Stages One and Two was also designed to collect some information about the child for whom approval was sought. Table 4.2 is a copy of the data collection sheet.

<table>
<thead>
<tr>
<th>At home my child</th>
<th>Several hours a day</th>
<th>At least once a day</th>
<th>Two or three times a week</th>
<th>About once a week</th>
<th>Less than once a week</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>watches television</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>listens to his/her own music</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses the telephone to talk to friends etc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plays games on a Nintendo, SuperNintendo, Sega, Megadrive or other games machines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plays games on a computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for writing and/or drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for school projects and homework</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for other purposes: ........................................ please specify</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The information provided by the parents through this form was used to help select children for the focus groups and interviews. As well, an analysis by school
of time spent on each of the activities provided a profile for comparison with the children's responses.

The final step in each stage of the permission process of the study was seeking the agreement of children to take part in the study. This occurred verbally at the start of each session where a child or a group of children was involved. In each case children were reminded that they could choose to not take part, withdraw from the study at any time and/or choose not to answer any questions about which they felt uncomfortable. It is worth noting that no child chose to withdraw from the study.

4.4 Stage One

4.4.1 Purpose of Stage One of the study.

The purpose of this phase of the study was to describe how children use computers in their homes and the physical and social environments within which they use them.

4.4.2 The schools

The participants in the discussion groups were selected children from years K-6 in three primary schools in south western Sydney. Two of the schools drew their children from multicultural, lower-middle class communities, while the third drew theirs from a predominantly Anglo-Australian middle class community. Neither of the schools with multicultural communities had ESL Phase 1 students in the schools, nor did they identify any parents who would need research and consent documents translated into languages other than English.

In one of the three schools, the principal published information about the study in its regular newsletters to parents and acknowledged the long-term benefit of this type of research for the school. In this school, the rate of return of permission notes was 85%. In the two other schools the rate varied between 35% and 47%. The varying response rates were not seen as a problem as the resultant pool of possible children was sufficiently large to provide the type of diversity sought
through the discussion groups. In addition, the information provided was mainly used to identify regular users among the children and to provide some ability to check children’s own perceptions about the frequency of their use.

4.4.3 The children

The selected children were regular users of computers at home for game playing and other purposes. Regular users were defined as children whose parents indicated that they used a computer at least two or three times a week for games and/or other purposes. The decision to include only these children stemmed from the need to develop a rich understanding of the breadth of activities that children of this age undertook. It would not have been useful in this circumstance to work with children who only played games on the computer or who only used the computer for other purposes on rare occasions. Table 4.3 presents the numbers of children interviewed by gender and grade groupings across the three schools.

Table 4.3 Children participating in discussion groups

| Grades | School A | | School B | | School C | | Total |
|--------|---------|---------|---------|---------|---------|---------|
|        | Boys    | Girls   | Boys    | Girls   | Boys    | Girls   |
| K-1    | 5       | 8       | 16      | 5       | 18      | 14      | 66      |
| 2-4    | 5       | 8       | 14      | 9       | 20      | 19      | 75      |
| 5-6    | 13      | 17      | 4       | 2       | 23      | 19      | 78      |
| Total  | 23      | 33      | 34      | 16      | 61      | 52      | 219     |

In school A, the first school in which the discussion groups were held, only children in Years K, 3 and 6 were involved in discussion groups. In effect, this school was used as a pilot school with all aspects of the discussion group process being refined and improved. In school B, the only time available for the school to participate was during a week of extra curricular activities when almost all Years 5 and 6 children were away from the school on camps. Overall, the difference in the gender of children interviewed closely reflected the difference in return rate of permission notes from families of boys and girls. In school C, where there was an exceptionally high return rate of permission notes, there were only slight
gender difference in rates of return. In this school, all available children who met
the criteria participated in the discussion groups.

4.4.4 The discussion groups

In general, two researchers worked in a school holding discussion groups over a
period of 3-4 days. Discussion groups lasted from twenty to forty minutes
depending on the age and number of children involved. The discussion groups
were held in a quiet part of the school, usually within a separate room, with
children sitting in a horseshoe shape on the floor or on chairs. This shape allowed
for easy video taping of the discussion. Discussion groups usually had six
children of mixed gender, generally balanced in numbers. The beginning protocol
for the discussions involved explaining to children what the project was about,
what the role of the video recorder was and that they had the right to not take part
or to not contribute to aspects of the discussion.

The same moderator was used for all discussion groups, with the second
researcher monitoring the video camera from time to time to ensure that all
children were visible and audible. This researcher also made explanatory notes
about the discussion. In schools A and B, the second researcher was the doctoral
student. In the early stages, informal but regular discussions were held between
the two researchers when decisions were made regarding the inclusion of new
questions or the deletion or refinement of existing questions. In particular,
questions relating to children’s uses of other electronic technologies, including
televisions, were dropped after the first round of discussion groups. It became
obvious that the information being provided by the children matched the data
provided by the parents and the overall length of the discussion needed
shortening. It is worth noting that the older children often had much to say on the
various topics and wanted discussions extended to allow them to discuss all
topics. Appendix B contains a copy of the original discussion group schedule.
Once the schedule was refined, a third researcher replaced the doctoral student as
monitor and note taker.
4.4.5 Data analysis

The moderator or the researcher who was present at a discussion group generated a complete transcript of the session from the videotape. Transcripts were rechecked against the videos a second time to verify their accuracy. On some occasions both researchers present at the discussion group worked on difficult sections of tapes in order to ensure that comments were ascribed to the correct child. A preliminary analysis of the transcripts involved each of the utterances being coded for content of utterance, school, discussion group, grade, gender and child. The content of the utterance was based on the question asked or, in some cases, the answer given, as children often provided a rich variety of information within the one utterance. The coding scheme for content of utterances is contained in Appendix C. An example of coded utterances is contained in Appendix D.

Three researchers were involved in the coding of the content of the utterances, beginning the process together and continually checking and crosschecking their coding decisions. After a strong pattern of consistency of coding was evident, researchers continued the coding process individually but sought clarification when needed. Codes and utterances were stored in a data base and word processor file format.

Using the computer’s ability to sort, utterances relating to similar content were sorted and printed out for preliminary analysis. Themes, patterns and issues were identified within transcripts. Highlighting, annotating, tallying and making notes were common strategies used. Emerging patterns and themes were verified, and a range of supportive and counter examples identified.

This preliminary analysis involved the generation of rich descriptions of the social and physical contexts of children’s use of computers, the wide range of uses, and children’s views about school computing. Some identification of commonalities and differences across age and gender was undertaken using tallying. The results of this preliminary analysis were published in a Preliminary Report (Downes, Reddacliff and Moont, 1995). The generation of this report was
part of the contractual arrangement with the funding organisation, Compaq Computers Australia.

The results of these analyses were also used to develop a framework of children’s uses of computers and to help shape the questions to be included in the structured interviews in Stage Two of the study. Selected findings were presented at an international conference in 1995. Feedback from this session and the published paper (Downes, 1995) also helped shape aspects of the methodology and content of the interview schedule in Stage Two.

4.5 Stage Two

4.5.1 Purpose of Stage Two of the study

Stage Two of the study was designed to seek clarification of many of the issues raised in the first stage of the research. In particular, an attempt was made to see what similarities and differences existed among children who regularly used computers at home, and among their families and communities. The following characteristics were identified as key factors that might be associated with differences.

children: gender and age
homes: parental computing experiences, computing resources in the home
communities: socio-economic and cultural factors, school experiences.

The study was designed to investigate these differences in terms of children’s perceptions of their access to and use of computers. Gender, age and community type were treated as \textit{a priori} factors, in the sense that categorical definitions were self evident or available prior to the data collection phase. Other variables were approached more inductively, in the sense that children were asked about these factors as part of the interview. No attempt was made before the interviews to operationalise definitions of these characteristics or to lead respondents, through closed questions, to particular responses.
4.5.2 The schools

Children were selected from eleven primary school communities in urban Sydney. Table 4.4 presents the characteristics of these schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Type of school</th>
<th>Location</th>
<th>Gender</th>
<th>Ethnic Backgrounds</th>
<th>Socio-economic Status of Drawing Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>1g</td>
<td>independent, junior school of K-12 college</td>
<td>northern suburbs</td>
<td>girls</td>
<td>predominantly Anglo</td>
<td>predominantly affluent</td>
</tr>
<tr>
<td>1b</td>
<td>independent, junior school of K-12 college</td>
<td>eastern suburbs</td>
<td>boys</td>
<td>predominantly Anglo</td>
<td>predominantly affluent</td>
</tr>
<tr>
<td>2</td>
<td>state primary</td>
<td>eastern suburbs</td>
<td>mixed</td>
<td>mixed mainly Anglo and European</td>
<td>mixed, affluent, middle &amp; working class</td>
</tr>
<tr>
<td>3</td>
<td>state primary</td>
<td>inner southern suburbs</td>
<td>mixed</td>
<td>mixed, largely Arabic</td>
<td>mixed, middle &amp; working class</td>
</tr>
<tr>
<td>4</td>
<td>state primary</td>
<td>inner southern suburbs</td>
<td>mixed</td>
<td>mixed, largely Arabic</td>
<td>mixed, middle &amp; working class</td>
</tr>
<tr>
<td>5g</td>
<td>catholic systemic primary</td>
<td>south western suburbs</td>
<td>mixed K-4 girls 5-6</td>
<td>mixed, largely South East Asian</td>
<td>mixed, middle &amp; working class</td>
</tr>
<tr>
<td>5b</td>
<td>catholic, junior school of 5-12 college</td>
<td>south western suburbs</td>
<td>boys</td>
<td>mixed, largely South East Asian</td>
<td>mixed, middle &amp; working class</td>
</tr>
<tr>
<td>6</td>
<td>state primary</td>
<td>southern suburbs</td>
<td>mixed</td>
<td>predominantly Anglo</td>
<td>mixed, mainly middle class</td>
</tr>
<tr>
<td>7</td>
<td>state primary</td>
<td>south western suburbs</td>
<td>mixed</td>
<td>mixed, including Anglo, Samoan, Tongan, Khmer, Arabic, French, Spanish, Vietnamese</td>
<td>mixed, working class and public housing estate families</td>
</tr>
<tr>
<td>8</td>
<td>state primary</td>
<td>south western suburbs</td>
<td>mixed</td>
<td>mixed, including Anglo, Samoan, Tongan, Khmer, Arabic, Spanish, Vietnamese</td>
<td>mixed, working class and public housing estate families</td>
</tr>
<tr>
<td>9</td>
<td>state primary</td>
<td>southern suburbs</td>
<td>mixed</td>
<td>predominantly Anglo</td>
<td>mixed, affluent and middle class</td>
</tr>
</tbody>
</table>

In the main, schools 1g and 1b and schools 5g and 5b are matched. schools 1g and 1b both draw on predominantly affluent and middle class Anglo
communities. Similarly schools 5g and 5b draw on mixed middle class and working class communities of similar ethnic backgrounds. In fact, in this case, the boys in Grade 4 in school 5g feed into Grades 5 and 6 in school 5b. The data in the table referring to ethnic backgrounds and socio-economic status of each drawing community was taken from the schools' self descriptions. The former were taken from the schools' own census data, the latter was indicated by the principal of the school in the early meeting when permission was being negotiated.

Purposive, rather than representative or random sampling, was used to ensure the diversity of social, economic, cultural and language backgrounds. This need for diversity stems not so much because family background was seen as an a priori factor but more to ensure that a full range of different backgrounds was included. For this reason, it was considered appropriate to use schools' own broad-brush descriptions of the communities from which students were drawn and to not seek a numerical balance of children from these different types of backgrounds.

One other school was engaged in this stage of the study but the data collected was not used in the analysis per se. This school was used as a site for the trialing of the structured interview and its schedule. This trial provided the opportunity for the refinement of questions and the protocols to be used in the schools to improve the smooth running of the interview processes.

4.5.3 The children

While Stage One of the study involved children from Kindergarten to Year 6, Stage Two of the study only focused on children from Years 3-6, generally eight to twelve year olds. The main reason for this was that it was not until children reached the middle years of primary school that they regularly mentioned using the computer for school-related purposes. Prior to this age computing activities were generally restricted to playing recreational and educational games and using drawing and writing programmes for leisure. This finding came both from the children in the discussion groups and from the parents who completed the
checklist (see Table 4.2) and matches the findings from the Australian Bureau of Statistics national study.

All parents in the upper grades (3-6) of each school (or partner school) received a letter of introduction, information about the research and a consent form. The rate of return of consent forms varied across the grades and schools from 24% to 58%. In five of these schools, materials in languages other than English were sent to some of the parents.

In this stage of the study, because age and gender were treated as *a priori* factors equal numbers of boys and girls were selected from each of the four grades. Table 4.5 indicates the breakdown of the gender, grade and school of students who were interviewed. In all, a total of 276 children were interviewed by researchers.

**Table 4.5 Numbers of children interviewed**

<table>
<thead>
<tr>
<th>Schools</th>
<th>Gender</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>1b</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1g</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4</td>
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<td>1</td>
<td>4</td>
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<td>4</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>5b</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5g</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>4</td>
<td>4</td>
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</tr>
<tr>
<td>7</td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>33</td>
<td>35</td>
<td>34</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

In some cases, absences and school events prevented all selected children from being interviewed. Where possible these children were replaced by other children of the same gender in the same grade with a similar profile of use. A difficulty did arise with Year 4 girls in school 3 but interviewing more girls in the same
grade in school 4 compensated for this. Schools 3 and 4 were similar in geographical location, socio-economic status, cultural and language backgrounds. However, another difficulty with the number of boys in Year 6 in school 4 could not be resolved. As in Stage One of the study, the children to be interviewed were selected on the basis of the information provided by their parents that the children used the computer two or three times a week for a variety of purposes. These included games, school work, writing, drawing and other computing activities.

4.5.4 The interviews

The interviews lasted between twenty and thirty minutes. They were structured in the sense of using a set schedule, but the wording of each question was framed by each researcher. Appendix E contains a copy of the interview schedule. Key topics explored included children’s ways of using the computer, ways of learning to use the computer, who ‘owns’ the computer, who uses it most and who helps them, what they see other members of the family doing with the computer, what rules exist in the family to regulate computer use, what they learn from playing games and using computers, and differences in home and school use.

Interviews took place during the school day. With the permission of the teachers, the children to be interviewed were withdrawn from class. In general, two or three researchers attended a school and where possible interviewed children in the same room but sufficiently separated from each other so that each interview was not disrupted by the talk from another interview. When this was not possible children were invited to nominate a ‘safe place’ in which they would be comfortable with the researcher.

The opening protocol of the interview included an introduction by the researcher, a brief outline of the nature of the research and a statement informing the children that they could choose to not take part, withdraw at any time or not answer any questions with which they felt uncomfortable. As well, the reason for audiotaping the session was explained and approval sought for the taping to proceed.
During the interviews researchers recorded responses on a form. This involved recording answers to closed questions, such as “Do your parents use a computer at work?” as well as answers to more open-ended questions such as “How do you work the computer?”

It is worth noting that even with closed questions, children were able to respond using their own words. The researchers matched some of these responses to terms pre-recorded on the interview schedule, or recorded the child’s words for post-interview coding. All interviews were audiotaped to allow for checking the accuracy and completeness of the information recorded on the form. In particular, responses to open-ended questions were transcribed from the form.

4.5.5 Data analysis

As part of the initial analysis, a codebook was developed for closed-answer questions and open-ended answers that could be appropriately categorised. Appendix F contains a copy of this codebook.

The data was keyed into a spreadsheet by the researchers or the word processor operators in one of three ways:

- as a numerical code, representing categorical data;
- as a numerical code with a textual note attached which provided qualifying or additional information from the child’s response; or
- as a text field, recording the transcribed response to the question or topic.

A number of informal meetings were held during this process to ensure that the coding was consistent. The principal researcher systematically checked each of the spreadsheets for obvious data entry errors and unusual or incomplete answers and rechecked the child’s interview schedule or the audiotape to clarify or correct entries. As well, each cell with a numerical code plus textual note was rechecked for accuracy of the coding.

A small number of the children were identified by the researchers as ‘interesting’ or ‘unusual’ in terms of the wide range of computing activities in which they
engaged. In each of these cases, the whole audiotape was transcribed for analysis (see Appendix G). Having a number of 'rich descriptions' of selected children provided the opportunity to balance the 'agency' perspective during an analytical process that was, at least initially, predominantly geared toward a structural view of children's computing.

A preliminary analysis of the data was undertaken in the following ways:

1. All coded data was entered into a matrix of case by variable. The data in the matrix was analysed using Minitab, a statistical package. A number of two and three-way tables were generated. Where appropriate, Chi-square tests were employed to test for statistical significance and to guide the researcher regarding the inclusion of the table in the report;

2. All textual data was grouped by topic, sorted by variables such as gender, age and school community type so that commonalities and differences could be identified. Highlighting, annotating, note taking and discussions between researchers were used as strategies in the analysis;

3. Complete transcripts of selected children were analysed for counter-examples, using the same procedures in (2) above and also for examples of the trends and commonalities identified in (1) and (2) above;

4. Materials were reviewed with the purpose of determining which children would be followed up in Stage Three of the study and what topics would be focused on in interviews with the children, their parents and their teachers.

Some of results of the analyses stemming from (1)-(3) above, were published in a Preliminary Report of Stage Two of the study (Downes, Reddacliff and Moont, 1996). The generation of this report was also part of the contractual arrangement with the funding organisation, Compaq Computers Australia. As part of the agreement with the school principals, copies of the reports were also presented to the school. At the same time, they were alerted to the nature of a potential third stage involving some of the previous participants and their families (pending
funding and approval). When contacted to see if their copies of the report arrived they were asked to indicate their willingness to engage in a further stage. All principals did so.

A deeper level of analysis, more conceptually focused, was undertaken at the end of the study when the data was merged with the data in Stage Three of the study. The details of this analysis will be provided in Section 4.7

4.6 Stage Three

4.6.1 Purpose of Stage Three of the study

The purpose of Stage Three was to extend the previous findings through a closer examination of a small number of children’s uses of computer technologies from the viewpoint of the children’s parents and teachers as well as themselves. The main purpose of this stage of the study was to develop a middle range theory or set of theories that help explain the interactions of children, computers and homes.

As well, the perceptions and beliefs of children, parents and teachers about the children’s use of the computer technologies in their homes, particularly as they relate to learning and schooling, were also explored as a part of the task of analysing the educational implications of the findings of the doctoral study.

4.6.2 The schools

Eight schools took part in this stage of the study. They were drawn from the eleven schools that had taken part in Stage Two of the study. Unlike Stages One and Two, the schools were chosen in tandem with the selection of children, thus at times the child determined the school, while at other times the child was selected from those within a school.

The eight schools selected were schools 1g and 1b, 2, 4 5g and 5b, 6, and 8. These schools still represented a wide selection of school and community types. In two cases, interpreters were employed to communicate with families.
4.6.3 The children, parents and teachers

The study involved fourteen children from thirteen families (one pair of twins was included). All of the children were in upper primary classes and were either ten or eleven years of age. As with the previous stage, the age focus was narrowed again to the older children, because this was the age group when the range of activities was broadening significantly both in the school-related and leisure-related activities.

The selected children had been identified in Stage Two of the study by the researchers and their schools as coming from relatively ‘technology rich’ home environments. This relativity was in relation to the other children in their class or grade. By national standards, half of the families would have been considered ‘technology rich’ and the others more ‘average’ in terms of the resources they had in the home.

In order for the children to take part in Stage Three of the study, the involvement of their parents and teachers was necessary. This process of determining the necessary agreements to participate was complex and is described below in detail.

At the initial meeting with the school Principal, the possible children who were identified as potential participants were discussed. Principals were asked to identify any potential problems that might hinder the participation of either the family or the teacher. Upon agreement between the researcher and the Principal, the respective teachers of the selected children received written material and a follow-up conversation about the project. Once teacher agreement was in place, families were contacted. Families received written information about the project and a request for a meeting. Once a parent had agreed to take part in the study, the child was contacted for agreement. This contact was in person at the school and the child was asked to agree to keep a diary for two weeks and then take part in an interview. Where the triad (child, parent/s and teacher) agreed to take part, that child was included in the study. The process was repeated until fourteen
children across a range of schools had been selected. Table 4.6 presents the data related to the participants in the study.

**Table 4.6 Participants in Stage Three of the study**

<table>
<thead>
<tr>
<th>School</th>
<th>Gender and age</th>
<th>Siblings</th>
<th>Parent/s Interviewed</th>
<th>Teacher Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1g</td>
<td>girl, 11</td>
<td>brother-15</td>
<td>mother and father</td>
<td>teacher withdrew from study, female computing teacher interviewed</td>
</tr>
<tr>
<td>1b</td>
<td>boy, 10</td>
<td>sister -16</td>
<td>mother and father</td>
<td>male</td>
</tr>
<tr>
<td>1b</td>
<td>boy, 11</td>
<td>3 brothers -24 21 18</td>
<td>mother and father</td>
<td>teacher withdrew from study, male computing teacher interviewed</td>
</tr>
<tr>
<td>2</td>
<td>girl, 10</td>
<td>sister -5</td>
<td>mother</td>
<td>male 16</td>
</tr>
<tr>
<td>2</td>
<td>girl &amp; boy, 10</td>
<td>brother 22, sister 13</td>
<td>mother and father</td>
<td>male 16</td>
</tr>
<tr>
<td>4</td>
<td>boy, 11</td>
<td>-</td>
<td>mother (single p’nt)</td>
<td>female</td>
</tr>
<tr>
<td>4</td>
<td>girl, 11</td>
<td>sister -12</td>
<td>mother</td>
<td>female</td>
</tr>
<tr>
<td>5g</td>
<td>girl, 10</td>
<td>brother -17, sister -15</td>
<td>father</td>
<td>female</td>
</tr>
<tr>
<td>5b</td>
<td>boy, 11</td>
<td>sister, 24 (married to a computer whiz)</td>
<td>mother and father</td>
<td>female</td>
</tr>
<tr>
<td>6</td>
<td>boy, 11</td>
<td>sister -16, brother -13</td>
<td>mother and father</td>
<td>female</td>
</tr>
<tr>
<td>6</td>
<td>girl, 11</td>
<td>2 sisters -15, 14,</td>
<td>mother and father</td>
<td>male</td>
</tr>
<tr>
<td>8</td>
<td>girl, 11</td>
<td>5 sisters -16,13,10,8,6</td>
<td>withdrew from study</td>
<td>male</td>
</tr>
<tr>
<td>8</td>
<td>boy, 11</td>
<td>3 sisters -9, 5, 4</td>
<td>mother and father (and interpreter)</td>
<td>female</td>
</tr>
</tbody>
</table>

In three instances, after the process had begun and the child had been interviewed, adults withdrew from the study. In the case of the one set of parents, 16

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16 This male teacher taught all three children from school 2.
the older sister did provide some detail about use in the home. In the case of the
two teachers, they were replaced by the specialist computing teacher. Both of
these teachers had regular contact with the children in the study.

For children, participation in the study involved keeping a daily record of
computing activities for a two week period and participating in an interview
during the school day. For parents, participation involved interviews in the family
home, with one or both parents. Parents, themselves, chose who would
participate depending on parental preference and availability. For teachers,
participation involved an interview at school, out of school hours.

4.6.4 Data collection

Before this stage began, the format of the computer-use diary was trialed with a
ten-year-old boy and an eleven-year-old girl. Based on the trial, minor
modifications were made to the format and extensive modifications to the
instructions. A copy of a computer-use diary page is contained in Appendix H.
The diaries were trialed as stimulus material in subsequent semi-structured
interviews with these children. Based on these trials, minor modifications were
made on the nature of the questions asked about the activities.

The following sequence was generally followed for each child in Stage Three:

- At the handing over of the diary to the child, the child was requested to record
each computer activity they would undertake in the next two week period. The
child was shown a blank diary form and had a trial run at filling it in based on
a previous computer experience. Information to be recorded included day,
time, name of software, task and involvement of other family members. An
interview date was set for the end of the two week period.

- The child was interviewed using a semi-structured interview (see Appendix I)
about their use of the computer and a range of beliefs and perceptions about
computing. At the beginning of the interview the child was informed that
he/she could choose not to answer a question and could quit the interview at
any stage. The purpose of audiotaping was explained and oral permission sought to audiotape. The diary was used to prompt the child’s memory of recent computing activities. Any issues that emerged from an analysis of the diary were also raised with the children.

- Parent/s were interviewed using a semi-structured interview (see Appendix I). Where necessary, statements made by the children were checked with the parent/s. At the beginning of the interview parent/s were again informed that they could choose not to answer a question and could quit the interview at any stage. The purpose of audiotaping was explained and oral permission sought to audiotape.

- The child’s class teacher was interviewed using a semi-structured interview (see Appendix I). Where necessary, statements made by the children were checked with the teacher. At the beginning of the interview teachers were again informed that they could choose not to answer a question and could quit the interview at any stage. The purpose of audiotaping was explained and oral permission sought to audiotape.

4.6.5 Data analysis

The children’s diaries were analysed in terms of frequency of use, type of programme used, responses the children made regarding the social context of computer use, and the nature of the activity and learning that occurred.

All interviews were tape recorded and transcribed with transcriptions being checked for accuracy (see example of excerpts from children’s parents’ and teachers’ interviews in Appendix J). The checked transcripts of interviews with parents and teachers were sent to them with a note asking that they check the transcripts to see if their ideas and views were coming through the interview accurately or if they wanted to add anything else. Most participants were happy with the contents of the transcripts, though one father did comment on the surprising disjointedness of the recorded conversation that seemed quite coherent.
to him at the time. Several participants did not reply to the invitation to respond. After one follow-up telephone call, these participants were not pursued.

The children's transcripts of the interviews were combined with their transcripts of their Stage Two interviews. Using these transcripts and the diary a 'picture' of the child was composed. The transcripts were also analysed for common themes and differences in approaches to computing.

The amended transcripts of the parents were analysed for elaboration of existing themes from the previous stages or emerging themes that specifically related to the families' social and cultural context, as well as the beliefs of the parents about computing at home and at school. Teachers' transcripts were analysed in terms of their espoused views about home and school computing.

Once more, this initial analysis was only lightly theorised and a report was written (Downes and Reddacliff, 1997) to meet contractual obligations with Compaq Computers Australia.

4.7 Retrospective analysis

With the completion of the Stage Three report, all contractual obligations to Compaq Computer Australia were finalised. This allowed the researcher time to re-analyse the data from all stages of the study. This analysis involved a number of parts; each is described in turn below.

4.7.1 Discourse analysis

The discourse analysis was at the macro level rather than at the level of linguistic analysis. Glaser and Strauss's (cited in Strauss and Corbin, 1990) constant comparative method was used to build and refine categories (organising concepts) and propositions and to explore the relationships and patterns between key propositions. This analysis was done in NUDIST. NUDIST is a software package that facilitates the management of a database of on-line documents and allows for dynamic coding of units of text within the documents. It supports the constant comparative method by allowing for the refinement of category labels,
for the merging of categories and the movement of subcategories from one node of categories to another.

The constant comparative method was used to generate organising concepts and propositions because it is flexible enough to allow multiple views of the same data. During this analysis, there were sets of propositions that formed salient relationships and patterns. These focused on:

1. the discourses in which children, parents and teachers participated when talking about computers in general, computers in the home and computers in the school.

2. the discourses in which children participated as they described the computers they used and how they used them.

4.7.2 Tabulation and cross tabulation

Type of school community emerged as an essential variable in the early stages of this period of analysis. Using the schools’ own descriptors as a basis, the school communities were grouped under two headings: more affluent and less affluent. Such an approach seemed reasonable, given the work of Connell, Ashenden, Kessler and Dowsett (1982) in the early 1980s that explored the complex relationship between individuals, communities and schooling. In this doctoral study the following grouping occurred: schools 1g, 1b, 2, 6 and 9 were categorised as being in more affluent types of communities; and schools 3, 4, 5, 7 and 8 as being in less affluent types of communities.

The range of tabulations and cross tabulations was extended in this phase of the study. These included:

- Type of equipment in children’s homes by type of school community;
- Parental workplace use by type of school community;
- Place of initial use by type of school community;
- Parental home computer use by gender and type of school community;
- Type of parental use by gender and type of school community;
• Ownership of the family computer/s and gender and type of community of the respondent;
• Frequency of computer game playing by gender;
• Learning strategies for game playing by gender and age;
• Computer use at school by age and school;
• Computer use at school by age and gender;
• Type of activity by gender and school;
• Average duration of use of school computer by school.

These tabulations and cross-tabulations provided the basis for understanding some of the differences between groups within the study.

4.7.3 Activity analysis

The final retrospective analysis related to the nature and purpose of children’s computer-based activities. Such an analysis was in part a discourse analysis, in the sense of analysing the data to better understand how children position the computer and themselves, and the nature of the tasks they undertake. The complementary analysis involved categorising and labelling the activities in order to validate the framework that emerged as part of the analysis of Stage One data. In this analysis, data from all three stages were re-analysed. In the main, this analysis was conducted through sorting and grouping children’s utterances within word processing and spreadsheet files. At times when clear categories emerged, simple tabulations were undertaken.

4.8 Presentation of results

The results of these analyses form the basis of the following three chapters. Chapter 5 focuses on findings related to the socio-cultural context of children’s home computing. Chapter 6 focuses on children’s uses of the computer at home, and the reciprocal shaping of the affordances of the home computer. Finally, Chapter 7 turns to computing in schools.
In all of these chapters there is a mixture of description and interpretation in an attempt to best illuminate the ‘what’, ‘how’ and ‘why’ of the interaction of children and computing in the home. While such an approach might be uncommon in theses with a strong quantitative framework where sections on results precede sections on discussion, it is more common in all forms of reporting of qualitative and mixed method reports. Such a mixture better reflects the nature of grounded theorising, where theory is carefully drawn out of emerging patterns in the data.
Chapter 5. Contextualising family computing

Chapter 5 is the first of three results chapters. It deals with the contextualisation of family computing and the affordances of the home computer in terms of its functional and symbolic meanings. Subsequent chapters, Chapters 6 and 7, focus on children’s uses of the computer in the home and on computing in the school environment.

Chapter 5 begins with an analysis of the physical and social contexts of children’s home computing that emerged from various stages of the study. The chapter ends with a discussion of the affordances of the family computer as shaped by the functional and symbolic meanings which have in turn been shaped by the above contexts.

Beginning the results chapters with a focus on the socio-cultural contexts and the functional and symbolic properties of the computer does not imply a lessening in the theoretical position that children are both actors and acted upon. Chapter 6 restores the balance when it focuses on children’s uses within these contexts. The decision to begin in this way is a recognition of the rich diversity of issues that need to be addressed in terms of children, computers and homes and the resultant need for a clear and well-organised approach to this complexity. More importantly, it reminds us that socio-cultural practices may hide some affordances of the family computer, reveal others and allow children to participate in the creation of others.
5.1 The physical contexts of children's home computing

The chapter begins with an analysis of the equipment and software in homes in order to explore the instrumental meaning of the family computer. The instrumental meaning of the computer, for the purposes of this study, is defined by the applications that are available to children on their home computer. The instrumental meaning of the family computer is significant in the sense that it defines the home computer’s possible affordances.

5.1.1 Computing equipment in the home

The children in all stages of the study were selected on the criterion that they had computers in their homes. Notwithstanding this, a very small number of children (approximately 2%) in Stage Two of the study were identified as not having a computer in their home. These children all had regular (several times a week) access to computers in another location: their other home, the home of their non-residential parent; in the homes of their extended families who lived locally; or in the homes of close neighbours. Of the children in Stage Two of the study who had computers in their homes, over 95% reported that they had at least one computer in their home that was used regularly, about 30% had two or more computers in the home, although some of these were not used or not used much. A small number of children, approximately 6%, had three or more computers in the home.

As with the Australian Bureau of Statistics [ABS] (1996) study over 80% of the computers that could be identified were desktop computers. Laptop computers when mentioned were often reported to be the second or third computer in the home. This study was not designed to identify brands and technical capacities, however the children’s responses, which commonly included terms such as Windows, suggest that like the ABS (1996) study the majority were Windows (IBM or IBM compatible) capable machines. Many of those that were not, were referred to as older computers that were rarely, if ever, used. When brand names were mentioned in relation to these older computers they usually referred to brands such as Atari, Amiga and Commodore. These older computers were
sometimes the only computer in the home\textsuperscript{17}. In these cases children explained their limited uses. At times they became just a game machine; at other times it was the games that were the missing feature: \textit{"no mouse"}; \textit{"can\’t play games on it"}; \textit{"just for writing... a bit old fashioned"}.

Children in Stage Two of the study also systematically reported which peripheral devices they had in their homes. Approximately 80\% of the children reported that they had a printer, about 50\% a CD-ROM drive and 20\% a modem. It is worth noting that these percentages are similar to those in the Australian Bureau of Statistics (1996) report of 86\%, 50\% and 23\% respectively. While a number of children did not have any printer in the home, about 10\% of the children had a colour printer and another 10\% had two or more printers in the home. Commonly these were one colour and one black and white.

A range of other equipment was also reported. Items included scanners, digital cameras, sound digitisers, zip drives and local area networks. Additional equipment, however, was the exception. In general the base line equipment was a Windows computer with printer and in many cases a CD-ROM drive. This base equipment is not unexpected as it reflects the typical basic package available in major department stores over the last five years. More recently internal modems have become part of the base package.

Windows-based systems provide a platform for a wide range of applications software, significantly: word processors, desktop publishing software, and graphics libraries. The printer is probably now considered a necessity for serious use of applications such as word processing. The addition of the CD-ROM drive and modem allows for extra applications, particularly those that use the computer as a source of information.

\textsuperscript{17} It is important to note that the sampling procedures in Stage 2 of the study, described in Ch4 p. 126, could well have eliminated from the study many children from families with disused or very old, rarely used machines. The essential criterion for selection was parental indication that the child used the computer for a variety of purposes and used the computer several times a week.
While there were no age and gender differences in the children’s reports of what equipment they had in their homes, there were differences between children in the more and less affluent communities. Table 5.1 details the equipment within the two types of communities.

**Table 5.1 Reported equipment in children’s homes by type of community**

<table>
<thead>
<tr>
<th>Type of Community</th>
<th>More Affluent</th>
<th>Less Affluent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=128</td>
<td>N=147</td>
</tr>
<tr>
<td><strong>Computers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>One</em></td>
<td>64%</td>
<td>73%</td>
</tr>
<tr>
<td><em>Two</em></td>
<td>26%</td>
<td>22%</td>
</tr>
<tr>
<td><em>Three</em></td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td><em>Four</em></td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Total</em></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Printers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>no printer</em></td>
<td>11%</td>
<td>32%</td>
</tr>
<tr>
<td><em>one b&amp;w</em></td>
<td>59%</td>
<td>36%</td>
</tr>
<tr>
<td><em>one colour</em></td>
<td>16%</td>
<td>21%</td>
</tr>
<tr>
<td><em>several b &amp; w printers</em></td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td><em>several printers including</em></td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td><em>at least one colour</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Total</em></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>CD-ROM Drives</strong></td>
<td>58%</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Modems</strong></td>
<td>25%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Children from the more affluent communities were more likely to have two or more computers, printers, CD-ROM drives and modems in their homes. Overall, these results are consistent with those found in the ABS (1994, 1996) studies.

In some ways the difference between one and two or more computers is not as critical as the difference in ownership of printers, CD-ROM drives and modems. For it is these devices, along with the presence of a Windows/Macintosh operating system, which define the range of potential applications available to children.
5.1.2 Software in the home

The children in Stage Two of the study spoke about how often their families purchase software. Approximately 27% of the children reported that their family did not buy software, about 50% reported that the family purchased software one or more times a year, and about 20% purchased software regularly, including special occasions such as sales and birthdays or when they needed a piece of software for a particular purpose. Again there were differences between communities, with 35% of children from less affluent communities reporting that their family did not purchase any software compared to 18% of their counterparts in more affluent communities.

The children were asked to name the last piece of software that their family purchased. Approximately 30% of the children in Stage Two of the study named a piece of educational software which had recently been purchased by the family. Educational programmes, including encyclopaedias and children’s word processors, were mentioned as often as recreational games. Examples of popular purchases with the children and their families were: SIM CITY, DANGEROUS CREATURES, ENCARTA, FINE ARTIST, MYST, and children’s word processors such as CREATIVE WRITER, MY OWN STORIES and THE WRITING CENTRE.

While there were differences in the number of children from each type of community reporting that the family purchased extra software, these differences did not extend to the types of software that were chosen when purchases were made. Children in both types of communities were likely to report a mixture of games and educational software. If a difference existed at all, it was a gender difference. Boys were more likely to report the last purchase as a recreational game and girls as educational software.

While the purchase of new software allows families to shape and extend the collection of software in the home, the initial purchase package of equipment tended to shape the base set of software. This base collection in the homes of children in Stages One and Two of the study almost always included a word
processor, a drawing programme (paint or draw variety), desktop publishing software (such as PRINT SHOP), some clip art libraries, and a number of recreational games. In homes with CD-ROM drives this collection was supplemented by one or more reference works such as an electronic encyclopedia.

This finding of a fairly universal base collection of software was not able to be checked against national data from either the Australian Bureau of Statistics (1994, 1996) nor the Australian Broadcasting Authority (Cupitt and Stockbridge, 1996). The former used a classification system for software more suitable for adult use and the latter only focused on game software. One source of confirmatory data comes from an analysis of advertisements of home computers. Australian magazines such as Computer Living, Family PC Australia, were advertising home computers (as opposed to hobby and business computers) which came with such software from early 1994.

The data from Stage Two of the study revealed that this base collection was common in both more and less affluent communities. However, it is important to remember, as mentioned earlier, that children from less affluent communities were less likely to own CD-ROM drives and hence the supplementary reference software. Furthermore, the efficacy of programmes such as word processors and draw/paint programmes rely to some extent on access to printers. For these reasons, community differences regarding ownership of printers and CD-ROM drives do influence the type and efficacy of the software in the home.

By combining the profile of ownership of hardware and software in the home, the functionality of the computer, and hence its possible affordances, can be defined. In simplest terms, affordances of both ‘toy’ (for playing games) and ‘tool’ (for doing work like writing) were possibilities for the overwhelming majority of children in all stages of the study. However, in some homes, usually those from the less affluent communities, older machines and lack of printers and CD-ROM drives sometimes diminished the ‘tool’ affordance.
5.2 The social contexts of children’s home computing

The socio-cultural contexts of children’s home computing are defined by the attitudes, beliefs, practices, expertise and participation patterns of family members. As mentioned in Chapter 2, p. 33, it is these socio-cultural practices that can hide or reveal the possible affordances defined by the instrumental meaning of the computer system. It is also these practices that enable children to interact with computers in ways that create new affordances.

The structure of the discussion that follows draws heavily upon Bronfenbrenner’s Theory of Ecological Systems (1979) that, as explained in Chapter 2, sees the child operating within a complex system of relationships affected by multiple levels of the surrounding environment. The influences of each of these levels, the macro system, the exosystem the mesosystem on the microsystem will be discussed in turn.

5.2.1 The macro system at work

There were two sources of data about the influences of the macro system on the possible affordances of the family computer. The first is the discourses upon which the parents, from Stage Three of the study, drew to talk about the importance of computers. The second is the children’s own discourses about the importance and value of computers and computing which arose through all stages of the study.

Chapter 3, p. 57, identified a number of discourses that exist at the macro system level. They are: computers as a hobby; computers as the future; computers for education; computers as entertainment; computers as productivity tools; and one which may encompass all of the above, computers as multifunctional devices. A number of other discourses intersected with these. Of particular importance to this study are the discourses surrounding childhood and gender. Identifying which discourses play a part in the attitudes and beliefs of parents and children in this study can provide valuable insights into their expectations and motivations for becoming involved in home computers. Furthermore, it illuminates the
affordances which the children perceive that the home computer offers them. These affordances are shaped as much by the computer’s instrumental features, the hardware and software, as by its symbolic meanings derived from the general discourses and practices that surround domestic computing.

It is also important to realise that parents’ and children’s participation in these discourses is also influenced by their experiences in all other levels of the ecological system, especially those with their own families in the microsystem of the home. This study does not attempt to analyse the specific contributions of the various levels per se, but rather, to use these levels as an organisational framework for thinking about the influences on children’s interactions with the computer at home.

The explicit discourses that the parents from Stage Three of the study participated in when discussing the importance and place of computers and computing were: computers as the future, computers for education and computers as productivity tools. While children from all stages of the study actively participated in these discourses they added, not unexpectedly, the discourse of computers as entertainment.

One of the key discourses of the past, computing as a hobby was notably absent from both parents’ and children’s discussions. That is, the notion was absent from parents’ and children’s considerations about the importance of computers and the role of computers in the home. While there were a number of parents and children who were enthusiasts, they had generally become so after the arrival of the computer in the home. This is dramatically different from the late seventies and early eighties when computers only came into the homes of the hobbyists. (Haddon, 1988a).

Other discourses, such as those relating to computers as multifunctional devices and those relating to gender and childhood, were more implicit, taken for granted, within the more explicit discourses. In following sections, both explicit and implicit discourses will be discussed.
5.2.1.1 Computers as the future

The parents considered being able to operate a computer essential for functioning in current and future worlds. They saw children’s gaining of computer skills as valuable for personal development and, more importantly, for future employment. Parents believed it was important for children to be able to use the computer as a tool to fulfil specific needs in addition to being aware of current technological developments. One parent summed it up by saying that: “I think the way the world is going now towards computers, kids have to be computer literate.”

A number of parents linked their reasoning directly to employment: “When they go for jobs I think it’s a big plus to be confident in handling a computer and being able to use it.” Another parent talked about his own workplace: “I like them to be involved in technology and we have computer technology in our work environment as well, so I recognise the ones in our office environment who are computer literate seemed to be able to get ahead in their work and they become highly respected in the work environment too. Advancement is easier for them.” Other parents emphasised the computer-use demands upon themselves in their own workplaces.

Children also linked the importance of computers to the future and to employment. As one child said: “...so when you grow up and you have a job you know how to use the computer. If you get into a situation where you have to use a computer you know how to work the controls and that.”

Participation in these types of discourses was evenly distributed across mothers and fathers as well as boys and girls. There was little evidence that parents or children linked particular types of computer uses to particular types of work or to the gender of the worker. Even keyboard skills, once considered the domain of the female secretary, were recognised as a fundamental skills for all children.

It is important to note that the conversations with parents and children did not probe for much detail related to the nature of the relationship between computers,
the future and employment. For this reason it is not possible to say whether underlying these broad non-sexist views there were gendered constructions of technology and work. What is evident, however, is that parents and children were using ‘the child as learner’ and ‘the adult as worker’ as their main constructions for linking computers, the future and children. Noticeably absent were any serious discussions about the need as future adults to understand the social and cultural impacts of the technologies.

5.2.1.2 Computers for education

Both parents and children linked computing to education. They both had similar views about the importance of computers at school. Both believed that schools were places where children should learn about computers and that this was particularly important for children who did not have them in their homes. Even children as young as eight were explaining the role of school computing in these terms: “...so people can learn [to use one] if they do not have one at home.”

Parents also recognised the role of the home as a place where children learn about computers. As owners of home computers, they felt that: for those who have computers in their homes, the home plays a more important part in learning about and learning to use computers than schools do; and for those who do not have computers in their homes, the school was the place to learn about them.

In general, when parents were talking about learning about computers at school, they were referring to formal learning more than learning through regular use. Several parents spoke about the reality that there would never be enough computers in schools for all children to use them regularly. One mother went on to say that as they were a scarce resource priority should be given to children who do not have access at home.

Some of the parents, particularly those without strong computing skills themselves, while praising the efforts of particular teachers or referring to past programmes that had been valuable, expressed discontent with the state of computing in their children’s schools. These parents, who themselves had little or
no expertise, either relied heavily on the school to provide the necessary support for their children or found the needed support in extended family members or work place colleagues. Other parents, particularly those with significant computing skills themselves, expressed the view that school computing was fairly irrelevant to their children’s computing because of the rich opportunities to learn about and use them at home.

Parents were united in their views that their children had an advantage at school because they were computer literate. Some believed it was particularly important as they progressed through the grades. As one parent explained: “The whole concept is to make them comfortable with the use of computers so that they, as they have more and more need to use them, as they continue their education, they’ll be confident rather than scared and so that computing is useful and it becomes second nature, and not something special.” Another parent, with four sons, one of whom had no interest at all in computers or computing argued: “It’s not essential, right, as my number three son found it not to be a prerequisite for anything. But those who want to take advantage of it will be more successful compared to those who do not want to take advantage of it. I mean, he could get through school just using his Encyclopaedia Britannica if he wanted, manually looking it up, or if he wanted to go to the forefront of technology, go to one of the computerised programmes on the Internet or whatever it is and you just grow up with the technology, it’s better really.”

Children were generally silent on the notion that they needed computer skills to do well at school, although in another context several children were keen to point out they got better marks because their work looked better when it was done on a computer.

Neither parents nor children raised matters relating to computers being used to improve teaching and learning in schools or to replace schools or schooling. The only references made to this type of discourse occurred when a number of children spoke about computers being used to make school less boring or more interesting. Generally these children were referring to the ‘fun’ element of
computing, whether using the computers for educational games or for other school work.

In several ways parents' participation in this discourse was more complex than in the 'computers as the future' discourse. As parents in homes with computers, they believed that the responsibility for developing computer skills was almost a shared responsibility between schools and home with the school's role being stronger for children who came from families without computers. By holding these views parents were obviously not viewing computing (or computer literacy) in the same way they view reading, writing or mathematics. In some ways the views would more closely align with views about social and health education in the sense that parents' constructions about home and school purposes related to the general well being of the child, especially the future of the child.

Parents seemed to accept the fact, albeit with some level of concern, that schools do not have enough resources or expertise to provide a reasonable level of skill for all children. Such acceptance provides some insight into their beliefs that while the school has an important part to play in teaching computing skills, these skills are still in many ways marginal to the basics of education in the sense that they are skills for the future. At least during the child's time at school, parents view these skills as advantageous rather than essential, and, in the case of these parents, the skills were being learnt in the home. These attitudes and beliefs draw on the discourse related to 'computers as the future' and have the school as a place to prepare children for the future, particularly employment, and hence the school as a place where children should learn about computers. Unlike the situation with reading and writing, however, parents who have resources and some expertise in their home, do not place the major responsibility with the school, in fact, to many of these parents the school is irrelevant.

Another belief about computers for education was that 'computers can improve children's school performance'. This belief is linked to parents' belief systems about computers as the future. One of the reasons parents want children to do well as school is so they have a greater chance of success in the future,
particularly with regard to employment. While computers are not essential for high achievement at school at the present time, they are advantageous. So in one sense having computers in the home achieves two important purposes, an essential one for the future and an advantageous one for the present.

These two beliefs provide a very strong child-centred motivation for parents to purchase computers. This source of motivation has been evident since the early eighties when numerous studies (Caron et al., 1989; Dutton et al., 1987) identified these types of parental beliefs as a major reason for purchasing a family computer. Both then and now, the strongest motivation for most parents to place a computer in the home is their own employment and business-related needs (ABS, 1994; Times Mirror Centre for the People and the Press, 1994).

By providing a motivation for the purchase of a computer these belief systems help shape parental views on how the computer should be used in the home once it is purchased. As such they have a direct impact on the social context of children's computing. Significantly, children share the strong belief in the importance of computers as the future. Children, however, also believe that computers are essential for schooling now because the computers make school work better, easier and more interesting. These views will be explored more fully in the following discussion on computers as productivity tools.

5.2.1.3 Computers as productivity tools

While parents were united in the view that computers can improve children's school performance, they had few concrete examples of how this occurred except by explaining the positive roles that computers played in helping their children undertake traditional school-related tasks. The three key tasks to which they all referred were writing, accessing information and presenting information. Children also shared parental views on the advantages of computers as productivity tools with the main advantage being that they make the task easier: easier to write; easier to find information; and easier to present written work well.
Detailed discussions of these topics also revealed underlying concerns about the implications of children using the computer as a productivity tool before they have developed the appropriate manual skills. The implications of these concerns will be presented after a discussion of the advantages that parents and children identified.

Parents and children spoke positively about the ability of word processors to make the task of writing easier. Their explanations included the speed of task completion, the quality of the ‘look’ of the final product and the ease of correcting and editing. One girl commented: "It is harder to try and write neatly on a piece of paper but instead you can type something up and do not have to worry about mistakes because you can just do a spelling check and it just goes to work and then instead of writing it down again and making mistakes you just print it out."

The editing facility of the word processor received by far the most number of positive comments from parents and children. As one parent stated: "That’s the wonderful thing about word processing, it’s just wonderful to correct a little mistake like that." One of the children put it this way: "You can save it and print it out as many times as you like and fix up mistakes easily." A number of parents mentioned that it did not necessarily improve the content of the writing: "You get a better end-product but the intellectual component is the same." In contrast to this a number of children pointed out that it makes their writing better because they can get all their ideas down first, then worry about fixing it up later. This is an interesting contrast in as much as it implies that these children might understand the editing possibilities of word processors a little better than their parents.

When talking about presenting information, both parents and children agreed that the benefits were in terms of the quality of presentation, in terms of neatness and professional ‘look’. Many parents felt that presenting neat work gave the children a sense of pride. As one father put it: "It gives them an appreciation of perfect presentation." A number of parents and children also pointed out that the word
processor had advantages for children with poor handwriting: "If you do not have good handwriting it is better to use a computer." and "He's very embarrassed about his writing so for him I think he'd use a word processor every time he had to write." Such benefits seemed to be particularly relevant to boys. It was against the backdrop of these advantages that many of the parents expressed concern about their children's continued use of word processors at home. These concerns related to children's need to develop good handwriting skills.

One mother compared the use of the computer for writing to using a calculator to do maths and its resultant problems. Another mother said that it made the children lazy. One father stated: "I do not think he's had to try, regarding the formation of letters at his age, formation of a writing style, because he's not constantly practising it you know when he's writing essays."

These concerns were focused on the 'child as learner', a learner of handwriting, using tools which in some ways eliminate the need to write by hand, or at least reduce the opportunities to practise handwriting. The parents believed that handwriting was still an essential skill, at least for the present, while word processing was only an advantage for the present, even if essential for the future. They wanted their children to be 'literate' in both handwriting and word processing even while they recognised that the word processing was faster, easier and allowed a higher quality presentation.

The children in Stages Two and Three of the study positioned themselves slightly differently from parents on this topic. While some children still chose to handwrite at particular times or at different stages of the writing process, they argued that both handwriting and word processing were essential skills for the present, because they made writing so much easier. They were critical of adults, both family and teachers, who seemed to arbitrarily decide when they could and could not use a word processor. They did not think that continual word processing reduced their handwriting skills. Many of the older children (10-12 yr olds) thought that they were already established as good or poor handwriters and those who identified as poor handwriters, mainly boys, praised the ability of the
computer to create a presentable looking version of their writing. These
differences in views did provide for points of contest between some parents and
children. One mother shared her frustration about her son who virtually puts all
his writing on the computer: “I say ‘Why are you using the computer like this? I
want you to write’. I say ‘You’ll forget how to write soon if we do not stop this.’
So we now set aside some things are just not done on the computer.”

Another area where both parents and children believed that the computer was a
productivity tool was accessing information either from a CD-ROM or the
Internet. A number of parents felt that this aspect of computing was probably the
most important in terms of the children’s schooling: “I think the access to
information is the most important.” The children expressed views about the ease
of use compared to books and libraries: “It’s easier to locate and select the
information you want.” and “It [the Internet] is not like a library where there is
a limited number of books and where everyone borrows the book on the subject
and there are no books left. So everyone can look at the same site at the same
time.” Children also spoke about how much more interesting electronic forms of
information were than print. The added features of movies, coloured images,
music, sound and voice were most appealing.

Parents spoke about other advantages of using electronic sources of information;
these included amount, accessibility and currency. Busy parents were particularly
aware of the often futile time and effort put into taking children to local libraries
that have relatively restricted opening hours and few available resources. Parents
commented: “...instead of taking them down the library, wandering up and down
the aisles just to find that the book’s not where it’s supposed to be”; “There’s so
much more information available if you’re doing it through a combination of
CD-ROMs and Internet than there would be just in your average library”; “Some of
the information I couldn’t get anywhere, whereas it was a bit more
accessible on the Internet” and “On the Internet the information is very current
information. Things can be published immediately - it’s instant.”
In juxtaposition to these positive comments a number of parents expressed some concerns about the shift from print to electronic sources of information. Such comments included: "I think technology-wise they lean towards it rather than a book." and "It's sad to lose an appreciation of books." One father, who was concerned that most of the electronic information on CD-ROMs and the Internet came from American sources, commented: "I think to some degree it discourages kids from going to the library and looking up the databases there which is probably giving them a better view." Another parent had gone to the trouble of purchasing both the book and the electronic copy of an encyclopedia because she felt both would be useful, and the books could provide a backup to the electronic version.

As with the handwriting/word processing dilemma, the ease and speed of access to electronic sources of information makes electronic access a more popular choice with children. This time, however, parents were not so much concerned with the matter of losing more traditional skills, but rather, of 'losing' an appreciation of the older technologies and of 'losing' the preparedness to put in the effort which the older technologies demand even when it is known that such an effort will yield benefits.

This lack of concern about losing the skills of looking up information in traditional ways, such as in the library, might imply that adults are more comfortable with the notion that even now while their children are at school, library skills are less important than handwriting skills. As several parents commented, handwriting is still a mandatory process for taking the Higher School Certificate, the major school examination.

Both electronic writing (word processing) and accessing information created dilemmas for parents. On the one hand, as parents they encouraged their children to develop new skills, they believed having such skills provide an advantage in their children’s schooling and are essential for the future. On the other hand, they worried about their children losing the traditional skills, not developing them fully, or losing interest and motivation in using them. This view is consistent
with their view of 'the child as learner' in the sense that learners are more vulnerable to skill loss than those who have already mastered the skill. These parental dilemmas and their implications for children will be discussed further in following subsections of this chapter.

Significantly, parental beliefs and concerns also provided insights into views about the role that computers play as productivity tools. With their emphasis on 'easier' and 'better', parents identified computers as productivity tools that support rather than transform existing tasks and learning; that support physical processes rather than mental processes. In this sense they deny Turkle's (1984) notion of the computer as a thinking machine, as well as the notion that using computers can transform the act of writing (Snyder, 1994 and 1995).

5.2.1.4 Computers as entertainment

While parents were silent on the issue of the importance of the computer as a source of entertainment, the children were not. Many children spoke about the importance of computers as a source of entertainment in their homes. Many also commented on the differences from television. Computing, particularly game playing, was seen as an active form of leisure activity. According to the children's views, television was more about filling in time and relaxing while playing games was more about having fun, facing challenges and winning.

In general, parents were comfortable about children using the computer to play games provided there was some educational or recreational value in them and they were not used excessively or in preference to homework being completed. In this sense, game playing was not generally considered as 'wasting time', and some parents compared it favourably to watching television.

Only two parents of the thirteen families commented negatively about game playing. They commented: "I do not want them to use it as a toy." and "I do not believe in sticking kids in front of the computer to play games. There are a couple of games which they do play which are purely computer games with no real skill in them, if you want the ability to master them, in the limited number of
tasks that the game requires, I just think that that’s boring and mind numbing. That’s not really a positive use for a computer.” Interestingly, both parents linked their objections to concerns about the role of the computer, implying by their comments that they wanted the computer to be viewed by the children as a ‘tool’ rather than a ‘toy’. In this sense, these parents were playing an active role in helping define the affordances of the computer for their children.

The parents who were happy with their children playing games, were so, even though their motivations for having computers in the home related to children’s education and future. They were comfortable with the home computer as both ‘toy’ and ‘tool’. As such they allowed the dual affordance of ‘tool’ and ‘toy’ to exist.

Where these parents had a concern with game playing, it usually related to the issue of time, since some children were spending too long at the computer playing. A number of children also commented on how time consuming game playing could be. One boy stated: “Oh, you play it for ages. You do not realise the time. You do some of the levels for at least 40 minutes sometimes.” A parent who also played games agreed: “I think, oh I’ll just give myself a five minute break and do a couple of levels of Lemmings or something and I find half an hour later I’m completely engrossed.”

Where it was an issue, parents spoke about the rules they had put into place to limit children’s playing time and the general advice given to the children to do other things first or as alternatives. Two boys from Stage Three of the study who were heavy users of the home computer were prevented from becoming too absorbed by parental monitoring of their behaviours. One parent commented: “We often tell him that he’s been there too long. Why doesn’t he go out and do something outside?” These concerns about time reflect more generally the issue of the bounded nature of family time and the opportunity costs of time spent playing games.
Generally neither parents nor children had major concerns about the content of games, though references to ‘the violence’ were made by both parents and children. Several parents specifically stated their objections to the levels of violence in some of the arcade-type games and would not permit them to be brought into the home. Both parents and children were quick to point out that children could separate game playing from the real world. These views were in accordance with the parental views reported in the Australian Broadcasting Authority’s study (Cupitt and Stockbridge, 1996). In this national population-based survey, the Australian Broadcasting Authority found that parents were more concerned about the content of television programmes than computer games, with parents identifying the difference as the level of realism on TV.

Several parents shared their children’s views that game playing could develop cognitive skills such as logical thought, decision-making, planning, problem-solving, memory, concentration, comprehension, reading and general knowledge. Physical skills such as hand-eye coordination, dexterity and quick reflexes were also mentioned. Again parents shared their children’s views that fantasy, action, competition, challenge, instant responses, choices, control, information and graphics were the aspects of computer game software which children found to be appealing. In this regard the ‘content’ or narrative of the game was partly irrelevant.

Parents and children also concurred in their views about the value of educational games for children learning basic skills such as reading, maths, spelling and general knowledge. One parent commented: "It gives a wonderful, interesting, varied way to learn those basic things." A child explained it in a different way: "I suppose you can compare it to how my mum makes me write my times tables out so many times whereas on the computer you can play, like there’s multiplication games and things like that and you usually get the hang of it."

One father believed that playing educational games helped his daughter with her general reading ability: "She would sit there for hours you know (playing games) so I considered that learning... she was a bit slow on reading... it did not matter..."
what it was as long as she was reading something and working out and comprehending what was going on, so we were quite happy for her to play that.”

In this sense there was accord between parents’ and children’s views about games. If any tensions existed they were contested through the family rules about how long, how often and when children could play games. These and other rules will be discussed further in Section 5.2.4.3, p. 183.

While the research literature is replete with evidence of the gendered nature of game playing (Braun and Giroux, 1989; Durkin, 1995; Funk, 1993; Kubey and Larson, 1990; Provenzo, 1991) few gender issues or assumptions arose in the parents’ and children’s talk about games. Those parents with a concern about violence or about time spent, had the concern for both boys and girls, though the incidence of problems with both of these issues seemed to be mainly with boys.

Fathers held stronger views about the value of game playing in terms of developing computing and other skills. Mothers were mostly silent on this matter, bar two mothers who themselves played card and strategy games fairly regularly. As will be seen later in Section 5.2.4.1, p. 172, while mothers and fathers basically shared the same rhetoric, fathers were more frequent game players and played the major role in making decisions about the purchase of new games software or hardware upgrades related to new generations of games.

Unlike their mothers, girls spoke at length about the value of game playing on computers and the importance of the computer as a source of entertainment in their home, but they too were critical of boys who spent long periods of time playing games. Like their parents, gender differences emerged in the actual patterns of children’s use. These differences will be more fully explored in Chapter 6.

5.2.1.5 Computers as multifunctional devices

The discourse, computers as multifunctional devices, was absent from parents’ and children’s discussions. However, while it was not an explicit part of the
parents’ and children’s talk, it was implicit in their belief systems. The evidence for the implicit acceptance of this discourse was the lack of conflict about the computer being both a recreational and a productivity device. This is particularly important with regards to the computer’s affordances. Parents and children perceived the instrumental and symbolic roles of the computer both as toy and tool. While parents in two families rejected the role of the computer as ‘toy’ for their family, they were acutely aware of its existence and took active steps to define the computer in their homes as ‘tool’. All other parents and all of the children had no difficulty in thinking of the computer in the different ways, nor, in most cases, of using the computer for these various purposes.

Overall, in terms of its symbolic function, the importance of the computer for parents stems from two things: its value in terms of the child’s future, especially regarding employment; and its value for the child’s present where it is seen as merely advantageous for schooling. Within this framework the computer was again perceived as a multifunctional device, this time, in terms of the variety of its instrumental uses such as writing, accessing and presenting information.

5.2.1.6 Other discourses

A number of parents made reference to what can be thought of as examples of new discourses that are emerging about children and technology. These new discourses construct today’s children as the computer generation (Ishagaki, 1986) or the information generation (Heppell, 1996). They imply that children born into today’s world are intuitively more comfortable with and capable of using computers. Some authors even go as far as arguing that today’s children are different because of their interactions with technology (Green and Bigum, 1993; Smith et al., 1995). A number of parents in the study made reference to such ideas in as much as they referred to their children’s greater comfort and natural abilities. For example one parent said: “I think that they do not have the same sense of awe and wonder about it that we had. They just see it as one of the things that they use.” Interestingly, no parent took this idea further in terms of talking about other fundamental differences.
This notion of the child being better positioned than an adult in regards to computing technologies presents a contrasting picture to the 'vulnerable child' of the transition generation, a child vulnerable to the loss of traditional skills and vulnerable to the loss of interest and motivation in using them. It constructs today's child almost as a leader, on the frontier of the new age, ahead of older generations.

Rarely, if ever in our social histories of technologies, have children been seen as carrying the mantle of a new technology. Even with other domestic technologies such as the radio, the television, the telephone and the gramophone, as least in the early stages, the adults 'owned' them and children were not expected to show more facility than their parents or other adults. Possibly the only other technology with which children are seen to be more 'natural' than adults is the video cassette recorder. The popular comment: "Show me a home with a programmed VCR and I'll show you a home with teenagers." reflects this relationship.

In terms of the context of children's computing in their homes, these beliefs highlight some of the complexities for children who live in a period of transition. As learners, they are seen as particularly vulnerable to the loss of important traditional skills and dispositions to work with traditional technologies which, in the view of the parents, are still essential, at least for the present. Parents seek to take control of children's interactions with computers to protect this vulnerability. As leaders, children are expected to have a 'natural' facility with the new technologies beyond that of the older members of society. The acceptance of this view allows children to take on the role of expert, adviser, teacher and mentor to others as they use computers. Hence, this latter construction blurs the boundaries and makes it possible for children to 'act as adults' in some circumstances while the former reinforces the boundaries of childhood and its separation from adulthood. These contradictory discourses and expectations create a complex social context within which children interact with computers in their homes. They are expected to be 'bi-literate' because at the societal level the present and the future demand it be so. For the present,
however, only the traditional skills and technologies are essential at school. The newer literacies while advantageous are not essential.

Gendered constructions of childhood and technology were not explicit in either the parents’ or children’s discussions. Parents had similar views for sons and daughters about the importance of computers now and in the future. Children, both boys and girls, held similar views about the importance of computers as well. Even in the discourses of ‘computer as entertainment’ boys and girls were making the same sorts of statements. From a historical perspective this may not be surprising in the sense that the innovators and early adopters, Rogers’ (1983) terms to describe the first users of a new technology of the seventies and early eighties, were socially situated within the discourses of the computer as hobby, in the sense of pursuing electronics and programming. Within these contexts the symbolic meanings of the computer were heavily gendered, social networks were mainly male dominated user groups and domestic computing was only recreational. As computers have diffused into more homes, and the multifunctional nature of the computer has emerged, the symbolic meanings have broadened to include ‘computers for education’ and ‘computers as personal productivity tools’. The bulk of adults and children using computers in homes could now be described as the early majority, taking advantage of broader social constructions and instrumental functions of the computer. These broader constructions are more inclusive, in the same sense that ‘education’ and ‘work’ can be considered as inclusive constructions. From this vantage, mothers, sisters and daughters have permission to participate in computing in the home.

While the study was not designed to allow for further analysis of explicitly gendered discourses, much data was collected which clearly indicates the gendered nature of parents’ and children’s use of computers. This contrast between explicit discourses and actual use will be discussed in later parts of Chapter 5 and in Chapter 6.

Overall, the similarities of parents’ and children’s discourses create a relatively harmonious social context where children and parents share beliefs and
expectations. In this sense both parents and children perceive the same set of affordances. However, minor points of contest do exist. These are dealt with through rules or resolved in other ways. In Section 5.2.4.3 on rules, these contests will be further explored. As minor points of contest, however, they do not detract significantly from parents' and children's shared perceptions of both the symbolic meanings and instrumental functions of the computer: its affordances. For parents and children, the computer has affordances of both 'toy' and 'tool'.

5.2.2 The exosystem at work

The exosystem refers to social settings that do not necessarily contain children but that affect their experiences in their immediate settings. In relation to this study the major focus is on the importance of family members' experiences outside the home and the relationship to the resources, support and approaches to computing in the home. Previous studies have shown that adults' use of computers in their workplace has an important influence on decisions made about domestic computing (Caron et al., 1989; Dutton et al., 1987; Times Mirror Centre for the People and the Press, 1994). The focus in this study is on how such use influences children's computing in the home. The literature is silent on the role of siblings in children's computing and while this study recognises the importance that other young people may play in shaping the social context of children's computing it was not able to focus on what exosystems if any contributed to sibling expertise and support in the home. The nature of that support, however, will be analysed in Section 5.2.4 on the microsystem as a social context.

In the discussion groups in Stage One of the study many of the children revealed that one or more of their parents used a computer of some sort in their workplace. Most reported only one parent doing so. The children mentioned a wide range of occupations when talking about their parents using a computer for their work. These included plumbing, sales management, insurance, engineering, teaching, armed forces, taxation, retailing, police work, computing, graphic design, airline work, hotel management, sales and community home care.
Often children’s knowledge of parental use of a computer in the workplace seemed to be tied to their experiences of the parent doing some of this work at home. One child explained: “Well, my mum normally uses it for her work, for her essays, sort of thing - like assignments, because she works in a tax office or something like that. And she always has to do stuff because they know she’s good at computers. My dad uses it for the army.” A small number volunteered descriptions of the use outside the home: “My dad’s a plumber, he works. And if he works at someone’s place, like if there’s a blocked drain or something, well they put that on the computer. And if they do not pay for it being done well they have to go and tell them because he went and did it for them.” For these children, at least it was obvious that their own knowledge of how computers are used in the workplace was increased by experiencing first hand their parents’ work. Many of them also had the opportunity of ‘seeing’ their parents using the home computer for business or employment-related work. Another outcome of these direct experiences is the reinforcement of the discourses that link computers with the future and with employment.

The children’s reports from Stage Two of the study allowed a closer look at which groups of children were more likely to have parents who used computers in their workplace. In particular, the relationship between gender of parent, socio-economic status, and computer use at work was investigated. All children in Stage Two of the study reported whether their mother, father or any other adult in the home used a computer at work. Approximately 60% of the children reported that one or both of their parents used a computer in their workplace; approximately 40% that neither parent did or that they did not know. It is worth noting that among the children who did not respond positively, 14% reported that their mother did not go to work and about 8% that their fathers did not go to work or did not live at home. There were no gender differences in the numbers of children who reported one or both parents using computers at work.

Table 5.2 presents the reported percentages of parents who used a computer at work by type of school community. Large differences exist across types of communities. Affluent communities have significantly higher proportions of one
or both parents using computers at work, 88%, compared to less affluent communities who have significantly lower proportions, 40%.

Gender differences are also evident. When the children who reported having both parents using computers at work are taken into account, 35% of the children reported that they have mothers who use a computer at work and 44% have fathers that do. These gender differences are consistent with data from recent national studies (Australian Bureau of Statistics, 1996) and clearly indicate that fathers are more likely than mothers to use the computer in the workplace.

**Table 5.2 Percentage of children with parents using computers in the workplace by type of school community (n=274).**

<table>
<thead>
<tr>
<th>Communities</th>
<th>Neither Parent or don't know</th>
<th>Father only</th>
<th>Mother only</th>
<th>Both Parents</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>More Affluent</td>
<td>12</td>
<td>38</td>
<td>22</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>(n=127)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Affluent</td>
<td>61</td>
<td>18</td>
<td>14</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>(n=147)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These gender differences, however, vary across the communities, with the differences in the affluent communities much greater than those in the less affluent communities. Such differences seem to stem more from the differences across fathers, with less than half the percentage of fathers in less affluent communities using computers in their workplaces than their counterparts in more affluent communities.

Further analysis of this data identified a strong relationship between parental use of computers at work and the computing resources in the home. Children who had one or more parents using a computer in their work were twice as likely to have two or more computers in their home, and more than twice as likely to have printers and CD-ROM drives. Furthermore, these children's families owned 44 of the 52 modems in the study.
As well as influencing the resource base in the home, parental use in the workplace also had a strong relationship with parental participation in computing at home. Apart from the obvious use of the computer for employment-related activities, these parents were more likely to be reported as using the home computer for a variety of other purposes. More detailed analyses of the parental participation in the Stage Two children's homes are presented in Section 5.2.4.1, p. 172.

An analysis of the sketches of Stage Three families reveals the complexities of the relationships between workplace use, personal interests and motivations, socio-economic background of the family and the resources and support within the home and the gendering of home computing. These family sketches are detailed in Appendix I. They demonstrate that the differences children experience in the social contexts of home computing are not simply patterned by socio-economic background, though the relationship of socio-economic background, parental expertise and work place use to the types of resources in the home is significant.

In three families (Families A-C) there were strong relationships between use at work, expertise, personal interest and socio-economic background. While all three families had up-to-date equipment for the children to use and parents who were keen for the children to develop computing skills for school and for the future, there were significant differences in the extra computing resources available and the degree of adult support and expertise. In Family A, both parents used computers incidentally in their workplace but had a strong interest in the local flying club. It was this interest that led to a commitment to and involvement in family computing. In Family B, both parents used an older computer at home for preparing newsletters in the Cambodian language, but did not use computers in their workplaces nor did they have any involvement with the more recently purchased family computer. In Family C, neither parent had any expertise or involvement with computers at work or in the home. In this family there was no support for family computing except by the eldest girl, in Year 9, who was doing a computer subject at school.
In a number of other families, the nature of family support was gendered. When fathers were family leaders, their expertise stemmed from their involvement through personal interest as well as workplace use. When mothers were leaders their expertise was developed mainly through the workplace. The gender of the leadership also had an impact of the amount and nature of extra computing resources in the home. When fathers were the leaders there was a greater range of equipment in the home.

It is also important to note that among the parents in the thirteen families there were both fathers and mothers who did not participate in computing at home or at work. While this lack of participation seemed to be very much a personal choice based on lack of interest, there was a gendered pattern consistent with the data in Table 5.1. The fathers were from the less affluent communities and did not use computers in their workplaces, (builders and firefighters) and the mothers were from more affluent communities and undertook full time home duties.

These complex patterns of leadership and resource provision clearly provided different socio-cultural contexts for children’s computing. Such difference did not extend to the public discourses within which parents and children participated. Regardless of socio-economic background and gender, parents were united about the importance of computing skills for ‘everybody’. This created a common set of expectations for all children. These expectations were not explicitly gendered in the sense that there were the same general expectations for boys and girls. The socio-cultural context became gendered and classed in more subtle ways through differences in use, expertise and resources. These differences will be further explored in the following sections where parental participation in computer-based work and recreation activities in the home and their decision making and support for children’s computing are reported.

5.2.3 The mesosystem at work.

The mesosystem as defined in Chapter 2 refers to the connections between the children’s various Microsystems. Children in Stage One of the study volunteered
the home and the school as their two sites of computing, thus identifying the school as the other major microsystem in this study. Children in Stage Three of the study were carefully questioned about other sites outside the home where they used computers. Apart from the occasional use of a computer in a local library, usually to use the catalogue, and the use of computers in friends’ and extended family members’ homes, usually for game playing, these children rarely used computers in places other than schools. This confirmed the proposition that for the purposes of this study, the school is an important microsystem.

While the connections between the two microsystems, home and school, are bi-directional, the school does influence home computing in explicit ways. One source of influence on home computing stems from the fact that for some children school is the place where they first learned to use a computer.

In Stage Two of the study children were asked where they first learned to use a computer. Approximately 35% of the children reported that their first learning experience was at school while approximately 65% said it was at home. There were complex differences across types of community, age and gender. Girls, older children, and children from less affluent communities were more likely to report school.

Generally, older children were more likely to have first learned at school, and younger children at home. This difference might suggest a shift over time, such that today more children have their first experiences at home, than in the past. This inference is well supported by the ABS (1994 and 1996) studies that show increases in the number of homes with computers from 1994 to 1996. Also of great importance is the ABS finding that the greatest increases in home ownership between 1996 and 1994 were in the lower income families. This suggest that differences across types of communities should be less over time. Checking this possibility was beyond the scope of this study.

The gender differences stemmed from the fact that more girls than boys first learned to use the computer at school. The greatest gender difference was with
the older more affluent children. Only 19% of Year 6 boys from more affluent communities first learned at school compared to 44% of Year 6 girls from the same types of communities. These gender differences are less readily explained in terms of access, because both of the ABS studies (1994 and 1996) confirmed that equal numbers of boys and girls in all types of communities have computers in their homes. The explanation for these gender differences may come from the fact that both ABS studies revealed strong gender differences in the numbers of boys and girls who use the computers that are in their homes. More boys than girls use the computers that are in their homes, particularly among the 4-9 year olds.

The gender differences in this doctoral study, regarding where older children (Year 5 and 6 children) first learned to use the computer, may be an important influence in the following way: by learning first at school, children’s first encounters are more likely to be educational rather than recreational game playing, that is, more related to ‘work’ than to ‘play’. Conversely it might have been the older boys’ greater interest in game playing that led them to use the home computer at an earlier stage than their female counterparts. Certainly, the results from Stage three of the study, which will be discussed in Section 6.2.4, p. 221, support this latter explanation. Importantly, for this study, the gender differences in first place of learning in both types of communities are almost non-existent among the Year 3 children. This suggests that gender differences, as well as community differences may be lessening over time.

A second but related influence of the school on home computing is that as children grow older, the types of work they do at school and do at home for school increasingly require writing, accessing information and presenting information. This provides children with ‘work’ that can be done more easily or needs to be done on the computer at home. As will be seen in Chapter 6, this ‘work’ is a major component of 10-12 yr olds’, particularly girls’, use of computers in their homes.
Stage Three of the study revealed one other key way that schools influenced home computing. This was the influence of particular male teachers on boys with a strong interest in computing. In each of the three cases these teachers provided support for the boys’ interests and home activities as the boys’ skills and interests outstripped those of other family members.

5.2.4 Within the microsystem

This section focuses on the socio-cultural context within children’s homes. The results are drawn from the children in all three stages of the study. Through using the children’s accounts of what was happening in their home, attention is drawn to the constraints and possibilities as seen by the children. This approach provides a strong foundation for contextualising children’s interactions with the computer for it helps us to understand how children make sense of their environment and thus take a proactive part through their participation and also their shaping of that very environment.

In analysing the children’s perceptions, one significant finding was that in both Stage One and Stage Two, where large numbers of responses were analysed, there was no discernible difference in how boys and girls, and younger and older children, described their social contexts, except that in the later case, older children gave much more detailed accounts. This does not deny that different children described different social contexts, but rather, that the differences are not consistently related to the age and gender of the child reporting the differences. This is not unexpected given the strong discourses that surround the importance of computers in the home which in themselves are not gendered.

The following sections each provide a different vantage point for understanding the social contexts. These vantage points are children’s views on other family members’ involvement in family computing, ownership and control within the family, and the family rules associated with use.
5.2.4.1 Family use of computers

During the focus groups in Stage One of the study the children tended to report that the whole family used the home computer. On the rare occasion that a child reported someone in the family not using it at all, it was likely to be parents, more often a mother, or a baby brother or sister: "My mum hasn't used it yet because she has other stuff to do."; and "My parents do not use it because they do not know how." In Stage Two of the study the children were asked specific questions about their parents' and siblings' uses of computers. Each of these will be reported separately below.

Parents

In response to direct questions, children in Stage two reported that parents bring work home or work from home, do family work or voluntary work for local organisations, and use the computer for their own study and for playing games. The most common family tasks were budgeting, printing (cards, banners etc) and typing (often referring to letters).

Throughout all these accounts there were differences related to gender and school community. Table 5.4 presents the percentages of fathers and mothers using computers by type of community. Major community and gender differences emerged in three main areas: the reported percentages of parents who used computers, who used them for employment-related work, and who used them for games. Each of these will be discussed in turn.

Overall, the type of community had a stronger influence than gender, in the sense that both fathers and mothers from more affluent communities were more likely to use the computers in the home than either fathers or mothers from less affluent communities. Interestingly the gender differences appeared to be stronger in the more affluent communities.
Table 5.3 Percentage of parents using computers in their homes by type of community (n=274)

<table>
<thead>
<tr>
<th>Computer use</th>
<th>Fathers</th>
<th></th>
<th></th>
<th>Mothers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>More</td>
<td>Less</td>
<td>Total</td>
<td>More</td>
<td>Less</td>
<td>Total</td>
</tr>
<tr>
<td>Work activities only</td>
<td>(n=128)</td>
<td>(n=146)</td>
<td>23</td>
<td>(n=125)</td>
<td>(n=145)</td>
<td>15</td>
</tr>
<tr>
<td>Variety including work</td>
<td>39</td>
<td>10</td>
<td></td>
<td>24</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Game playing only</td>
<td>3</td>
<td>11</td>
<td>8</td>
<td>7</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Family/Community only</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Variety excluding work</td>
<td>11</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Use</td>
<td>90</td>
<td>66</td>
<td>77</td>
<td>74</td>
<td>57</td>
<td>65</td>
</tr>
</tbody>
</table>

With regard to work-related computing activities, fathers were twice as likely to be reported as doing employment-related work than mothers, 50% and 26% respectively. Also, fathers and mothers in more affluent communities were twice as likely to be reported as doing so, 71% and 38% respectively, than those in less affluent communities, 32% and 16% respectively. It is worth noting that these differences are consistent with the earlier reported findings about the relationship between socio-economic background and gender and use of computers in the workplace.

When looking at the percentage of parents who were reported as only playing games, stronger and more complex differences emerged which were almost a reverse of those presented above for employment-related work on the computer. In more affluent communities the children reported 3% and 7% for fathers and mothers respectively and in less affluent communities 11% and 17%. Given the overall figures above, this phenomenon of fathers from less affluent and mothers from all types of communities only playing games, suggests not so much a strong attraction to games but of a lack of participation in other forms of computer use.
Further gender differences in game playing emerged as children described their parents’ game playing. Overall, fathers were reported as the more regular game players and mothers as only playing occasionally. There were also gender differences in relation to the types of games played. About equal mention was made of mothers as of fathers, with reference to the types of card games that come with system software, such as SOLITAIRE. However, apart from one reference to a mother playing TETRIS only fathers were named as playing games that would be separately purchased such as SIM CITY, GOLF or PRINCE OF PERSIA. As one child described: “Mum plays games like SOLITAIRE and other card games and dad plays driving games ... the super video car game.”

Parental game playing was mainly reported as a solo parental activity. Although some parents and children played the same games, and at times parents joined in informal family contests about ‘highest scores’ and levels of expertise, they tended to play the games by themselves. Only a small number of younger children in Stage One, 5-8 years of age, mentioned that a parent played games with them or helped them learn to play games: “My dad helps me learn some games.”; and “I play games with my mum.” Generally it was left to siblings to play games together.

While these overall results present clear indications of both type of community and gender differences, the magnitude and complexity of the differences can be further illuminated by looking at family profiles. Table 5.5 presents a profile by type of community of the children’s reports of parental computer use.

Only 3% of the children from the more affluent communities reported neither parent used the family computer, while 22% of the children from less affluent communities did so. In families where only one parent was reported to use the family computer, it was more likely to be the father, though the gender difference is slightly less in the families from the less affluent communities.
Table 5.4 Percentages of type of parental use by community (n=274)

<table>
<thead>
<tr>
<th></th>
<th>Use computers</th>
<th>Use for work</th>
<th>Use of games</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>More Affluent Communities</strong> (n=128)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>3</td>
<td>20</td>
<td>49</td>
</tr>
<tr>
<td>Mother only</td>
<td>7</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Father only</td>
<td>23</td>
<td>41</td>
<td>26</td>
</tr>
<tr>
<td>Both</td>
<td>67</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Less Affluent Communities</strong> (n=146)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>22</td>
<td>58</td>
<td>48</td>
</tr>
<tr>
<td>Mother only</td>
<td>13</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Father only</td>
<td>21</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Both</td>
<td>44</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

A similar set of trends applied to the family profiles of parental use for work-related computing. Children from less affluent families were three times more likely to report that neither parent used the home computer for work-related activities, and only a quarter as likely to report that both parents used the computer in this way. Children in families where only one parent used the computer for work-related activities were more likely to report that parent as the father. Again the gender difference was less in less affluent communities.

The picture with regard to game playing was very different. Similar percentages of children in each community type reported that neither parent played games, 48% for less affluent and 49% more affluent; while a greater percentage of children in less affluent comminutes reported that both parents played games, 20% compared to 14% in more affluent communities. In families where only one parent played games, it was more likely to be the father and again the difference was less in less affluent communities.

The results as presented in both Tables 5.4 and 5.5 present parents’ participation in home computing as gendered and socio-economically based. The patterns are
complex, but generally fathers participate more than mothers, and parents in more affluent communities more than parents in less affluent communities.

One of the significant outcomes of these results for the social context of children’s computing is that they contradict the major discourses shared by parents and children alike. While parents and children talked about the importance of computers for ‘all’ in terms of the future, especially employment, the boys’ and girls’ perceptions of their experiences in the home were presenting today’s reality as a gendered and class-based relationship between computers and employment.

**Siblings**

Siblings in the family also played an important part in the social context of children’s computing in the home. In Stage One of the study many children indicated a variety of ways that they interacted with their siblings around the computer. Most commonly they reported that they played games with them, actively watched them play games, asked them for help with game playing, and in the cases of younger siblings helped them with game playing.

Interactions extended beyond game playing, however, and included seeing their siblings, particularly their older siblings, do school work, projects, homework or college work and often get priority access to the computer over themselves for this work. Older siblings also frequently provided general support with computing and in a small number of cases controlled the computer, through its placement in their bedroom or, in the case of younger children, through them having to seek their older sibling’s supervision to print or shut down the computer.

When talking about siblings’ use some clear patterns emerged in the children’s responses. Overwhelmingly, older brothers and sisters use the computer for tasks such as college or university work, school work, home work, and projects: “My sister uses it for homework because she is in high school.” Again, as with parents, game playing was the second most common response. Though little
detail about the nature of the game playing was volunteered: "My brother also plays games on it." Their accounts did suggest gender differences among their siblings with game playing being reported as the predominant activity for brothers and a combination of school work and games for sisters.

These results are consistent with the Australian Bureau of Statistics [ABS] studies (1994 and 1996) which found similar gender differences between boys' and girls' household use of computers. A significant finding for this study was that the ABS study found that at about the age of 15-17 years boys were as likely to use the computer for school-related work as they were for playing games, while prior to this age game playing was by far the most common usage. These results imply a changing picture, albeit gendered, with different-aged siblings. Children in Australian households are likely to witness a pattern of development where younger family members mainly play games but older family members, while still participating in game playing to some extent, mainly use the computers for a variety of study and/or work related activities.

Children also interacted with their siblings around the computer in another way. At times they competed with their siblings for access to the computer. Both boys and girls described occasions when they wanted to use the computer but it was already in use, or when they were using the computer when others wanted to use it. In general there were family rules and expectations in place which helped resolve these conflicts and both boys and girls felt that they had reasonable access and that when conflicts were resolved they were done so equitably. Such a finding might be considered surprising given the literature on gender, competition and computers, particularly in schools. In Section 5.2.4.3, p. 183, on rules a tentative explanation is put forward about access and gender in the home.

5.2.4.2 Being in charge of the family computer

Another way in which the context of family computing can be gendered derives from the children's perceptions about who is in charge of computing/the computers in the household. In Stage Two of the study children reported on a number of matters related to this question. They spoke about who 'owned' the
computer/s in their homes, who used it most, who made decisions related to spending money, who fixed problems and where the computer was located. Each of these will be discussed below. When talking about ownership there was no attempt to clarify, per se, what children meant by the term. It was taken as a symbolic term related to one element of ‘being in charge of’ rather than the more technical meaning of who made the initial purchase.

The children reported such ownership for each computer in their home, thus the number of responses was greater than the number of children. The children reported that about 45% of the computers had shared ownership, through comments such as: “all of us”; “mum, dad, my brother and me”; “My parents own it but let us use it.”; and “Me and my sister own the one with the most games... my dad the one that only has office stuff.” Dads were by far the most commonly named individual owners of the computer, about 30%. Other individual owners were, 7%, themselves; 7%, their mother; 7%, a brother; 4%, a sister and 5%, other extended male family members or friends. Table 5.5 presents the children’s perception of ownership by community type and gender of respondent.

Table 5.5 Perceptions of ownership of the family computer/s by type of community and gender of the respondent (n = 379)\textsuperscript{18}

<table>
<thead>
<tr>
<th>Background of Respondents</th>
<th>From more Affluent Communities</th>
<th>From less Affluent Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=190)</td>
<td>(n=189)</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>girls</td>
<td>boys</td>
<td>total</td>
</tr>
<tr>
<td>parents/children</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>child/children</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>parent/parents</td>
<td>50</td>
<td>46</td>
</tr>
<tr>
<td>other</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

\textsuperscript{18} The number of responses represents the number of computers in the homes (378) which is greater than the number of children (275). This also applies to Table 5.7.
These differences are consistent with the patterns of parental use presented in Table 5.4 which revealed that many more parents in more affluent homes use the computer for work, or work and games, than in less affluent homes. It would seem reasonable to suggest that these are the parents whom children report as ‘being in charge of’ the computer/s. In less affluent homes fewer parents use the computer, and many who do just use it for game playing. It seems reasonable to suggest that in these homes children are less likely to assign ownership to parents who do not use the computer or who only play games. Stage Three of the study provided some insights into this pattern of symbolic ownership. In the more affluent families, all had one or both parents strongly involved in computing. In all these cases ‘ownership’ was assigned to the involved parents, who when an individual parent, was more often a father. In the case of families with second computers, or families with joint computing projects, shared ownership was assigned to parents and children. In families from less affluent communities, again if there were parents with expertise, they were assigned ownership solely or in conjunction with the children. In the three families where there was little or no parental expertise, a sister’s boyfriend, an older sister (in a family of 5 sisters) and the respondent (boy) himself were considered by parents and children alike to ‘be in charge of’ of the computer.

When the gender of the respondents was included in the analysis, few if any differences were noticeable. One difference did emerge in less affluent families. In these families boys were somewhat more likely to assign ownership to siblings and/or themselves and girls more likely to one or both parents.

Further analysis of ownership focused on the gender of the owner. Again, both the gender and community type of the respondent were used as antecedents. These results are displayed in Table 5.6.
Table 5.6 Children’s perceptions of gender of ownership of the family computer/s by community and gender of the respondent (n = 379)

<table>
<thead>
<tr>
<th>Background of Respondents</th>
<th>From more Affluent Communities (n=190)</th>
<th>From less Affluent Communities (n=189)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% girls</td>
<td>% boys</td>
</tr>
<tr>
<td>mixed gender</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>other female</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>other male</td>
<td>38</td>
<td>47</td>
</tr>
<tr>
<td>self</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

In general boys and girls from both communities mostly assigned a mixed gender ownership or male ownership to the computers in their homes. There were also other differences between the respondents based on type of community and gender. Firstly, children from more affluent homes rarely if ever assigned themselves as owners of the family computer/s. They were more likely to assign the ownership to males, or other males in the case of boys, in their family. Their counterparts in less affluent homes, while still more likely to assign ownership to males/other males, did so to a lesser extent and were more likely to assign themselves ownership. These patterns did not differ greatly between boys and girls in either community. Children’s assignments to ‘other females’ also had a curious pattern. Boys from more affluent homes were the least likely to assign ownership to females within the household, but the percentage was the same as self assignment. Girls from more affluent homes assigned to ‘other females’ at a much higher rate, about the same as children from less affluent homes. In the former case, however, the percentage was dramatically higher than that to self. In the latter case the assignments to ‘other females’ was about equal to assignments to self.

In further developing this notion of ‘who was in charge’ the children were asked questions about who used the computer most. About 35% of the children named
themselves with the gender ratio only slightly favouring boys. The significant
gender differences occurred when children named others. Approximately 20% of
the children named their father as the person who uses the computer most and
another 20% named their brothers. The remainder of children named a variety of
family members.

Another perspective on ‘being in charge’ related to who made the major
decisions about the equipment. A strong pattern of gendered decision making
emerged as the children talked about who were the major decision makers about
the home computer. Overwhelmingly fathers, particularly from more affluent
communities, were the major decisions makers: it was fathers who needed to be
convinced about the necessity for upgrades and who made the decisions about
new software. In many cases children were also involved in the decision making
process, but nowhere to the extent of their parent/s. When decisions were about
games software the gender differences were more extreme with fathers and boys
being the major decision makers. Many mothers, sisters and girls did, however,
have a say in purchases of educational software.

Mothers also made decisions related to computing but in a different way.
Children most often reported mothers as making decisions and rules about how
often and for how long computers can be used, and as the helper when it came to
doing homework on the computer. Through these roles many mothers were seen
by their children as having an active and direct role in their computing. While
this patterning of roles probably mirrors the more general distribution of power
and decision making across technical and social matters in the home, they do
contribute specifically to the gendered context of children’s home computing. In
many families children see fathers as the decision makers, ‘owners’, and key
users of the computer and mothers as less frequent users and responsible for
rules about the computer’s use.

The children also reported on another index of ‘being in charge’ of the family
computers: the location of the computer. The children in Stage two of the study
reported that computers were located in spaces such as living/lounge rooms,
dining rooms, family rooms, studies/offices, bedrooms, granny flats, garages, the sewing room, and interestingly a space which eight children labelled a computer room: "My father calls it the computer room - both computers are in there." It was obvious from a small number of comments that many families have had to make a special space for the computer: "One’s in my brother’s room and we are trying to find a spot for the other one - it’s in the dining room at the moment, but we are trying to find somewhere to put it."

About 40% of the children named a bedroom (own, parents’, brothers’, sisters’, and spare) as the place where the computer was kept. An equal number named public spaces such as the living room. About fifteen percent of the children named a space such as a study or an office, with most providing comments such as "in mum’s office"; or "in the office where mum and dad work because they sometimes work in it." Sometimes when the computer was in someone else’s room the children clarified the issue of access or control: "keep it in my sister’s room but I use it too"; "in my dad’s room because if it’s in my room my brother would come in and do what he wants on the computer."; and "Mine’s in Dad’s office so I can work without anyone bugging me." When describing other people’s bedrooms as the place where the computer was kept, the number of brothers and sister’s bedrooms seemed reasonably equal, however there was a major gender difference in reporting ‘my bedroom’. Of the 10% of the children who named their own bedroom, sixteen were boys and four girls.

Families made careful decisions about the location of their computer(s) in both public, semi-public and private spaces. Issues associated with locating the computer in a public place varied from wanting to make it accessible to not wanting it to become central to communal living. Parents in Stage Three of the study explained: "I suppose what happened is that the computer landed up in a central spot which was a table in the family room and the children seemed to do their homework on it." and from the other perspective: "We have a TV, but it’s very peripheral to our communal rooms and we felt the same about the computer, we did not want it to occupy the central place. So we just had to make, we made physical space for it, but peripheral to, it’s not in a common area, you
know, it’s in a room that we all use but it’s not a sociable thing to do to be on the computer in this house and in the same way it’s not a sociable thing to be watching television.”

Overall, the location of the computer was not strongly gendered, nor did it in general restrict children’s use. The greatest differentiation, in children’s views, was between computers that were in adults’ work spaces and computers in more public spaces. Children who had to negotiate access to a restricted space, such as their parents’ study and to a restricted computer such as a parent’s work computer, had more limited access than their counterparts. In this sense, the socio-cultural context was gendered through patterns of use and symbolic control rather than physical location or, for that matter, public discourse.

5.2.4.3 Family rules

Family rules played an important part in shaping the social context of children’s computing. Approximately 90% of the children in Stage Two of the study spoke about the family rules regarding computer use. Rules were either explicit - a clearly stated rule, or implicit - inferred from particular behaviour or decisions that parents made. The rules tended to fall into three categories: community rules regarding the management of a community-owned item; personal rules regarding the child’s use of the computer; and computer rules regarding the care and operation of the computer. In all, about 10% of the children in Stage Two of the study reported that there were no explicit rules in their homes. However, half of these qualified their statements indicating the presence of implicit rules. An example of such a comment is: “No rules - mum makes us play together if we both want to use it.”

The first group of rules, the community rules, included rules for managing the processes of sharing the computer and its resources, resolving conflicts and defining acceptable community behaviour. Some general examples of children’s comments are: “Share it and do not fight over it or mum or dad decides who will get it”; “If my sister has work to do she uses it but if she wants to play games and I am on it then its tough for her”; “I can’t distract anyone while they are
using it.”; “I’m not allowed to use the CDs that are for dad’s work..... not allowed to scrap someone’s saved files.”; and “Do not put music up too loud.”

The most commonly reported community rule related to ‘taking turns’. In general, children were expected to manage the turn taking and resolve disputes. The following comments typify this expectation: “...share it and do not fight over it; mum or dad decides who will get it”; and “If we fight over the computer no one is allowed to play it.” Many children mentioned strategies that parents used to regulate fair use. Time limits, taking turns, and playing two player games were commonly mentioned.

A small number of children did volunteer examples of unresolved disputes over access. Interestingly, these were provided mainly by girls (of all ages) but they were not always aimed at brothers. The following statements provide a range of situations: “He never lets me on. When he’s busy I tell him ‘After you can I have a turn?’ by then it’s probably tea time and I have to go to bed so he never actually lets me have a go.”; “Sometimes I’ll be playing games and my brother (OLDER) will just push me off the chair.”; “My older brother and sister use it more. If I want a go they stay on the computer but if I want a turn they just come on”; and “Whenever I want to play it when my older sister is playing it, she’s 9, turning 10 in a couple of weeks, I ask dad if I can have a go next and he says ‘we’ll see’. And I go over and I watch her and she’s always playing Marjrhong which is a game with finding the same tiles and I go ‘Can I have a go?’ and then she starts typing some stuff and I say ‘It’s my go’ and then she just pushes me away.” It is interesting that the older sister swapped from playing to typing in order to increase her chances of staying at the computer. This strategy suggests that there were some types of rules about priority uses within that home.

Significantly, a clear set of rules regarding who had priority existed in many of the families: older family members had priority over younger ones, and people needing to do ‘work’ had priority over those wanting to play games. In some families ‘work’ was sufficiently loosely defined to mean any use which uses the computer as a ‘tool’ as opposed to using it as a ‘toy’ for game playing. Parents
doing work on the computer and older siblings doing school work seemed to have clear priority: "We have to get straight off if mum or dad wants to do something."; and "If my sister’s on it I have to wait because she’s doing her HSC". Homework or school work had priority over games: "I tell my brother to get off because I need to do homework, study or typing or printing. He goes off and goes and watches TV or just something else."; and "If my sister has work to do she uses it but if she wants to play games and I am on it then its tough for her." The existence of such rules is not surprising given the strong parental discourses about ‘computers as the future’ and ‘computers for education’. Clearly these discourses shaped parental priorities in families where game playing, though recognised as a legitimate activity for leisure, was considered to be not important in the way that using a computer as a productivity tool was considered important.

The second group of rules, the personal rules, set conditions and limits on the children’s use. These include when and how and for what purposes the children could use it, when supervision or permission was needed, and what codes of behaviour operated when children used the computer. Many children reported that they needed to complete homework or chores before they could play games. A typical comment was: "If I have homework I have to finish it and then I can play games on it.” A small number of children described rules that implied game playing was a reward/punishment device for desirable and undesirable behaviour. One boy stated: "If I’ve been in trouble at school then I’m not allowed to use it for a couple of weeks.”

Generally, the most common rule about limiting computer use stemmed from a concern about how much time game-playing on the computer takes. Concerns relating to spending too much leisure time using the computer resulted in family rules being created about when and for how long the computer could be used, in particular, to prevent excessive game playing. It also produced general advice from parents to go outside and play. Several boys in the study were prevented from excessive use by parental monitoring of their behaviours. One parent
commented: "We often tell him that he's been there too long. Why doesn't he go out and do something outside?"

In general, time and duration rules were geared towards game playing only. Different rules or no rules existed for other uses: "I'm only allowed to work on it when I've got my school project or some work I have to do at home. I'm allowed to play games on the weekends only."; and "We can use it for 15 minutes for games but if it's homework we can have as long as we need." The only exception to this was the existence, in those homes where children used the Internet, of restricting the time children could be connected. This exception will be discussed further below.

When talking about game playing many children in Stage Two of the study mentioned explicit rules about when and how often children could use the computer: "I'm only allowed to use it on holidays and weekends."; "I have a time limit of an hour."; "one hour a night for school nights, anytime on weekends, take a rest after two hours on weekends."; and "only once a week. If I play it too much mum will take out the mouse and hide it."

Rules about supervision/permission varied greatly among children. In general younger children had more rules than older children. In particular, younger children had restricted use of printers: "Do not touch the printer - because I have to ask to use the printer. They can turn it on and then I can use it.", and "I'm not allowed to use the printer by myself until mum and dad say so." Older children seemed to have few if any permission/supervision rules, though most with modems in the home had restricted access: "I'm not allowed to use the Internet unsupervised"; "and must ask to use the modem". In many ways these rules were directed more towards the care of the computer and use of resources than the acceptable behaviour of the children. Few children offered rules that related to their own behaviour. One of these was: "No rude pictures; no rude words on the programme where you type something and it talks."
The third set of rules, computer rules, covered a wide range of issues. These included caring for the computer, use of resources (as mentioned above), and rules governing security or privacy of other’s files. Typical rules about caring for the computer included not eating and drinking near the computer, nor banging the keyboard: "Do not bang the keyboard, no drinking around the computer because you might wreck the keys, you might spill the juice in the keys and the keys might break."; "Do not eat near it: wash hands: do not touch the screen, be careful with it, do not play around with the mouse."; "Do not hit the keyboard hard, do not be rough with the mouse."; and "Do not turn it off automatically because you wreck it, close Windows 95."

Rules about judicious use of resources mainly referred to printers. The most common reference was to the limitations on how much could be printed or how much colour could be used. Typical comments were: "...can't print too much"; "Do not use too much colour on the printer." The Internet also had restrictions on its use: "On the Internet, I'm only allowed 30 minutes to 1 hour. When time runs out you have to turn it off. For other things, can use as long as I want."

Few children mentioned issues of privacy or security of programmes or files. When doing so it was mainly in relation to their father's work files: "Do not have the computer on when we have friends or visitors because of dad's files." Others mentioned these issues as more generic rules about loss of programmes: "You can't put nothing in the rubbish bin, no games and if the rubbish bin is fat, the disk may come out - but only for mum and dad it will. My sister and brother did once try to put a game in the rubbish bin."

Across all types of rules, community, personal and computer, there were no obvious gender differences. There were age differences in the sense that younger children were more likely to report explicit rules about caring for the computer and its equipment and the need for supervision/permission. Older children were more likely to report explicit and implicit rules that related to how often, for how long and when (for example, after homework) they could use the computer.
Interestingly, children who had one or more parents using a computer at work or at home were less likely than their counterparts to report the latter types of rules.

Gender differences did emerge in terms of the outcomes of rules. The community rules about priority use interacted with other factors in the social context of computing to produce important outcomes: girls and sisters had the power to remove game-playing brothers from the computer so that they could do what they were interested in doing, school or community related work. In the sense that girls’ and sisters’ preferred activities aligned more closely with parents’ priorities, their use was accorded the status of preferred activity. On the other hand, boys’ and brothers’ preferred use was game playing. While this was generally seen as a legitimate leisure activity it was not accorded any priority. In this way, family rules counteracted some of the gendering of the home computing context.

The above analysis implies strong structural boundaries in terms of affluence and gender within the socio-cultural contexts of domestic computers. The careful analysis of the family profiles from Stage Three of the study, however, identified ways that both parents and children reshape the socio-cultural contexts and transcended some of these boundaries. This is best illustrated in the following profiles of two families from less affluent communities. These families illustrate at least two different pathways that parents use to bring their children and their homes into the ‘computing age’.

The first family, a mother and son, were given a DOS-based computer about 12 months ago by the mother’s employer. A wide selection of games disks had been given to the family by various people. Although there was an older DOS-based word processor on the computer, there was no printer. The mother had very strong views about the importance of computing for her son’s future and was keen to see him use this new computer regularly. She felt that game playing provided a basis for learning about the computer and commented about her son’s growing knowledge of how computers worked as he succeeded in getting the games on the donated disks to work. Through her work place, the mother had
access to CD-ROM-based information and to the Internet. She occasionally brought home information related to school projects. Mother and child also visited the local library and used the computer there to access information.

The second family had had a computer in the home for just over twelve months. The parents purchased the computer solely for their girls’ education. They had no interest or expertise in using computers. The computer, which resided in the eldest sister’s bedroom, had a CD-ROM, printer and modem. These peripherals were part of the ‘basic package’ they purchased from a local department store. The modem was not connected to the Internet or any other low cost networked resources. The eldest sister, who was taking computing as part of her high school studies was the main user, decision maker and teacher/leader with her four younger siblings. She enjoyed being in charge of the computer and supporting her four younger sisters as they learned to use the computer. This sister provided help for the girl in the study. When the sister could not solve the problem, she asked for help in her computer studies class at school.

Overall, the analysis of the socio-cultural contexts of children’s computing highlights the tension between structure and agency and discourses and practices. Through the exosystem strong discourses about ‘computers as the future’ and ‘computers for education’ entered the home. These discourses were inclusive of gender and community type. Patterns of access which were strongly influenced by parental expertise developed in the workplace (mesosystem) and patterns of use within the microsystem of the home were gendered and unequal in terms of community affluence. Evidence was presented which supports the argument that the tension/relationship between discourses and uses was reciprocal with both influencing each other. Importantly, for girls the translation of the discourses into implicit and explicit rules about priority uses facilitated their access to computers at times of competition.

The discourses and patterns of use combined to reinforce the potential affordances stemming from the functional identity of the computer. The affordance as ‘tool’ was strengthened both through the dominant discourses, the
rules regarding priority use and the actual patterns of use of parents and older siblings. The affordance of ‘toy’ was legitimated by parental approval if not active participation in the discourse of computers as entertainment. Although it is important to note that this approval in some families is somewhat restricted by concerns about the time consuming nature of game playing. The legitimation process was also supported by parental and sibling game playing, though such game playing was both gendered, and in the case of parents, strongly related to community affluence.

The above analyses clearly indicate that the affordances of ‘toy’ and ‘tool’ can co-exist for children in the home. This notion of co-existence is a significant finding. Much of the early literature in the discourses surrounding domestic computing spoke in terms of competing discourses (Haddon, 1988a; Murdock et al., 1992). This study has found that while they have been shaped differently through the interactions of the discourses and patterns of use, both affordances are legitimate conceptions of the multifunctional domestic computer and are perceived by both parents and children.

In Chapter 6 the relationship between affordances and children’s own use will be explored in order to ascertain whether the reciprocal relationship between the two allows children to participate further still in the creation of new affordances.
Chapter 6: Children’s use of computers

In Chapter 6 the focus shifts from the contexts of children’s computing to their actual uses; from the concept of the computer as a conceivable phenomenon to the concept of the computer as a useable phenomenon. This chapter foregrounds the child as ‘actor’ rather than the child as ‘acted upon’. These shifts of perspective provide a balance to the previous chapter which focused on the socio-cultural contexts within which the affordances of the computer were perceived.

The chapter begins with a detailed description of the range of children’s activities with the home computer. Out of this comes a tentative framework of children’s uses. This framework is used to systematise the nature and purposes of children’s use. From this comes a clearer picture of the multidimensionality of children’s uses: they can be leisure or work-related, playful or purposeful.

The chapter ends with a discussion of how children come to create through their activities an affordance of the computer as ‘playable’.

It is important to remember that the children in all stages of this study were selected on the basis that their parents reported that they used the computer several times a week and that they used the computer for more than playing games. This selection process clearly defines this sample of children against two other groups, those who do not use computers at all in their homes and those who only use them for game playing. As was described in the literature review, a
number of organisations have undertaken national demographic studies which
included data on children’s computing (Apple Computer Australia Pty Ltd, 1996;
Cupitt and Stockbridge, 1996). The results of two of these studies were reported
in Chapter 3 in Tables 3.4 and 3.7, p. 80 and p. 87 respectively. These results
help to situate this study’s sample of children within the population of Australian
children. From these two national studies it is reasonable to suggest that between
25-60% of Australian children between the ages of five to twelve years of age use
a computer between 1 and 5 hours a week for game playing and other activities.
It is also clear from these studies that the percentage of children doing so
increases with age. The children in all stages of this doctoral study fall within
these national percentages. What is not available from these national studies is
detailed descriptions of what the children are doing when they play games or
when they engage in other non-game-playing activities. The following sections of
this chapter describe in detail the nature of the tasks and activities with which
children engage when they use computers in their homes. This is one of the
significant contributions of the doctoral research.

6.1 Game playing

Both the parents\(^{19}\) and the children in all stages of the study reported that the
children’s most common use of the computer was game playing. Many of the
children also played games on dedicated games machines, such as Super
Nintendos and Segas and on hand held machines such as GameBoys. In many of
the discussions about game playing it was difficult to separate the different game-
playing environments, although a small number of older children did
differentiate: “I play the Sega much more than the computer. I would say I only
use it (the computer) once every two weeks, I play the Sega more like once a
day”. In the many discussions and interviews with children it became obvious

\(^{19}\) The parental data came from the mini-time grid that parents in Stages One and Two of the study
completed about their children’s activities as part of the process of giving written parental permission for
their children to engage in the study.
that while there were differences in who played and how often they played in the two different environments, there was little difference in the ways children played the games, and in their game-playing attitudes and behaviours. In the following sections, the distinction between computer game playing and videogame playing will not be made unless the distinction is relevant to the point being made.

A further complication in discussions about playing games and more general use of the computer stemmed from the children’s generic use of the term ‘play’ and ‘games’. For example, children spoke about “playing typing”, “playing books” and about software such as KID PIX and other paint programmes as their “favourite games”. A number of children also used the phrase: “play the computer.” The actual significance of the use of this language will be discussed later in the chapter, suffice to say here that in this section the terms play and games will be restricted to the activity of playing electronic games except in the direct quotes of children or where clearly indicated otherwise.

The following sections on game playing begin with a discussion of the frequency of game playing. This discussion helps to situate the time children spend playing games against time spent in other childhood activities and to explore any age, gender and community differences. Following this, there is a brief discussion of the types of games children play, then a lengthy discussion on the purposes and processes of game playing. While many previous studies (Braun and Giroux, 1989; Cupitt and Stockbridge, 1996; Haddon, 1994; Kubey and Larson, 1990) have investigated what children play and how often they play, few if any have explored the purposes and processes, particularly within a framework that gives agency to the child.

6.1.1 Frequency of game playing

The frequency of the children’s playing varied from every day to once a week, although a very small number indicated that they rarely played games. Duration of play also varied enormously among the children from several hours in one sitting to about ten minutes. In discussions about duration a number of children
mentioned that duration of particular sessions also varied greatly: "I don't know how long I play with it because sometimes if I'm playing a fighting game and they kill me, I get really angry and I just turn it off." Some mentioned the fact that some games take a long time: "With Monkey Island, it takes ages so I do it for about 2 hours every day." Many children mentioned some restrictions on the time they could spend playing games. These restrictions were for a variety of reasons: "...usually one hour after homework. Other times 20 minutes..."; and "It depends if others are waiting to use the computer. I have a time limit of half an hour."

Only ten children in Stage One of the study reported that they played for several hours every day, all but one of these children were boys in the eight to twelve age range. One such child reported: "Most of the time, once of a morning and three times in the afternoon. Every day. Sometimes I play it until I finish a game no matter what. Sometimes I play through tea without having any tea or breakfast. ...1 to 2 hours but sometimes of an afternoon I play for 5 to 6 hours." These children did not mention restrictions on the amount of time spent playing games although one of the boys said that his parents did complain about the amount of time he played.

Within Stage Two of the study children were asked to identify which of the following statements matched the amount of time they spent playing computer games: never, hardly ever, less than once a week, about once a week, two or three times a week, at least once a day or several times a day. Table 6.1 reports the results which incidentally were consistent with the reports that the parents gave about their children as part of the permission process. A number of important findings stemmed from this data.

The first important finding related to gender differences. Though they are not as dramatic as earlier research about electronic game playing might suggest (Cunningham, 1994; Kubey and Larson, 1990; Spender, 1995; Wober and Shehina, 1994) they were still significant in this study. It is possible that these differences would have been more dramatic if the total amount of time spent
playing electronic games (computer games plus video games) had been calculated. While data on time spent playing video games was not available within this study there was data on ownership of video game machines. In Stage Two, 78% of the boys reported that they had a video game machine in the home which they used, compared to 55% of the girls. It is also interesting to note that 23% of the boys reported that they used the games machine more often than the computer, compared to 10% of the girls. The Australian Broadcasting Authority national study (Cupitt and Stockbridge, 1996) had findings consistent with this notion that the differences with time spent playing electronic games stems more from the video game playing than the computer game playing. They found that while boys and girls spent a similar proportion of their total leisure time playing computer games (3% and 2% respectively) the differences increased when video game playing was included (7% and 3% respectively).

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Children</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>girls</td>
<td>boys</td>
<td>all</td>
</tr>
<tr>
<td>never</td>
<td>3%</td>
<td>-</td>
<td>1%</td>
</tr>
<tr>
<td>hardly ever</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>less than once a week</td>
<td>8%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>about once a week</td>
<td>28%</td>
<td>24%</td>
<td>26%</td>
</tr>
<tr>
<td>two or three times a week</td>
<td>31%</td>
<td>39%</td>
<td>35%</td>
</tr>
<tr>
<td>at least once a day</td>
<td>23%</td>
<td>22%</td>
<td>23%</td>
</tr>
<tr>
<td>several hours a day</td>
<td>6%</td>
<td>4%</td>
<td>5%</td>
</tr>
</tbody>
</table>

The results of both the doctoral study and the Australian Broadcasting Authority study suggest some gendered patterns of playing across the two game platforms: computers and video games machines. These differences may stem from a variety of sources. Cunningham (1994) found that gender differences in game playing declined as electronic games moved from the arcades to loungerooms and playing became part of the domestic culture rather than youth culture. These changes
improved access for girls and provided them with 'permission to play'. It is possible that the male youth culture still pervades video game playing more than computer game playing. For example, Provenzo (1991) found that American boys, between the ages of 8-11, were the most common owners of family video games machines and developed players' networks outside the home to swap information etc. In this study the computers were more likely to be jointly owned or owned by a father. Parents and older brothers and sisters were also more strongly involved in family computing through doing work and/or playing games. This created, for many children, a network of users within the home. Such involvement may 'allow' girls to participate in game playing through computing in ways that they cannot with video games machines.

Secondly, the majority of boys and girls were regular computer game players, that is, they played computer games at least once a week. These findings are consistent with the Australian Bureau of Statistics Study (1996) reported in Table 3.5 p. 81, which placed the majority of children within a time band of 1 to 5 hours per week. Few children in this doctoral study (5%) played for several hours a day. The Australian Broadcasting Authority Study (Cupit and Stockbridge, 1996) also confirmed that very few children at all fit the media stereotype of the 'addicted game player'. Furthermore, the Australian Broadcasting Authority study found that on average children spent only 5% of their leisure time playing electronic games. The majority of their leisure time was spent watching television (33%), going places (11%), on general play (10%), and playing sports (8%). This is consistent with the findings of Stage One of the study where children, when talking about leisure time, particularly on weekdays, spoke about the following activities taking up most of their out-of-school time: organised after school activities, doing homework, watching television and doing domestic chores.

Two other points are worthy of note. Firstly, it is important to remember that about 30% of Australian children do not play games at all (Cupit and Stockbridge, 1996, p. 67). Secondly, the age group in this study, particularly the older children (10-12 yr olds), were according to the ABS (1996) among the age group with the highest percentage of both boys and girls playing computer games.
and who described game playing as their ‘main’ computer activity (see Table 3.4 p. 80). Thus even with the age group who are most likely to play games and who play them more often than any other age group, their game playing was still only one of the many leisure activities with which they engaged.

These results seem to contradict the assertion by several influential authors that computers (particularly game playing) are a central feature of children’s everyday lives (Heppell, 1996; Smith et al., 1995). While it would be fair to say that for many children today a computer is part of the furniture in their home, for the vast majority of children electronic games are a regular but not a central part of their lives. This suggests that much of the rhetoric regarding fundamental shifts in children’s world views and in their predispositions to learning and thinking needs to be carefully scrutinised. It is significant that this doctoral study has such scrutiny built into its goals.

### 6.1.2 Games played

Overall, children mentioned more than 60 different games when they were describing their favourite game. No one game, nor type of game, was outstandingly popular. A small number of games were mentioned by several children. These included KID PIX (as discussed earlier, this is not a game), TETRIS and STREET FIGHTER. There were gender and age differences in choices of favourite games. For example, KID PIX and ROGER RABBIT were only mentioned by younger children, TETRIS was only mentioned by older girls and games such as STREET FIGHTER and MORTAL KOMBAT were only mentioned by older boys. Differences also existed in that girls were more likely to name platform\(^{20}\) educational or strategy games and boys, platform, combat and sports games. These differences are similar to those found in a national study by the Australian Broadcasting Authority conducted at the same time as the doctoral study (Cupitt and Stockbridge, 1996).

\(^{20}\) Platform games are defined by the Australian Broadcasting Authority (Cupitt & Stockbridge, 1996, p. 70) as games played in the third person perspective where the player’s objective is to progress to the game’s end in stages or platforms. Examples include SONIC THE HEDGEHOG and THE MARIO BROTHERS.
A further difference, that has not been well documented to date in published research, relates to the types of games, where a different categorisation system is used. This system differentiates games in terms of whether they are borrowed, shared, already installed on the computer, or purchased and installed. This difference assumes an importance because children who play games that are borrowed, shared or bought are likely to be more serious game players who seek out new games. In doing so they are likely to learn about the technical capacity of their machine and become involved in working with the computer’s operating system in order to determine if the system requirements of the game match those of their computer and to install the games onto their system.

While Stage Two of the study was not designed to investigate differences across use of these types of game, Stage Three was able to shed some light. In Stage Three of the study, none of the girls was involved in sharing information and games software with friends, nor were they involved in the purchase of new games. The games that they played either came with the system or were games, purchased by the parents or by other members of the family. The games purchased specifically for the girls tended to be educational games or packages. For these girls, all of whom did play games at least several times a week, game playing was a recreational activity, not a hobby. In contrast, four of the six boys in Stage Three were keen game players who shared or purchased, installed and customised games. In all of these activities the boys regularly worked with the operating system of their computers. Three of the boys became quite involved in game playing. One helped his sister’s boyfriend rig up a local area network within the home to play networked games. Two others joined bulletin boards or searched Internet sites for new ‘free’ games that they could download to the computer. While such findings cannot be generalised they do suggest that this issue needs to be explored in further research.

6.1.3 Why games were favourites

The discussion about why particular games were favourites was significant in that it provided some insights into what attracted children to game playing and
the way children related to the process of playing games. Children in Stages One and Two of the study spoke about why particular games were their favourites.

From their discussion it became obvious that the children’s pleasure was mainly derived from the processes of game playing. Variously, they liked the challenge, the creativity, the unexpectedness, the discovery, the choices, the excitement, the complexity, overcoming the obstacles, ‘beating the baddies’ and, of most significance, winning. Some children spoke about features of a particular game such as the quality of the graphics, the sound effects, the number of levels, the pace of the game (usually referring to faster paced games), the ability to alter it or use cheats. Only a small number spoke about the content of the game: “...cause I like cars, I buy car magazines”; “...got fighting, you can kill people straight away”; “It’s fun to have to build stuff and get little people to go home.”; and “...because you can build your own cities, if you make a mistake you can switch on the disasters.”

It is interesting to note that many of the processes of game playing that children described relate to cognitive performance: challenge, complexity, discovery, choice and creativity. There was concern on the part of some about the degree of challenge: “not too hard”; “not too easy”; and “because it’s really hard.” Overall, the preference for these cognitive processes was not gendered nor related to the community from which the children came. Children of all ages, gender and communities affirmed that pleasure and fun were not associated with ease. They enjoyed facing challenges and meeting complexity. In particular, they enjoyed mastery: “winning”, “beating”, “getting better” and for some “being the best”. These themes of cognitive activity continued in their talk about how they played and learned to play.

6.1.4 Learning and playing games

Children in Stages One and Two of the study talked extensively about how they played and learned to play games. They spoke about how they went about learning to play a new game and how they ‘got better’ at games they played. The results of each of these discussions will be presented in turn below.
When children were learning a new game, a variety of strategies were employed: they asked for help or were shown how to play; they read manuals and help files; they just played and 'fiddled' with the programme working out how to use it; they learnt by watching others playing the game; or they used a combination of these various methods. The percentages of children in Stage Two of the study who reported each of these strategies is presented in Table 6.2. Percentages by community are not shown as there were no systematic differences in the selected strategies. The more systematic differences were found between younger and older children and between boys and girls.

Table 6.2 Percentage of children who employed particular strategies for learning to play games (n=275)

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Girls</th>
<th></th>
<th>Boys</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>younger</td>
<td>older</td>
<td>younger</td>
<td>older</td>
<td></td>
</tr>
<tr>
<td>asking/being told or shown</td>
<td>35</td>
<td>21</td>
<td>24</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>reading from manuals and help files</td>
<td>16</td>
<td>33</td>
<td>18</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>playing, trying it out, fiddling</td>
<td>16</td>
<td>26</td>
<td>32</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>watching others</td>
<td>4</td>
<td>4</td>
<td>13</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>a combination of the above</td>
<td>29</td>
<td>16</td>
<td>13</td>
<td>39</td>
<td>24</td>
</tr>
<tr>
<td>total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6.2 reveals that while all groups of children used a variety of strategies there were clear age and gender differences. Younger girls were more likely to seek help; older girls were more likely to learn through reading manuals, booklets or help files; younger boys were more likely to play and explore while older boys were more likely to use a combination of strategies. Few children learned to play new games by watching others with the most likely group to do this being the younger boys. Possibly it is this group of children who socialise around computer game playing. When the patterns are viewed in terms of a developmental sequence, girls move from mainly asking for or getting help from others to
reading, fiddling or getting help. Generally, boys move from working it out by fiddling to a combination of strategies.

Children who sought help were also asked from whom they sought help. Over 50% of the children said fathers or brothers and about 25% of the children said a combination of family members. The remainder said mothers, sisters, other relatives or friends. There were some clear community differences. In families from more affluent communities the fathers predominated (40%) with a combination of family members (30%) and brothers (17%) being the next common choices. In less affluent families brothers predominated (29%), with fathers (17%), mothers (11%), sisters (9%) and others (8%) being the next common choices. Not surprisingly these patterns closely follow the children’s perceptions of who ‘owns’ the family computers, as reported in Section 5.2.4.2, p. 177. That is, in less affluent communities children play a greater role as ‘owners’, and in this case ‘teachers’.

What is remarkable about these findings is the overall percentage of children who work out how to play a new game for themselves by fiddling and/or reading. The following response seems to best sum up this common approach: "Well, I have to say I just put the disk in, and then just look at it and then just play around, fiddle around with it and then gradually understand how it works, if I can’t, I look up the booklet or ask someone."

When children began describing how they ‘got better’ at games after the initial learning period, the overwhelming majority of children in Stage Two of the study (87%), with equal proportions of boys and girls, reported that they did so through repetitive play. When describing how they ‘got better’ many children spoke about doing it by playing the game over and over again: "Every time you play a game...you always get up a level...you keep on doing it and doing it and you get better because there’s clues and you’ve got to keep them in your head. And at the end you just keep going and start a new one." Some children mentioned how they consciously altered their responses to various situations based on previous outcomes, others spoke about using trial and error approaches. This approach was
also applied to what the children called ‘educational games’. One child described her approach as: “...well playing it more than once ... like going on to different stages and like just say its a mathematical game, like trying a different concept like I did addition last time, I’ll do subtraction this time.”

One of the more important findings from these discussions was that there was little differentiation in the minds of the children between the notions of playing the game for fun/competition and playing to get better at the game. That is, in most children’s conversations, the distinction between performance and practice was blurred: children learnt from playing and played to learn. A small number of older children did report separating out episodes of performing and practising. They described how sometimes they would play not to win but to learn. Particularly in complex strategy games, they would save where they were up to, and they would try a variety of options, returning to the saved position before trying the next option either until they had checked out all options or found one that worked.

It is worthy of note that several characteristics of the games themselves facilitated the blurring of the performance/practice dichotomy and increased the value of the trial and error approach to improvement. These included: the existence of different levels of difficulty; of lives so that users can ‘die’ several times before they are out of the game completely; of cheats where users can ‘break’ into a level or place without having to go through the whole game or level; and the ability to save games and return to particular positions. Combined with the graphical and sound feedback about the quality of the decisions or moves users make, these characteristics create ‘an affordance’. This affordance is equally shaped by the characteristics of the game environments and the conceptions children develop through their own game-playing behaviours. The outcome is that children conceive of the computer as an environment where the combination of exploratory learning and learning by doing works well. Given that the majority of children in Stages One and Two of the study reported that their first computing experiences were within a game-playing environment this affordance may be significant as it might well become a dominant conception of the computer.
For some children this affordance applies equally to the beginning stages of learning to use a game as well as to the later stages of improving performance. For younger boys whose dominant strategy is ‘fiddling around’, and for older boys whose strategies have become more eclectic, this affordance is dominant. For younger girls whose dominant strategy is ‘asking’ and for older girls whose dominant strategy is ‘reading about’, a form of ‘asking the text’, this affordance is not so strongly perceived for the initial stages of learning. This difference in perception of affordance may inhibit some girls from developing the same degree of confidence in tackling new situations at the computer as others do.

The other strategies, particularly used by younger children when learning to play a new game, also generated important features of the total learning environment. For many children these included easy access to just in time help/advice/teaching and an environment characterised by mentoring and modelling which comes with the opportunities for spectatorship and apprenticeship within the family. This latter characteristic was mainly available to children who had older brothers and sisters and was mainly used by younger boys. One feature of this total learning environment was particularly important for girls. Help, advice, mentoring and modelling was generally available within the family context. This reinforced the domestic culture around computer game playing that facilitated their own game-playing activity.

A further important feature of this learning environment was that electronic game playing was a learning environment where the children were setting their own goals and were in control of their own learning strategies. In general adults were not seen as ‘resident’ experts in either the skill/knowledge domain of the game, in the processes of playing the game or in the processes of learning/improving game performance. Parents did not have a stake in the quality of their children’s performances possibly because they only ‘allowed’ rather than ‘encouraged’ children to play games. Generally they only contributed to the teaching and learning when asked to do so and usually this was only at the early stages, when a child, particularly a younger child, was learning a new game. This provided for
many children the ‘space’ to develop their own expertise using their own approaches.

Some children spoke more generally about playing with parents, or competing against parents, but except for the very young, the language used to describe this involvement suggested they participated or competed as equals. Some children, usually boys, spoke about being the resident expert for particular games and how they helped their parents and others how to play.

6.1.5 Learning from game playing

From the above account it is obvious that another affordance, namely the computer as an environment for learning by doing and exploratory learning, emerges from the children’s activity of playing games. Hence, the ‘toy’ affordance interacts with children’s patterns of use to create a new affordance. Furthermore, the activity of game playing seems to offer children other opportunities or learnings not readily found in other types of leisure and informal learning environments. The following discussion begins with the children’s own views about what they learn from playing games then moves on to explore some other possibilities.

The children in Stages One and Two were asked to comment on what they learnt from playing games. Most children believed that there were benefits from using both games and the computer more generally. In Stage Two of the study about 70% of the children responded that they did learn a variety of things from playing games. The remainder were not convinced that they had learnt anything: “I haven’t learnt much from playing games but there are some games that you can learn from [child names a desktop publishing package].”

The children who believed that they had learnt from game playing reported that they learned a number of skills and strategies either specifically related to that game or to game playing in general. Some believed they improved their general computing skills and knowledge. More interestingly, some children reported that they learned a range of ‘real world’ skills from the simulated environments.
within the games. Examples of these included physical skills such as driving cars, skiing, playing golf, playing soccer, controlling aircraft, shooting missiles, how to use guns, and other more strategic skills such as handling money, building cities and playing real card games. A small number of children reported that they learnt how to solve problems, to develop thinking skills, to have patience and to develop perseverance, memory and imagination. Some of the children’s comments were: "how to use computers"; "to do some things sometimes to kill the baddies"; "that if you practise it will get easier"; "With driving games, if you have good graphics it can show you how to drive a car."; and "...how to play better and compete against sister and mum in games."

In Stage Three of the study the parents too agreed that children learn from playing games. Mostly their responses related to children learning more about the computer through their game playing. This included both low level skills such as operating the mouse and higher level skills such as installing software and switching between operating systems, for example between Windows and DOS. More often than not these higher level skills were developed by boys, through necessity, in the sense that part of the game-playing culture of male game enthusiasts was the sharing of games software and the purchase of new software. As mentioned previously in Section 6.1.2 p 197, shared and bought games needed to be loaded or installed. This provided the motivation and opportunity for some boys to ‘fiddle’ with the software or the operating system to get the game working. Girls did not share in these opportunities as overall, the types of games they were attracted to were usually already installed on the computer.

While the technical skills and abilities that readily come to the minds of both children and parents seem logical, those relating to ‘real world skills’ seem less so. There also appears to be a logical case for the claim that the children are developing a range of cognitive skills, given the sheer number of decisions children make as they weave their way through various games. In particular, within games, children are operating within specific types of environments. These are governed by rules, often involve breaking codes, and many are fast paced. Playing these games involves constant concentration visually, aurally and
mindfully (as one child explained: "You have to keep so much in your head"). It is within these environments that children succeed at learning through learning by doing and by exploratory learning.

These modes of learning by doing and by exploratory learning, while well accepted as natural and appropriate for young children’s informal learning, are rarely accepted in the older child’s world, especially in environments governed by rules and in ‘educational settings’. Game playing provides one environment where children can continue to develop these processes into middle childhood, within an environment where they are in control and where feedback is readily provided so that learning can be built through performance. While the overall significance of this opportunity is still open to question, particularly given the relatively small amount of leisure time that children actually devote to game playing, it is reasonable to suggest that the approach to game playing may alter children’s predisposition to learning and performing in similar environments and thus create new affordances of the computer. This suggestion will be explored further in the following sections which look at how children use the computer for other types of activities.

6.2 Other activities

As well as playing games, the children in this study engaged in a wide range of other computer-based tasks. The common tasks were drawing, writing, doing school-related work and making things such as cards, posters, and banners. More exotic or uncommon tasks included manipulating sound and images, communicating by email, designing and making newsletters and stationery, searching the Internet for information related to leisure pursuits or for software to download, and listening to music through the computer’s CD system while using the computer. Table 6.3 presents the full list of tasks identified by the children in all stages of the study.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Creating texts</th>
<th>Using texts</th>
<th>Communicating</th>
<th>Using technical processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks*</td>
<td>composing</td>
<td>locating</td>
<td>phoning</td>
<td>booting the computer</td>
</tr>
<tr>
<td></td>
<td>writing</td>
<td>browsing</td>
<td>emailing</td>
<td>shutting down the computer</td>
</tr>
<tr>
<td></td>
<td>editing writing</td>
<td>searching</td>
<td>chatting in chat room</td>
<td>running software</td>
</tr>
<tr>
<td></td>
<td>decorating</td>
<td>viewing</td>
<td>chatting one to one</td>
<td>loading files</td>
</tr>
<tr>
<td></td>
<td>writing</td>
<td>listening</td>
<td>role playing</td>
<td>saving files</td>
</tr>
<tr>
<td></td>
<td>constructing</td>
<td>and/or reading</td>
<td>joining an interest group</td>
<td>printing files</td>
</tr>
<tr>
<td></td>
<td>images</td>
<td>using</td>
<td>searching for people with particular characteristics</td>
<td>managing files</td>
</tr>
<tr>
<td></td>
<td>manipulating</td>
<td>organising</td>
<td>sending greeting cards etc</td>
<td>customising software</td>
</tr>
<tr>
<td></td>
<td>images</td>
<td></td>
<td></td>
<td>fixing problems</td>
</tr>
<tr>
<td></td>
<td>designing</td>
<td></td>
<td></td>
<td>recording sounds</td>
</tr>
<tr>
<td></td>
<td>texts with</td>
<td></td>
<td></td>
<td>scanning/ digitising images</td>
</tr>
<tr>
<td></td>
<td>words and</td>
<td></td>
<td></td>
<td>dialling and connecting to network service</td>
</tr>
<tr>
<td></td>
<td>images</td>
<td></td>
<td></td>
<td>downloading from network</td>
</tr>
<tr>
<td></td>
<td>making texts</td>
<td></td>
<td></td>
<td>altering desktop features</td>
</tr>
<tr>
<td></td>
<td>with words and</td>
<td></td>
<td></td>
<td>installing software</td>
</tr>
<tr>
<td></td>
<td>images</td>
<td></td>
<td></td>
<td>altering system configuration</td>
</tr>
<tr>
<td></td>
<td>creating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sounds</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>manipulating</td>
<td></td>
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<tr>
<td></td>
<td>sounds</td>
<td></td>
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<tr>
<td></td>
<td>integrating</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>writing, images</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>and/or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sounds</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* black print represents common tasks, grey represents exotic tasks.

The tasks have been grouped into four categories. The labels for the first two categories have been drawn from terms provided by the children in their discussions: they spoke about “writing and making things”; and “looking things up”. The labels for these two categories are ‘creating texts’ and ‘using texts’. The term ‘text’ is used here in the generic sense of cultural artefact or in the children’s words “things”. It includes written, aural (music, sounds, speech), visual (clip art, photographs, animation, video, 3D images) and multimedia artefacts.

The third category, communicating, contains all tasks related to communicating with others through networked services. It does not restrict, though, the tasks based on the type of service. It can include direct point to point connections.
through the telephone network, access to local bulletin boards, email and other Internet services. It includes mainly exotic tasks, and as such these tasks were not commonly spoken about by the children.

The fourth category, using technical processes, contains those technical tasks which underpin all of the other tasks. At the simplest level the category included those tasks that children took so much for granted that they did not talk about them. Examples were turning the computer on and running the software. The category also included exotic tasks that were undertaken by interested and technically competent children, for example: altering the system configuration of the operating system.

This detailed table of tasks provides for the first time within Australia a full and complete picture of a group of children’s uses of the home computer. This is a significant contribution of the doctoral study. It clearly identifies and distinguishes the non-game-playing tasks with which children engage when using a computer in their home. While there have been major studies, both in Australia and overseas (Anacarrow, 1986; Apple Computer Australia Pty Ltd, 1996; Australian Bureau of Statistics, 1994; Australian Bureau of Statistics, 1996; Cupitt and Stockbridge, 1996; Times Mirror Centre for the People and the Press, 1994) which have looked at children’s use, the categories those studies used were crude and ill defined, the main reason being that most of these studies applied adult categories to the children’s use. For example, in the ABS studies (Australian Bureau of Statistics, 1994; Australian Bureau of Statistics, 1996) the categories included: games, educational, study, home-business, own business, employment, record keeping, email, Internet, Online, and other.

One exception was the Australian Broadcasting Authority study (Cupitt and Stockbridge, 1996). Their categories for non-game-playing uses were: typing; finding information using a CD-ROM; drawing; using the Internet and Bulletin Boards; and others. This system of categorisation is problematic because of the myriad of tasks that cannot be easily placed in one of these categories and in terms of the actual labels it uses. The classification system provided in Table 6.3,
recognises the technical tasks with which children engage, and features the nature of the task rather than the software or networking environment within which the task is undertaken.

The tasks in Table 6.3 performed two distinct functions. Some were leisure activities generated by the child for their own or others' pleasure. The remainder were work-related activities. For the purposes of this study work-related activities were defined as activities which involve tasks defined by others or tasks with a serious purpose. These included activities related to school, community, business, or family. While school-related activities were by far the most common work-related activities, there were two children who engaged in community- and business-related activities. These children created a newsletter for a local community club and designed a letter-head for a family business. The following paragraphs provide a detailed analysis of children's non-game-playing tasks and activities and their purposes.

Results from Stage One and Two of the study revealed clear age differences in the nature and type of activities undertaken. The youngest children, aged 5-8 yrs, were only in Stage One of the study. Their activities were mainly creating texts and included common tasks such as composing, editing and decorating writing, constructing and manipulating images, designing and constructing artefacts such as cards and signs, and printing. Few of these children volunteered much detail about their activities. Of those who did volunteer descriptions, many used the terms 'play' and 'game' in their descriptions whether they were describing the use of common tool software or programmes specifically designed for early childhood that have 'play' or 'game' contexts embedded within the software: "I can play PAINTBRUSH and print my favourite pictures."; and "I print out my fairy games. I can print every game what's on the computer. I have to print it by myself. And sometimes I know how to send it out. And if I make mistakes I just rub it out and do it again. You get the soap and then you click on it and move it and where you made the mistake, you click on it again and it rubs out." The descriptions revealed that generally these children were engaged in playful leisure activities. They were in control of the purpose and processes of the activity and
the processes were as pleasurable as the outcomes. For example, some of the children spoke about the best part being the rubbing out of a ‘picture’ they had just spent time and energy creating. Others spoke about just doing things to see what happens.

Only a small number of children spoke about using the computer for purposeful leisure activities such as making party invitations or writing letters to someone. These types of activities differ from playful activities in that there is a goal or intended outcome. In these activities children are still in control but the outcome is as important or more important than the pleasurable process. These descriptions of their leisure activities, both playful and purposeful, suggest that the affordance of the computer as an exploratory-learning environment and a learning-by-doing environment applied beyond game playing.

Children in the middle years of primary school from Stages One and Two also engaged in creating-text activities. The difference lay in the range of texts created. They mentioned more frequently making texts such as stories, diaries, invitations, banners, posters, cards and abstract images. They also began to refer to homework activities in their descriptions of what they did. Some gave detailed descriptions of how they did their spelling or tables, while others only volunteered the term ‘homework’: “…like I do my spelling. Look, cover, write, check. I look at the word, then I cover it, then I write it on the computer and then I look to see if it’s right and if it’s not I go right back and rub it out.” Many also mentioned using-text activities as part of their homework. These activities included ‘looking up’ information or ‘finding things out’ but without specific references to particular electronic texts or software, for example, encyclopedias. The language of ‘play’ still pervaded some children’s descriptions of what they did. What was notable was that this age group increased their range of purposeful leisure activities and began using the computer for work-related activities, and that these activities were in the main, initiated by the school. The range of technical tasks also continued to expand with most children engaging in a wide
range of tasks including booting and shutting down the computer, loading and saving files.

Children in the final years of primary school from Stages One and Two made many more references to work-related activities: homework or school work. These activities included both creating-text and using-text activities. Again the range of texts was greater than that of the younger children. These older children spoke about doing projects and assignments, writing essays, book reviews, poetry, stories and speeches and doing research; making notes; answering questions; getting pictures; using the calculator for maths; practising times tables; making newspapers; finding the meanings of words; writing; and learning spelling lists. Among the technical tasks the range expanded to included all of the common tasks listed in Table 6.3.

Fewer of these older children mentioned constructing or manipulating images as leisure-related activities. They mainly constructed and manipulated images for title pages and illustrations within projects. A small number of girls did refer to designing things: "Sometimes I just sit at the computer and I like designing my own flags, like the Aboriginal flag and doing different sorts of backgrounds". Another girl spoke of SIM CITY in terms of liking design: "I like going into a thing called SIM CITY. I like designing things like that. You build your own cities..., and you go into a thing called evaluation and it tells you how many people the city has. And it tells you the thing that's happening like it might be pollution". It was also within this age group that children began to mention using texts in the Internet environment and undertaking a range of more exotic text-creating, text-using and technical tasks. It is notable that exotic tasks were rare, even among older children from more affluent backgrounds. Where they did occur they were closely linked to parental expertise and encouragement, and the availability of resources such as the Internet.

A number of points of interest arose from these older students' more elaborate responses to their uses. The first was that a small number of older children were still using 'play' and 'game' terminology in their descriptions of use: "I like
playing KID PIX and MAGIC SCHOOL BUS."; and "There's games like ENCARTA". The second was the continuing shift away from playful to purposeful leisure activities and to work-related activities. Importantly, there was evidence that during the processes of purposeful activity, there were episodes of playful activity in order to work out or fix up some aspect of the process or product. For example, a child when describing a writing task for school spoke at length about how she discovered the Word Art function and experimented with it before choosing a design for the title of her work. Other children spoke of 'fiddling with' and learning about various features of the word processor as they completed projects for school. Also, when children reported how they designed cards and banners for particular purposes, they often spoke about how they 'fiddled' with the 'look' until they 'got it right'. The third point was that the vast majority of children took part in a quite limited range of leisure and work-related activities. These common tasks were: writing (composing, editing and decorating texts); manipulating images; and locating, browsing, searching and using multimedia texts within CD-ROM environments.

In Stage Two of the study, where the sample of children only included Grades 3-6, the nature and processes of these common uses were explored in greater detail. The purpose of this exploration was to more fully understand if and how leisure and work-related activities differed and whether the affordance of exploratory play and learning by doing were also perceived within the context of these common activities.

6.2.1 Creating written texts

Over 90% of the children used the computer for composing, editing and decorating texts. Those who did not were more likely to be boys in the younger grades or children without printers. About 66% of the children created written texts on the computer both for school-related purposes as well as for leisure. Many of the children reported that they created texts for a variety of purposes and audiences. Texts included stories, letters, party invitations, signs, poems, songs, cards, jokes, memos, messages, lists, captions, diaries, journals and
recipes. A small number of children reported that they copied passages from books.

In these activities, the children clearly differentiated between leisure and work-related activities. Work-related activities involved tasks such as homework, school projects or assignments and finishing work begun at school. Leisure activities involved mainly purposeful activities. For example, children used the computer to write stories and poems that were revisited from time to time, and to write letters and email messages to friends. The only systematic difference found was related to gender and writing stories, with girls being the predominant story writers. Few if any activities described could be categorised as playful, that is, writing activities where the processes of writing were explored rather than used for a particular outcome.

The children were asked to describe the last piece of writing they had done on the computer. Children varied in how they responded to this question. Some described what they wrote, others retold the processes they used and some a mixture of both. Typical comments included: “...about a bush walk...wrote straight on the computer, did title page, headings and pictures by hand”; “...just thought it up, typed it in, used MSWord, used spell check, did heading and underlined it, saved on disk, and printed it at uncle’s place”; and “...invitation for sleepover, also a fiction story about a monster typed onto the computer, did heading and used different fonts.”

The children’s descriptions of their writing highlighted a number of important points. Firstly, different children had different processes for writing with the computer. Some children composed and edited at the screen, others only transcribed an almost finished text from paper on to the computer for the publishing process. Some children used different processes when they were writing for work rather than leisure. A child explained: “Depends if it’s for fun I write straight on the computer. If it’s for school then I want it to be perfect, so I write on paper first.” Secondly, while many children expressed preference for word processing rather than writing with a pen because of ease of editing, they
rarely if ever took their editing beyond the correction of simple errors and misspellings. Few, if any, worked to improve the meaning of the texts through moving ideas around or undertaking major rewriting, additions or deletions. Thirdly, in clear contrast to the above, most children referred to how improving the ‘look’ of their texts was an integral part of the writing process.

While the ‘look’ of the text has always been important in school-related written work, it seemed even more central to these children’s writing activities and appeared to become a central feature through the interaction of children’s use and key features of the software. By using WYSIWYG\(^{21}\) word processors, children could see the direct results of formatting commands. Such a feature allowed children to explore or fiddle with a variety of ‘looks’ both during and after the composing and editing processes. They achieved this through trying out different borders, font types, colours and sizes to improve the design and layout of the text. This fiddling with the look became such an integral part of the writing process that most children when describing their writing process made reference to it: “I just typed it in and then fixed it up and put in headings with different fonts and sizes.”; “I typed it up, spell checked, changed fonts and printed.”; “I wrote on paper first, then typed on to the computer, fixed it up, did title page, heading, different fonts and sizes and then printed it.”; “I wrote a project for Sunday School...put border, changed letters(fonts) typed it and printed it.”; “I went into it, clicked, started typing, changed style of heading and writing”; “...did writing at school, took it home and typed it out, typed in other stuff - then changed the font to running writing, changed size, put a border and printed it.”; and “I wrote the story down, Dad edited it, then I typed it onto the computer, did heading, border and changed letters [fonts].” As can be seen from these comments, fiddling with texts also included “fixing it up.” Generally this referred to fixing obvious typographical errors, identifiable punctuation omissions or errors or

\(^{21}\) WYSIWYG (What You See Is What You Get) word processors allow the user to see an exact replica on the screen of what will be printed on paper. In one sense they are a relatively new invention. Until late 1980s they were not common in homes with Dos based machines.
incorrect spellings. About 10% of children specifically referred to spell checking their writing as part of the ‘fixing up’ process.

These descriptions, and the practices behind them, are consistent with children’s talk about why they prefer word processors to handwriting. This talk was discussed in Section 5.2.1.3, p. 152. These children associated word processors with making it easy to fix mistakes and to make their writing look good. In this sense word processors afforded these activities for the children as they provided the tools and opportunities for children to undertake these activities.

When the children described how they learnt to use a word processor, those who learnt at home described the same processes as those described for playing games. Initially, a variety of strategies were used but afterwards the repetitive use coupled with fiddling became the main learning strategy. It is not difficult to understand how, under these circumstances, children end up focusing on the ‘look’ of the text. The visual feedback when fiddling with the ‘look’ of the text is obvious and immediate. There is little if any feedback when trying to improve the meaning of text or even fixing up simple errors. Thus, children’s approaches to learning, together with the features of the software environment created a dominant affordance, namely, word processors are for improving the ‘look’ of texts.

With regard to ‘fixing up’ errors, a small number of children mentioned that mum or dad “checked it”, “helped fix it up”, “checked the spelling” or “edited it”. In these cases the parents were providing the feedback. Those children who did use a spelling checker also had access to ‘visual feedback’, in the sense that the computer identified words that were not in the standard dictionary. This feature of word processors thus supported the learning of spelling through a learning by doing approach. However, within the scope of this study it was difficult to say whether the type of feedback given was sufficient for children of this age. Some recent developments in word processors where the children can hear the word spoken, may improve the quality of feedback such that this truly
becomes an affordance for these young children, many of whom are emerging spellers.

6.2.2 Creating and using visual texts

Constructing and manipulating images were other common activities for the children within the study. Over 85% of the children in Stage Two indicated that they used the drawing and graphics programmes for constructing and manipulating images. When children spoke of how they learned to use such programmes, the dominant strategy was learning by doing and exploratory learning. Again, this affordance was supported by the fact that, as children fiddled and explored, there was visual feedback in terms of the outcomes of their actions.

The text-creating and text-using tasks included both leisure and work-related activities. Unlike the written text activities, these leisure activities were sometimes playful and at other times purposeful. The former refers to experimenting/playing within painting and drawing programmes and the latter to one of three activities: creating artefacts such as cards, banners, signs, posters and invitations; drawing pictures; or designing things such as flags, dresses, houses and cities. Some examples of children’s descriptions include: “...mostly for fun, sometimes I design party invitations and things”; “...patterns, experiment on different things, make cards for people going away”; “…designing things like cities... mixing things up together”; “I draw pictures on KID PLX - just play around with it. Don’t print or save anything”; “I muck around doing pictures - print them if they’re any good”; and “…don’t print them out, just play on it to draw. Use mouse to choose colours, sizes, use spray”.

Many children, when describing their playful drawing activities, emphasised that they constructed patterns and pictures ‘just for fun’. Some children spoke of this type of environment as one where they could do ‘silly’ things or where they could ‘go crazy’. A ten year old child explained: “Well... you just draw something really weird or something.... you can put it somewhere or change it or
leave things...you can jumble it up or something and if you don't like it you can rub it all out.” When talking about their playful activities many children commented that they did not ever save or print out their work. For example, one child said: “I use Paintbrush to practise drawing. Don’t print it ......use the rubber to take it off the screen." Other children sometimes saved and sometimes printed.

Purposeful leisure activities mostly ended with the printing process. Generally they involved making cards, banners, posters, party invitations that were to be used, or creating pictures and designs. Within the context of the purpose of the task, children seemed to adopt a playful approach to the making process, in the sense that ‘fiddling’ to get the right ‘look’ was more common than executing a prepared plan. Again, this suggests that exploratory play is central to purposeful tasks when a learning by doing approach is used.

Many children also illustrated or decorated school-related texts. Again within these purposeful work-related tasks there were periods of playful activity as children fiddled with borders, backgrounds, fonts, clip art or photographic images. Working with images generally involved ‘cutting’ and ‘pasting’ or inserting ready made pictures into their document. It was rare for children to use self-constructed images. There was an overwhelming reliance on clip art and images downloaded from CD-ROM encyclopedias or the Internet. Often clip art and pictures were used even when inappropriate for the text. In fact, the children who spoke about using clip art in projects did not seem to worry about the appropriateness of the image. For example, one child explained how she used a clip-art image of an Australian colonial woman to represent Christopher Columbus’s wife. In many ways these illustrations were more about decorating than adding meaning to the overall text. Clip art images were rarely manipulated or altered to change the nature of the image. They were, however, sometimes ‘played with’ when they did not ‘look right’. A number of children spoke about ‘fiddling’ with size or orientation of an illustration so that it fitted within the desired page layout. Again, as in the writing environment, the children were not using the power of the computer to improve the content or message of the text.
(visual or written), but rather, to improve the ‘look’ of the text. In both cases, it is almost as if one of the affordances of the computer, ‘exploratory learning’ interacts with the dominance of the visual feedback provided by software such as word processors and drawing programmes to focus children’s attention on the obvious, on the visual, on the form rather than the content. While this same focusing works well in improving game playing, in effect, it distracts children from the ‘main game’ of writing and creating images, which is to communicate meaning.

6.2.3 Using texts

Another standard activity for many children was the use of texts to locate and use information. Such activity, however, was restricted to those who had appropriate software, CD-ROM drives, access to bulletin boards or access to the Internet. In Stage Two of the study about 55% of children reported that they used the computer for looking up information in the context of work-related activity. There were some differences related to age and community. Younger children from more affluent communities (about 65%) were much more likely than their counterparts from less affluent communities (about 35%) to use the computer to look up information. However, these differences almost disappeared between the older children (63% and 58% respectively).

Locating and using information was mainly a work-related activity. Only a small number of children browsed and searched for information for leisure. Leisure activities were both playful and purposeful. The playful activities involved browsing through CD-ROM-based collections of information or ‘surfing’ the Internet. For example, one child explained: “Well we’ve got this atlas. And I like going into that and you pick your countries. And you bring it up and they show you the flag and you can play the anthem.” Children’s purposeful leisure activities included searching CD-ROM-based collections or the Internet for information related to hobbies and interests, and looking up bulletin boards or searching the Internet for tips and cheats associated with particular games or downloadable software.
Children’s work-related activities were usually prompted by homework or project-work. In Stage Two each child was asked to describe the last project they undertook using the computer at home. The older children’s elaborate answers revealed much about how they located, browsed, searched and used information. Generally children used a search strategy that involved matching exact words such as ‘whales’, ‘tigers’ or ‘Christopher Columbus’ if this approach did not work they tried other words or browsed until they found other clues about where to look. This strategy applied both to CD-ROM sources and Internet sources. Again this approach suggests that even within the purposeful task, the children ‘fiddled’ until they found what they wanted. In this case it often involved using a browsing technique along with a ‘word search’ approach. Both of these techniques are well suited to an ‘exploratory’ approach, particularly if the user does not have a familiarity with the knowledge domain they are investigating.

Children also spoke about what they did when they found the information. Very few children just cut and pasted the texts and presented some or all of it as their own. Two children who did so explained: “...on Humpback whales - went into ENCARTA and typed in whales and it took you to all the whales. Looked up humpback whales gave me all the info, printed it and wrote it out by hand.”; and “I printed out the information. Read it. Cut it up with scissors because some of the information is too hard to understand. Pasted it onto cardboard.”

Most children went through elaborate processes which involved reading, deciding which ‘bits’ to use, and rewriting the text in their own or the original words. Some examples of the children’s descriptions are: “I get information from the CD-ROM and print it and then put it in my own words.”; “First I go to Encarta, print out the information, read it, put it into my own words, shorten it from 6 pages to 3 pages, type it into different paragraphs, print it out”; “I print the information off ENCARTA. Underline the bits which are important and type

22 Most CD-ROM based encyclopedias provide a number of different search strategies for users. These include a subject-based hierarchical menu driven system, a keyword system and a word search system. The first two require some familiarity with the domain of knowledge being searched and some prior systematic and strategic thinking about a searching plan.
them up”; “...printed the information from GROLIERS and changed it into my own words. Typed it back again”. A very small number of children followed a similar process without printing to paper: “I go to the encyclopaedia, cut information from the encyclopaedia and paste it into WORD. I change, add, delete and try to put it in my own words”.

When children spoke about how they learned to and did use these collections, similar patterns to those with games, word processors and drawing packages emerged. Initially they were shown, or they found out on their own through reading or fiddling with the software, after that they worked it out for themselves through repeated use and exploration. Hence the affordance of learning by doing and exploratory learning also applied within this context. There was, however, one exception to this independent approach. Many of the younger children and some of the older children who used the Internet did so with supervision and guidance or did so by asking others to use it for them. In the former case, children were able to both ‘surf’ and search the Internet. In the latter case children were only searching for specific information or sites. This special case of the Internet was more likely to be associated with issues of cost and safe use than with differences in affordances.

Overall, children’s locating and using texts revealed similar patterns to creating written and visual texts for both work and leisure-related activities. Exploratory learning, learning by doing and ‘fiddling’ all played a major role in both playful or purposeful tasks. Unlike when creating texts, however, the computer did not offer any special affordances that distracted children from attending to the content of the material they located. It is interesting to note that note taking, underlining and writing in own words to make sense of the information were often manual tasks. Only a very small number of children seemed to bypass the making sense stage and simply used the found electronic text as their own.
6.2.4 Exotic activities

As mentioned above, a small number of children pursued a range of exotic tasks. These were mainly from families with more sophisticated equipment and/or who had family members with particular expertise or interests. In Stage Three of the study about half of the 13 children undertook a range of exotic leisure activities. On the following pages two snapshots of these children and their activities are presented. These snapshots will help illustrate the following discussion.

David is ten years old and comes from an affluent family. He is the expert in the family. Initially his interests and expertise were game playing, but over time this broadened to include using bulletin boards and email and now the Internet. His expertise has been developed mainly through his own explorations and repetitive use. His father explained: "... he just sort of picked it up himself, we're not a particularly computer literate family... we couldn't give him any great help along the way apart from just the very basics." David initiated the family's purchase of a modem. His father pointed out that he has developed such confidence that he now phones, faxes or contacts through the Internet, other experts and technical support services when he has problems. The computing teacher at David's school has supported and encouraged his interests. His parents are proud of his expertise and also encourage his interests.

David is a keen user of the Internet and he is allowed to use the Internet and access bulletin boards unsupervised. His playful activities include surfing the Internet investigating sites of interest. These have included the Jim Carey and James Bond sites. He regularly downloads information. He uses email to talk to friends and to his teacher. He has set up his own home page on the World Wide Web. He learned how to do this by 'fiddling' with the appropriate software, downloading instructions and helpful hints from the Internet and seeking technical support when needed. Recently he has been experimenting with music and sounds using relatively sophisticated software. He records sounds, changes the speeds, cuts out bits and changes bits of conversations or songs. One of his purposeful leisure activities is to search the Internet collecting viruses. Using a virus production kit, which he downloaded from the Internet, he tries to create his own harmless viruses so he can play tricks on his computer-using friends.

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23 All names are pseudonyms
David’s work-related activities are the common writing and looking up information activities. His father said (and David confirmed): “... and now he virtually puts everything on the computer for school... he’ll never handwrite a story.” While he is a technical master of the word processor, he still gets help occasionally from his parents with the actual writing. He occasionally looks up information for school on the Internet. Recently when searching for information on Antarctica he became quite frustrated because even with 250,000 hits, none of the information was exactly what he wanted so he ended up using a book!

Like David, Carine has a strong personal interest and a ‘flair’ for computing. Her strengths, like David’s, are in the ability to pick things up quickly just by fiddling but the focus of her interests is entirely different.

Carine is 11 years old and comes from an affluent family all of whom are regular users of the computer. While she often is taught by her brother or father how to do new technical processes such as how to use the scanner, she is considered the adventurous one in the family with the computer. Both parents are astounded about how quickly she learns and discovers new things by herself. Her mother says she spends a lot of time exploring: “She sees the icons on the top and click, click, clickety, click... all the time she spends and just finds out amazing things”. Her father stated: “... she just does it, finds things out that she can do and just does them.”

Carine focuses on writing, publishing and communicating tasks. Game playing is not a major use. Most of her leisure activities are purposeful. She publishes a weekly newsletter for the flying club to which the family belong using Microsoft Publisher’s pre-set newspaper format and then adding scanned images and photographs. She enjoys writing and was putting together a collection of 5 or 6 short stories using a visit to the Southern Highlands for inspiration. She writes regularly to two key-pals which she found on the Internet and enjoys spending ‘hours’ in a variety of chat rooms talking to who ever comes along.
Her playful activities include experimenting with sound recordings - cats' meowing, saying hello and singing choir songs. She changes the speeds and edits the sounds. She also enjoys browsing the Internet. When her family were planning a trip to New York, she discovered sites which displayed images of the streets of New York taken from cameras on street corners. Connected with this trip, she tutored her mother to use the Internet to make advance bookings for seats at the Metropolitan Opera.

Carine uses the computer extensively for school work, and does all of her writing using the word processor. She employs her desktop publishing skills and the ability to insert images and scanned photographs to good effect. While she has excellent searching skills for the CD-based encyclopedias and Internet, she always includes books among her sources. Reading books is one of her passions.

Among the other four students who engaged in exotic activities three were boys who had become very interested in the technical side of computing. Two of these boys, who had access to the Internet, regularly downloaded tools, utilities and enhancements to improve the performance of their computer. One of these had designed a home page on the World Wide Web. The other designed and created a new letterhead for his father's small business. Both of these boys had within family support and encouragement. The third boy, from a less affluent community had much in-family encouragement, but his support came from a knowledgable teacher at school. His home computer had come with a modem, but the family could not afford Internet access. He pursued his interests by using the computer as a 'phone' to make direct voice and data connections with a friend and to locate 'free' bulletin boards.

The fourth child was a girl, Kris, who had also developed excellent computing skills. She shared her enthusiasm with her father who encouraged and actively supported her use through shared computing activities and much teaching. At the time of the study the family had over 100 CD titles, many of which were either educational or libraries of clip art and images. She spent much time exploring and using these CDs. She and her father explored the Internet together, locating interesting sites and chat rooms that she was allowed to use independently at later
times. She had a number of key-pals who she kept in contact with over the Internet. She rarely played non-educational games.

Interestingly, David and these other children did not engage in any exotic tasks for work-related purposes. Carine did, in the sense that she scanned in images into her writing tasks. However, all of her work-related activities, including this one, fell within the bounds of writing, manipulating graphics and images to decorate and illustrate texts and of looking up and using information in projects and assignments. As such her work-related activities fell within the range of common activities. While all of these children may have had access to more resources and more support, and had a greater general skill and interest base, their work-related activities were still confined to the common activities. Their exotic activities were leisure-based. A possible reason for this may lie in the fact that the school is the source of definition of what children do and do not do as work-related tasks, and school activities are still firmly embedded within a paper-based environment. This issue will be discussed further in Chapter 7.

These six children plus David and Carine also illustrate and support a number of important findings from Stages One and Two of the study. Firstly, all of these children used the same strategies to learn about and to improve the way they used the software or computing equipment as well as to improve the processes they were undertaking, for example, designing and publishing newsletters or stationery. Kris was an exception in the sense that much of her learning was guided by her father as they used the computer together. However, when working independently, she still displayed the ability to discover and work things out for herself. Thus for each child in Stage Three, the computer afforded both learning by doing and exploratory learning. This exploratory learning or ‘playful use’ was often embedded within purposeful activity. In some ways these children’s personal success at computing could be partially attributed to the ease and success with which they used the approaches afforded by the computer in both their playful and purposeful activities.
There were, however, some subtle differences in the outcomes of these affordances and the children’s approaches to learning and using the computer. In the case of these children each of the boys began their successful interactions with computers through a strong interest in game playing. As younger game players their dominant approach was learning by doing and exploratory play. This approach along with their keen interest in game playing led to a mastery of the technical side of computing such as working with various operating systems and understanding the memory and speed capacity of the computer. Such mastery allowed them to install, copy and use a variety of games software which was purchased for them or shared with them.

The girls also developed significant expertise with computers, but generally the mastery was more confined to operating within software, albeit a wide variety of software. They did not develop the same degree of technical expertise as the boys nor was it developed in the same way. More often they were initially shown how to use or manage technical processes and new hardware. While they could improve their own skills at using/doing these technical processes through their learning by doing approach, they lacked some of the contextual knowledge which came about through the exploratory play associated with the early stages of learning.

There are two other sources of data about the variations in levels of expertise between boys and girls that resulted from different approaches to computing. These were the nature of the descriptions of children from Stage Two in regard to the type of computer they had in their home and to their responses to difficulties or problems when using the computer. Each of these will be discussed in turn below

6.2.5 Children’s talk

Children in both Stages One and Two were asked to describe the computer equipment in their home. The analysis of Stage One data clearly indicated a difference across ages while Stage Two revealed further differences by gender and community.
As might be expected, younger children gave shorter and simpler answers and older children more elaborate ones involving more technical terms. Typical responses from younger children were: “My computer has treehouse... there is some paintings and cars and bears too. You can play anything else.”; “My computer’s called Windows.”; “My computer at home is big and heavy and a bit grey.”; and “It’s a [Brand], its very easy to use, its has lots of things that came with it, it runs most games, and has a lot of megabytes.” Older children, mainly 10-12yr olds, described the capabilities of the machine, the software on it and the purposes for which it is used. Typical comments were: “It’s an old [Brand] model, no Windows, but has DOS, its useful. It has WORD PERFECT, drawing programme, new PRINT SHOP and games, golf, chess, bridge, patience.”; “[Brand], 486, 33 Mhz, 16 bit sound card and superVGA colour monitor”; “[Brand], use it for assignments. Got information and clip art - can transfer it by cutting and pasting.”; and “It’s an IBM compatible, I do word processing, play games on weekends, its got MS WORD, EXCEL, VENTURA PUBLISHER, and COREL DRAW.”

Overall, 53% of the children in Stage Two of the study chiefly described their computer in terms of what tasks they could do on it combined with what software it had. The remainder of the children (47%) described the computer mainly in terms of its type, processing and memory capacities and/or attached devices, for example, joystick, modem, colour printer or sound blaster card. About 15% of the children described the computer solely in this way.

The pattern generally held across age, gender and community with only slight differences between age groups and gender. Younger children and girls were slightly more likely to describe their computer in terms of use and software. One group that deviated significantly from this pattern was older boys from more affluent communities. They were much more likely to define their computer in terms of technical capacity and features (66%). Common in their talk were features significant to particular types of game playing. These include the graphics capability of the screen and the absence or presence of a sound card. For
example: "Mine is a 386DX2. We don’t have a sound blaster. Just the one hard drive and a monitor."; "IBM, VGA, mouse, CD-ROM, sound cards"; and "386 IBM compatible 8 bit sound card, SVGA colour."

Of the children who defined their computer in terms of its software or the tasks they could undertake 65% included references to both games and other tasks, with 20% only mentioning games and 15% only non-games. There were some age, gender and community differences: older children (72%) were more likely to report both than younger children (57%) and children from more affluent communities (69%) were also more likely to report both than less affluent communities (60%). While the percentage of girls and boys recording both was more similar (62% and 67%), girls were much more likely to report non-games only and boys games only. Overall, younger boys from less affluent communities are most likely to report games only while girls, both younger and older, from more affluent communities are most likely to report non-games only.

Two important points arise out of these findings. The first reaffirms the existence of a dual toy/tool affordance for most children. The second further reinforces the emerging picture of a complex relationship between age, gender and community in terms of the contexts of computing, and now also in terms of the uses and conceptions which lead to refined affordances. For some boys in less affluent communities, the dual affordance becomes stronger as they grow older and grow out of a games-only pattern of use, while for some girls in more affluent communities the dual affordance becomes less so, as there is a shift towards a non-games-only pattern of use.

6.2.6 Handling difficulties and problems

In Stage Two of the study, the children were asked whether they could fix the computer when something goes wrong. No attempt was made to define a particular problem, but rather, to ascertain a level for confidence or familiarity with the range of problems that face computer users. A number of the children however, attempted to clarify the nature of the problem. Typical comments were: "Depends - if a big mistake ask my dad but usually fix it myself"; "Depends - if a
minor problem I can, if its a disk I can delete things, but if its a big malfunction I call dad."; "Sometimes - if frozen then I just turn it off and it start again, if a problem which it is not often I ring my uncle."; "Depends - games - yes, other things - usually dad fixes it."; "Depends - if major problems call dad but I can fix small problems."; "If it's not with the tower, if its with another part I can fix it."; and "It depends. If it's just dirt on the disk, just blow it out. Otherwise no, if it's something serious." The remainder of children tended to answer with a bald yes or no.

Overall, 40% of the children said "no", 34% said "sometimes, depends if... or mostly" and 26% said "yes". If the latter two categories are combined then it could be said that 60% of the children reported that they could handle at least some of the problems encountered. Generally boys (63%) were slightly more positive than girls (56%) and children from more affluent communities (63%) slightly more positive than those from less affluent communities (56%).

The analysis of interactions of age, gender and community also revealed unexpected and complex patterns. Among the younger children, girls from less affluent communities (48%) were the least positive compared to their counterparts. The variation among their counterparts was minor, with girls from more affluent communities reporting 62%, boys from more affluent communities 69% and boys from less affluent communities 67%. These relatively high results would explain the general pattern of a higher positive result among younger children. With older children there were major differences between each group. Older boys from less affluent communities (49%) were the least positive, their counterparts from more affluent communities (69%) the most positive. Again, curiously, girls from the less affluent communities (61%) were more positive than their counterparts in more affluent communities (53%).

One clear pattern emerges from these results, boys from more affluent homes remain consistently the most confident group when it comes to fixing problems. As members of families from more affluent communities they are in homes where expertise exists, adult male expertise dominates and the family regularly
purchases software. This finding further strengthens the differentiation in the outcomes of the affordances and patterns of use.

More obscure are the reasons for the rise and decline of percentages from younger to older children in each of the other three groups. Percentages for girls from less affluent communities rose, while they declined for boys from less affluent communities and girls from more affluent communities. Further analysis would require a greater understanding of the nature of the problems the children were thinking about when answering these questions and the contexts within which they faced problems in their homes and the interaction between these and children’s differing levels of interest. Unfortunately the structured interviews in Stage Two of the study did not provide any further information. The detailed accounts of the 13 children in Stage Three of the study also did not cast any further light on these patterns.

6.3 A framework of uses

In each of the preceding sections a number of characteristics emerged which helped define the nature and variety of children’s uses of computers in the home. The descriptions provide for the first time in Australia a detailed picture of the full range of one group of children’s uses of the home computer. In an attempt to understand more fully the relationship between the socio-cultural contexts, the affordances and children’s uses a framework of the uses is presented in Figure 6.1. It illustrates the relationship between the types, purposes and outcomes of children’s activities.

In this framework, there are two types of outcomes: playful and purposeful. These are differentiated through the relative importance placed on a pleasurable process or a quality outcome. The final classification, namely purpose, also had two categories, leisure-related and work-related. These purposes are differentiated through the relative dominance of the source of the task. Leisure activities are generated by the child for the pleasure of the child. Work-related
activities are generated by agents outside the child. In general these are school-related, but could also be related to business, community or family.

![Diagram of children's uses]

**Figure 6.1 A framework of children’s uses**

Within this framework, game-playing tasks by definition are leisure activities which are generally playful. At times, however they can be purposeful, in the sense that a child, who is competing against the computer or others, may place more store on ‘winning’ than on enjoying the playing process. Tasks belonging to three categories, namely creating texts, using texts and communicating can be either playful or purposeful, and can be either related to leisure or work. It is worthy of note that in this study there were no children who engaged in communication tasks for work-related purposes. This is considered an artefact of the historical timing of the study. It is conceivable that in the future even children of this age will be communicating from home with other people through networked services for school-related purposes.

Technical process tasks are generally purposeful and work-related, but work-related in a less common sense of the word. The source of motivation is the intended task. The need to undertake technical tasks such as turning on, booting the computer or running the software is generated by the intended task. There are
times, however, that technical tasks can be both playful and leisure related. An example might be when a child seeks to fiddle with a variety of settings in order to change the look or functionality of the desktop. Two of the boys in Stage Three of the study mentioned downloading different images to use as desktop 'wallpaper'. Another child in Stage One of the study spoke about fiddling with the volume and sounds associated with particular keyboard actions.

This framework serves two main purposes. Firstly, it provides a detailed map of children's uses. Secondly, it provides a way of classifying children’s uses which encapsulates the two key affordances of the computer namely, the toy and tool affordances. This is reflected in the leisure/work dichotomy. The learning-by-doing and exploratory-play affordances which are shaped by the children's own patterns of use are encapsulated in the dichotomy of purposeful and playful uses.

Children in all stages of the study had clear views about the difference between leisure-related and work-related activities, in terms of who initiated the task. The notion of work and leisure truly represented a dichotomy to the children. In one child's words: "Well... mostly I do what I want on the computer... but sometimes I have to do work." Their attention to these distinctions created some important outcomes. For example:

- Different processes were common when writing for work rather than leisure. The common pattern was that leisure-related writing was solely a screen-based activity, except for printing. Typically, writing for work-related purposes, mainly school work, involved some paper-based processes. These included composing on paper then transposing to screen, or composing on screen then printing out for editing. A nine year old child explained: "Depends if it's for fun I write straight on the computer. If it's for school then I want it to be perfect, so I write on paper first."

- Many children, when describing their playful drawing activity, emphasised the 'just for fun' aspect and generally used self-constructed images or highly modified ones. This was the environment where they could do 'silly' things or
where they could ‘go crazy’ with others’ images. Often the products of their play were not saved or printed, simply erased when complete. On the other hand, work-related art relied solely on others’ images such as clip art and images downloaded from CD-ROM encyclopedias. Rarely were self-constructed images used or existing images ‘played’ with, even when they were not quite appropriate for the context.

- Electronic sources of information were also the object of work and leisure. Many older children regularly used their CD-ROM-based encyclopedia for school work. Tasks involved searching for and locating information relevant to a set topic. Once found, children either printed out the information, from which they made notes and constructed reports or projects using their own words or they cut and pasted all or some of the text directly into a word-processor document. The outcome of the process was always a printed document. In contrast to this the small number of children who browsed and searched for information as part of their leisure time worked within a screen-based environment. They read and viewed on screen or listened through the speakers to the information they found, rarely did they printout the information.

6.4 ‘Playing the computer’

Children had less clear views about the differences between playful and purposeful use. In fact, rather than speaking in terms of a dichotomy, their talk implied that is was more like a continuum, where the boundaries were blurred. This was particularly so in the cases where children who were engaged in purposeful tasks engaged in episodes of playful activity during the process of completing one of these tasks. This ability to shift backwards and forwards from one to the other as needed, basically allowed them to complete purposeful tasks through playful means. Figure 6.2 presents this in graphical form.
Figure 6.2 Pathways to playful behaviour through purposeful tasks

Comments from the children throughout the study, such as: "I can play Paintbrush.", "I played typing stories.", and "I played Encarta." powerfully illustrate this. In some ways this use of the word ‘play’ is also akin to the meaning of the word play when it is used in the context of ‘playing a musical instrument’. Children, through skilful use of the features of the computer environment, were able to perform and enjoy the performance.

Other components which contributed to this ‘blurring’ stem from the enjoyment most children experience when using the computer and the sense of control they have as they do so. Both components are strong components of ‘play’ in the traditional sense of the word. In Stage Three of the study children were asked about differences in play, work and learning. The children used the word play to cover a variety of processes and activities. When specifically talking about playing on the computer, even outside of game playing, they referred to the fun or pleasure associated with the use, their control over how they used the software and the features within the software, the interactive nature that facilitated exploratory use and the challenge associated with achieving their goals. One parent from Stage Three of the study, who constantly used the computer in a professional capacity, also commented on the link between pleasure and play: “Sometimes I enjoy what I’m doing so much that it might as well be play.”

While it needs to be recognised that there are many definitions of the word play, and that the term can be used to describe many different processes and activities, its abundant use in the language of the children points to the way that, at least in
the minds of children, aspects of computer use afford the user the same sense of enjoyment, of control and of exploratory activity which is similar to that found in more traditional play activities.

For most children this affordance comes through their early experiences as electronic game players and extends through to their experiences with creating and using texts in the context of both leisure and work. In this way both sets of affordances, foregrounded in the framework, interact with children’s use of the computer in ways that further refine children’s conceptions of computer-related activity. Through this process a super-ordinate affordance best described through children’s common utterance: “I played the computer.” is created: that is, the computer is playable.
Chapter 7. The school computing environment

In Chapter 7 the focus shifts from the home to the school. The chapter begins with the views, interests and expertise of the teachers who help shape the physical, the socio-cultural and the pedagogical context of children’s school computing.

The second part of the chapter deals with children’s reports about what they do with computers at school, how often they use them, and their views of ‘school computing’. These reports are analysed in ways that highlight the similarity and differences between home and school.

The chapter ends with a summary of the differences between home and school computing.

While the primary goal of the doctoral study is to make a contribution to the knowledge about and understanding of the reciprocal relationship between the child and the computer within the socio-cultural context of the home, its secondary goal is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools. Because of the secondary goal of the study, it is important to examine the school as a site where knowledge about computers and computing is gained. This chapter focuses on the examination of the school as a site in the same way that Chapters 5 and 6 focused on the home, although in a much briefer way.
The results in this chapter are drawn from a variety of sources of data about school computing. These included data from children in all stages of the study. In Stage One children discussed when and how they used computers at school. Their descriptions highlighted two important findings. Firstly, some children do not use computers at school, and secondly, there are similarities and differences in how those children, who do use school computers, actually use them. There were differences not only between home and school but also between and within schools. In Stage Two, both of these findings were explored more systematically. In Stage Three the twelve children spoke in detail about the differences in their home and school experiences. Data was also collected about the schools from a number of other sources: through observations and discussions with teachers during the time spent within the schools collecting data in Stages One, Two and Three of the study; and through the formal interviews with teachers in Stage Three of the study.

These multiple sources of data allowed for continual cross checking of responses. In general, there was strong consistency across all sources of data, especially between teachers and children. From all these sources there arose a greater understanding of how schools’ organisational structures, resources and policies combined with teacher beliefs, expertise and interests to strongly influence children’s experiences of school computing.

There were dramatic variations in the resources, structures and approaches to school computing across all schools within the study, 3 in Stage One and 11\footnote{As explained in Section 4.5.2 p. 125, there were 11 schools in Stage Two of the study.} in Stage Two. Types and numbers of computers varied across the schools, as did their configuration. Three schools had computer rooms or laboratories and the rest had computers in classrooms, laptop computers or a combination of the above. In all schools the primary focus of computing was across-curriculum use, however, two of the schools supplemented this with well-defined systematic instruction in computer use. In two schools there were specialist computing
teachers; in three others, there were identified computing support teachers with varying degrees of expertise, interest and release time. In the remainder, there were no identifiable personnel with special responsibilities. In these schools the responsibility rested solely with the classroom teacher. Later in this chapter, part of Table 7.3, p.256, details the differences in how schools manage the organisation and responsibility for computing. These differences and their impact on children’s school computing will be a recurring theme throughout this chapter.

Some results relating to computing and schooling have already been discussed in Chapter 5, where the parents’ and children’s discourses surrounding home computing were analysed. The important finding in relation to school computing was that parents and children believed that an important purpose for school computing was to provide access to and skill development for children, particularly for those children who did not have a computer in their home. Further, they believed that while these skills were essential for the child’s well-being in the future, they were important for schooling but not essential in the sense that reading, writing and mathematics are seen as essential for schooling. Furthermore, both parents and children believed that home computing was advantageous for school performance. In fact, 74% of the children in Stage Two of the study reported that they believed that they did better at school because they had a computer at home.

Presented below is a range of results that focus on school computing. In order to more finely contextualise schools’ computing, it is important to turn first to the teachers who worked with the children and portray their experiences, skills, attitudes and views. Later in the chapter, the children’s views on a range of emergent issues related to school computing are reported.

7.1 Teachers’ views about computing at home and at school

In Stage Three of the study eleven teachers, four male and seven female, were interviewed. These teachers were selected because they were the classroom
teachers of the children in Stage Three of the study. Table 4.6, p.133, presented a summary of the child / parent / teacher triads in Stage Three and the schools from which they came. Because of the way the children were selected there were a pair of teachers from each of four schools, and three teachers each from a different school.

These teachers were interviewed about a range of issues to do with their own computing activities at home and at school. These included questions about: their home usage; their own usage at school; the way they used computers with children in their classrooms; issues related to using computers in their school; their views about the role of computing in schools; and the changing nature of children and schooling. Appendix H details the key questions.

The teachers who were interviewed fell into two groups: identified computing specialists and classroom teachers. The range of expertise and experiences varied enormously among the teachers, as did their beliefs and commitment to computing in schools. Teachers were considered computing specialists if they were specifically employed for that purpose or they had been given particular responsibilities within the school for computing. Three of the teachers from Stage Three of the study were considered to be computing specialists. The remainder of the teachers were considered classroom teachers.

The computing specialists were one female teacher and two male teachers. The female teacher was specifically employed within her school, an independent girls junior school, to be the computing teacher. One of the male teachers, from an independent boys junior school, had originally been employed as a computing teacher, but had recently returned to the role of classroom teacher, when funds were no longer available for a specialist. This transition occurred between Stages Two and Three of the study. The second male teacher was the deputy principal of a primary school that drew on a less affluent community. As part of his leadership role in the school he undertook a wide range of formal and informal support and resource tasks related to computing. It is worthy of note that a number of other schools in the study also had teachers who would be considered
computing specialists within their schools. These teachers, however, did not take part in Stage Three of the study as they were not identified as teachers of the children in that stage of the study.

The three computing specialists had significant expertise and experiences. Each had had access to computers in their homes for ten or more years. They had undertaken a variety of courses in aspects of computing over the years, and had themselves led professional development activities for other teachers in schools. One of the three, had also been a regional educational computing adviser who worked across many schools in a leadership and professional development role. These teachers shared a clear vision for computing within their schools and had expertise and comfort with computers in a wide variety of situations.

Eight teachers in the study, six female and two male teachers, were classroom teachers with varying degrees of expertise, commitment and interest in using computers in their classrooms in a range of teaching and learning activities. Almost all of these teachers had a computer in their home, or had access to a laptop computer at school that they could take home in the evenings. Some of these teachers had had computers in their homes for more than five years. Most of these teachers were very comfortable with the notion that the computer was useful in helping them record, document and communicate through letters, newsletters and notices.

Only two of these teachers, both female, expressed strong personal confidence and competence in their own computing skills; the remainder of the teachers were tentative or negative. The two confident teachers used a wide variety of applications for their own professional use. The four tentative teachers used computers for a range of tasks but spoke about the need to improve their skills. Two actually mentioned that their own children helped them use the computer at home. Two male teachers expressed negative attitudes to personal and classroom computing. One rarely used the computer, and when he needed some work typed up, he asked his son to do it for him. The other also rarely used a computer. He reported that his spouse was, in fact, a computer coordinator in another primary
school and had great expertise but that at home computers were rarely mentioned because of his negative attitude.

The eight teachers had mixed views about the resources and support within their schools. Some reported that their school had a reasonable amount of equipment, distributed and organised in ways that suited their approach to teaching and learning. In general, these teachers were happy with their own practices with computers in their classrooms. Another teacher, who was happy with the amount of equipment in the school, identified poor classroom dynamics, created by a number of identified ‘trouble makers’ in his class, as the main reason why there were few if any computing activities taking place in his classroom. The remaining teachers were critical of the lack of equipment in their school, of the way access to the computers in their schools was organised, and the lack of support and professional development opportunities in their schools. Generally, these teachers saw these factors as reasons why they did not participate in computing in ways that they felt they should. Often teachers from the same schools had very different levels of expertise, commitment, interest and use of computers within their classrooms for teaching and learning as well as different views about the school’s organisation and level of resources. This might suggest that other factors as well as school organisation and patterns of responsibility were related to the personal responses of the teachers themselves.

One factor that did emerge as strongly related to the commitment to and use of computers in primary schools was personal beliefs. Overall, the teachers’ belief systems were consistent with the discourses found in the home. Computers were about ‘the future’ and about ‘productivity tools’. The notion that computing skills are essential for the future was common to all teachers. They expressed these beliefs, with comments such as “I mean, life is computers ... and it helps them when they leave school”; and “They’re learning to use a tool that they are going to need as adults, they’re going to need as teenagers, they’re going to need as students in general.”
Only one teacher, a specialist teacher, had a vision of the role of computers in primary school that went beyond teaching computing skills for the future, or using the computer as a productivity tool. He spoke about two distinct aspects of computing. The first related to motivation: "Whether its a throw back to video games that enthral kids as well ... but there's some magical power that attracts kids to computers. It motivates them unbelievably. So you can take advantage of that motivation and turn it round to a learning experience." The second related to using the computer to allow children to do things that they could never do before: "Mum might not take them out of the suburb, but when they come into the school complex, they can be anywhere in the world at any time ... the world's coming into their classroom ... talking to schools in Russia ..., kids in North Carolina, ... how often do they get to talk to a scientist, do some data collection for the scientist and feed it back to him and know how the results compare to other places around the world... you're giving them other opportunities that they would never get before."

For the remaining teachers whose dominant views related to 'for the future' and 'as productivity tools' there were tensions between the demands of the future and the demands of the present. Only five teachers, the three specialists and two classroom teachers, saw that using the computer as a productivity tool was essential in primary schools, and that computing was central to the curriculum, albeit in ways different to reading, writing and arithmetic. The remaining six teachers viewed computing as important but not as essential as other areas of the primary school curriculum. The difference between these two groups of teachers stemmed from the different conceptions of the computer. The former saw the computer as an essential tool for primary school children along with all the other essential tools and resources needed for primary school learning, for example books and pens and pencils. The latter group saw the computer more as a useful but not essential tool, at least in the primary years. In the minds of two of these teachers primary school was not the time to learn about computing 'for the future'. Each of them spoke about the secondary school as being a better time for the development of such skills. One teacher emphasised how much quicker the
students would pick it up later on: “If by 13 or 14 they can be learning typing and learn skills so quickly...that all the time in the world spent at this age, I think is wasted.” The other teacher pointed to the fact that the local high school had the proper equipment and teachers to do the job properly.

Other teachers in this group spoke about competing priorities in the primary school, with computing not being a high priority. One teacher explained: “When it comes to maths and reading and writing they’re so important because in the sixth grade, I mean in any grade it’s important but as a sixth grade we’re sending these kids to high school which is going to be their livelihood for the next 6 years...and I mean they go to high school, they’re told to read and you know make their own notes and so ... comfortably clear conscience about the fact that the kids who you’re sending to high school ... you have to prioritise here and if computers are not the main priority then it’s going to be shelved until such time...”. Another teacher also argued that in terms of priorities in the primary school, computing was not among the highest, and that of computing activities, only word processing was really important: “I think they should teach them basic word processing...but I wonder the benefit of other things...by the time the children get a chance to use the other stuff... I don’t think we should spend a lot of time actually getting them to do it [learning to make graphs using the computer] because time’s so precious in primary school to be honest, I mean its precious in all schools but in primary schools it’s very precious. I actually believe more in reading, writing and arithmetic than worrying about drawing a graph on the computer.”

This type of thinking led a number of these teachers to regard computing almost as an optional part of the primary school curriculum. In some of these classrooms, only children with an interest used the computers. One teacher explained: “It’s more the kids who ask for a turn, some kids never had much of a go ... and I definitely don’t make kids who aren’t interested get involved.” Two teachers spoke of interested teachers doing great things but other teachers achieving little. In making this point one of the teachers, who had no interest at all, likened it to sport: “I don’t really see it as being important ... You can’t force
people into being the super keen ones. The teacher's got to be to one who's really interested to do that. You can't make teachers take kids to sport and show an interest if they're not interested in it themselves and... computers are exactly the same thing. You can give the teacher the sport or activity but if they're not interested in it, its not going to achieve very much."

While this comment reflects as much on teacher professionalism, as it does on beliefs about computers and computing, it is consistent with parental views in terms of the positioning of computing within the primary curriculum. It mirrors parents' belief that the place of computing in the curriculum is among the peripheral subjects that support the child's well being. It is not among the essentials such as reading, writing and arithmetic. It is also consistent with the dominant view of parents that computer use for primary-aged children is only advantageous for the present, even though essential for the future.

Whether essential or only useful, another conception, the conception of the computer as a productivity tool, also posed difficulties for many of the teachers. This particularly came through when the teachers spoke about writing and computers. As found above, analysing teachers' beliefs about the role of computers in writing tells us as much as about their approach to writing and the pedagogies of writing as it does about their beliefs about computing.

When the teachers were talking about word processing and children they spoke, about the tension between the advantages and disadvantages of word processing, in the same way that parents did. The advantages of word processing were linked, as they were in the home, to 'easier' and 'better'. The disadvantages were linked to lost skills, lost motivation and willingness to 'labour'.

Four of the teachers seemed quite concerned about the too frequent use of word processors, mainly for reasons associated with the importance of handwriting: "We still see handwriting as a very important skill that they need to develop, so a lot of their classwork they're still expected to use handwriting"; and "There have been a couple who are atrocious writers and the only way they're going to
improve is if they write, so I say to them every now and then, ‘this work cannot be done on a computer, you must hand it in your own handwriting’.” A third teacher made a curious link between children’s ability and the dangers of word processing: “Some of their eagerness to write diminishes even if they’re fairly computer literate, for the average ones, right. For the bright kids its a different ball game. ... won’t instantly carry over from the computer to the handwritten. If you think that the handwritten is the prerequisite for this age that’s why I get very wary about the computer being used so strongly because when they are a bit older - fine, they can use the computer all they want because they’ve already got a good grounding in having alternates. At this age, unless they’re really bright I think it’s dangerous. I don’t mind them using it for extra things but I would be very worried about school where the kids do heaps and heaps on a computer.”

The fourth teacher did not mention handwriting, but rather, had concerns about the change in the process when writing with a word processor. She argued that when working with a word processor you could get your ideas down in any order, then work them into a coherent piece of writing. She compared this to the need to plan and structure writing in your head before committing pen to paper, particularly in an exam situation: “You’ve got to know how to plan it first and then actually write it, in its proper order ... you’re sort of stuck with what you’ve written, you don’t have time to go back and re-write.”

The remaining seven teachers were relatively positive about the role of computers in writing activities in their classroom. Two teachers actually argued that word processing was an essential skill for their children. One even went as far as arguing that the amount of time spent teaching kids to handwrite was a waste, particularly for those children for whom handwriting will always be a barrier to good writing. The other argued that for primary school: “One laptop between two children is really becoming essential.”

When these seven teachers were enthusing about the computers, they were mostly commenting on the role of computers in the publishing process. Only one teacher mentioned children composing at the screen, and a few mentioned editing at the screen. The teacher who mentioned composing at the screen argued that
one of the greatest benefits of word processing came when two or more children (he spoke of three being the ideal number for younger children, and two for older children) gathered around the computer to cooperatively compose a text. He argued that by working in groups, children bounced ideas off each other in an informal way, thus changing composing from a solitary to a social process.

The teachers who mentioned editing at the screen mainly spoke of children who composed on paper and took their drafts or ‘rough copy’ to the computer for editing and publishing. Some teachers mentioned that in some cases a lot of the editing was done before it was typed into the computer for publishing: “They do a lot of their editing normally before they type it in and then it’s sort of just the final glitz on it that they do on the computer.” Other teachers encouraged children to edit at the screen because of the ease of doing so: “It’s really good for editing ... they don’t have to rewrite and rewrite and rewrite when they’re drafting ... when it’s on the screen you can just say that’s wrong go back and change it and I think it makes it easier for them to handle because ... when it comes to correcting and rewriting and publishing it kind of turns them off.”

Three teachers spoke about the impact of screen-based work on conferencing. One spoke of the ease of on-screen conferencing, mentioning that she thought that children could read their work and find their mistakes more easily when it was on the screen. The remaining two had some organisational difficulties. One explained that because of the rotation system needed to allow children to access the one computer in the classroom, the timing of on-screen conferencing often clashed with other main stream teaching activities, and that when this happened the conferencing opportunity was lost, or the text was printed and kept ready for conferencing at a more convenient time. Another spoke of having no time to conference in class, so she took the files home and edited them, returning the edited files to the children the next day.

Publishing existing drafts on the computer was more common than editing. It also appeared to be a more manageable process for the teachers. Computer-based publishing seemed to have two distinct functions. One was to produce a variety
of formats. These included books, booklets, oversize books, posters and charts as well as the standard A4 page. The other was to improve the 'look' of the work.

All of the teachers agreed that the process of writing on a word processor had little or no impact on the quality of the children's writing, in terms of the ideas expressed, the way they were expressed or the amount of writing completed. They saw the benefit solely in terms of the quality of the presentation, the neatness, the professional look and the readability of the type-written text as opposed to a hand-written text. This is similar to the children's and parents' conceptions about the use of the word processor in the home: word processing is about making the final version of the text look better.

Two teachers commented that the focus on presentation is not new in primary schools, nor confined to writing with computers. They argued that there has always been an emphasis on neat and presentable work, particularly with reports and projects where there have been separate marks for presentation as well as for content. One also commented that taking time to present work neatly and decoratively has always been a part of most primary girls' approach to writing. She speculated that computers were now making it easier for boys to also focus on presentation. Another teacher shared this view in the sense that she felt the computer helped less artistic writers: "But I think computers are good for children too that aren't, well, like myself and my children, we're not naturally artistic, ..... you can be neat with a computer and it looks good, even if you haven't got lots of fancy pictures, whereas most children's handwritten assignments seem to rely a lot on pretty pictures." A third teacher spoke about the need to help children make judgements about the use of appropriate pictures: "They really enjoy adding graphics to their work and it's actually quite difficult at the beginning of the year to get them to only include appropriate graphics, they'll include anything they can find as long as it looks nice. So that's a bit of a tussle that we usually have, saying to them, you know, like if there's not an appropriate graphic then you're better to leave it without a graphic."
A final issue to do with presentation of written work came from a teacher who was concerned with maintaining a balance between personal effort and the ease with which the computer can achieve quality presentations. Again, the concern was linked to the age of the children: "At this age, where the computer can be a short track to doing it, sure it looks nice but in a lot of instances it comes very easily just knowing what buttons to press, which programme to load and it's a very very lazy way, not, well lazy is not a very good word to use, not really lazy, it's a short cut method. And for some kids I think it's dangerous because then the only way they can do it is by using the computer programme whereas you should be able to do it, be proud of something you can do yourself as well as knowing how to do the short track method. I mark down projects that are purely all computerised. I like to see them have a combination. Sure they can have the printout and all the written stuff typed out but then I like to see borders and things like that - that are not just a programme. Because the parents have very simply bought the programme, pressed the button and it's there."

In some ways this teacher has raised a slightly different issue to that raised in the handwriting versus word processing dilemma. There, the problem stemmed more from the concern that children will lose or not develop the necessary skill of handwriting, or lose interest in doing so because word processing is 'easier'. Here the teacher's concerns focus on the value of a product which can be created with little effort. This concern is in stark contrast to the notion put by two of the teachers, above, that such ease provides some children, boys and less artistic children in particular, with a new pathway to presentable work.

This contrast highlights further tensions surrounding the use of the computer as a productivity tool with children. These tensions, however, are not restricted to writing and computers. The same tension is played out in the area of using electronic sources of information as opposed to traditional sources. The three specialist teachers, who were experienced Internet users, had thought deeply about the role and impact of technologies such as the Internet and each of them spoke about some of the dilemmas it created for teachers and children.
They all believed that the Internet was a valuable tool and source of information to which all primary children should have access. When talking about its use in education they mentioned that it could be used to "improve general knowledge", "teach information skills", "provide access to more timely resources" and "broaden experiences". One of the specialists, who used the Internet within the school and the classroom, also regularly published information about the Internet and some useful sites in the school's newsletter. He viewed the Internet mainly as an excellent source of information, but expressed some concerns about the extra skills children will need to be able to sift through large quantities of information for relevance and accuracy "On the Net there is so much garbage ... you forget that it's been put on by anyone and quite often by kids". He also felt that teaching the children to synthesise the useful information that they had found remained a major challenge for teachers. Furthermore, he expressed concerns about over reliance on the Internet as a single source of information, even in his own research "I'm finding the Net's making me lazy, because all you do is... use a search engine to go and find something for me whereas before I would have gone and looked in books in the library and things like that...now I get it to do it for me ... and quite often if I don't find it on the net I think 'oh well its not there, its not worthwhile finding ...". One of the classroom teachers also spoke of this problem with the children: "But they do, they come in and they say, 'I couldn't find any information Miss'. 'Where did you look?' 'I looked on the computer'. I said, 'well, is that the only place you can look?' They look at you as if to say, 'oh, there are others?' I said, 'well, yes, there were other places before the computer came along'." This particular issue raises similar concerns to those the parents raised. They believed that the ease of looking up electronic sources of information facilitated the loss of motivation or interest in using the older technologies which require more effort.

The second computing specialist who also saw lots of potential in the Internet for accessing information, identified the dilemma of balancing exploratory time (play) and productive time when using the Internet: "They could just sit and wait off and do things...find interesting things...get off on a tangent...I do it myself... I
think you have to be flexible.” She recognised through her own use, that
electronic information systems afforded playful use, which at times could distract
users from set tasks. In fact, of all the teachers in the study she was the only
teacher who had reflected on the role of ‘playing the computer’ during class time.
She readily used the term ‘play’ and encouraged the girls in her school to ‘play’
with the computers: “And I find the kids will browse um, something like Groliers,
they’ll come in here and they’ll say, well they use the word ‘play’, I don’t think
there’s anything wrong with them saying play because I’ve had little third grades
say, ‘can I play on Groliers?’ I say, ‘that’s fine’. But to me, play indicates
something I want to do, I’m happy doing it, and ... Yes, yes, and I mean, isn’t that
a plus that they think of work as play? Go to school, oh, what did you do today?
We played on the computers, you know. And they do use that term and I’m guilty
of........ it, ‘right, today we’re going to play, let’s play typing’, you know.”

She also saw value in their playful approach, suggesting that these children, in
fact, have a different way of approaching learning: “And that’s what I think the
kids like. I have some very good CD-ROMs from CSIRO on the rainforest, ... and
sixth grade are doing something on the rainforest and um, little thirds will say,
‘Oh, can I try that, can I play that one?’ And then I’ll show them how to sort of,
go through the rainforest and, so they are learning and they’re discovering and
they’ll often come and say, ‘I’ve just discovered this, this’ - factual stuff that,
when I was a school kid I don’t think I would have, you know, I wouldn’t have
had the same. I think they’ve got a different approach to learning. They’re
curious, they want to know more. The fact that it comes sometimes in video form,
it’s actually moving and doing and the sound effects, especially in the rain-forest,
are very good. I think their general knowledge by the time they leave the junior
school is going to be ten times better than mine at the same age.” She was
always conscious, however, of maintaining a balance between playful and
purposeful uses of the computer, and being prepared to step in and direct
children’s use if she thought that such intervention was necessary.

The third teacher used the Internet as part of integrated curriculum projects such
as Newsdays and the National Geographic projects which involve children
collecting information and sharing it with children in other places around the world. As mentioned above, he valued most the breaking down of the walls of the classroom and the community. For the children in his care, this was a significant outcome. In contrast, the computing specialist from a more affluent boys school linked this facility with general concerns about childhood. "They take a lot of things for granted... like talking to people at NASA and the South Pole... they don't seem to have as much fun... they get bored... there are no mountains to climb any more...." To some extent this contrast is similar to that posed by the teachers who felt that the computer opened up the world of 'presentable' writing to particular groups of children, because of its ease, while another teacher was concerned that the 'ease' diminished the value of the process and product.

These notions of ease and boredom were also raised by other teachers who spoke about the changing nature of childhood. In their discussions about these changes some or all of the following ideas were combined by the teachers: children do not spend as much time outdoors as they used to; children do not use their imagination as much as they used to; too much of their leisure time is focused on small screen activities, television, computer, video games machines; and children now expect to be entertained rather than find their own entertainment. Some examples of the teacher's comments included: "They don't use their imagination..."; "They don't entertain themselves"; "They don't know how to play, They don't know how to keep themselves occupied"; "It's [the computer] also stopping them from getting out and playing..."; "It's very screen oriented... very indoorish"; "They're not spending as much time outdoors..."; and "I don't think they know how to play... because they haven't been out back in the playground or out in the street hitting a cricket ball or a tennis ball or skipping or something like that...".

In each of these comments the teachers were comparing today's children unfavourably with past generations. As one teacher commented: "... that's what we are losing. And that's where I think you know, the backward movement, we are moving back...". In the minds of many of these teachers, using the computer,
particularly for games, was tied up in this sense of loss of ‘a real childhood’ where the dominant image is children playing imaginative games outdoors. One teacher even linked this demise to non-game-playing computer-based leisure activity: “I’ve got some boys in there and their parents say to me, we lock the computer because they just sit there and they go through what’s on the computer, a lot of the information, on Encarta, ..., and they just go through ... reading that just for the fun. One mother had to stop one of them using the Internet because it was costing too much and he was just looking up information on different things, things that he was interested in. But it’s also stopping them from getting out and playing and I think that’s a bit of a loss because some of them spend far too much time just sitting in front of the computer. I think there are other skills that they need as well.” In this way, at least for some teachers, the computer takes on a symbolic meaning, as a technology, like television, which seduces children away from an ideal childhood. While many authors might argue that the relationship between the changing nature of childhood is much more complex and related to a wide range of social and economic as well as technological changes (Ishagaki, 1986; Meyrowitz, 1985; Mayall, 1994b; and Qvortrup et al., 1994), several of these teachers and, in fact, several parents, turned the computer into the symbolic culprit.

Through this linking of the computer with the loss of necessary skills and also with the loss of the ‘ideal childhood’ the computer ends up with two distinct symbolic functions in the minds of several teachers in this study. The first is as a productivity tool, which needs to be mastered at some stage of schooling, to provide children a key to the future. The second is as the ‘playable’ and ‘easy’ computer, which distracts children from the wholesome ‘real play’ of the past, and from the ‘real work’ of the primary classroom. For these teachers, these two conceptions are in opposition to each other and create an ambivalence towards children’s use of computers both in the classroom and in the home. This contrasts dramatically with the views of some of the other teachers, and of the children who see the ‘playable’ and ‘easy’ computer as the essential productivity tool.
The results presented in this section highlight the problems that develop when teachers are expected to integrate computers into their daily classroom activities in the absence of strong, clear and understandable guidelines. Without a strong rationale and mandated curricula it is reasonable for teachers to rely on their own world views and approaches. The teachers in this study demonstrated two different world views. One where computing was an essential ingredient of primary schooling and one where it was not.

Given that both these views exist within environments where there are differences in resources, organisation and approaches to responsibility and leadership within school, it is not surprising that children in all stages of the study reported mixed experiences of school computing. These experiences are described in the following sections.

7.2 Children’s computer activities

At times, the data provided by the children is tabulated and quantified so that possible trends or patterns may be discerned. These trends and patterns have been identified, not so much to clinically define the nature of computing in schools, but to raise issues and questions about computing in schools that can be further explored in the final chapter of the thesis where the implications of home computing on education and schooling, in particular, are presented.

Of the 275 children in Stage Two of the study, 94% reported that they used computers at school. While there were no gender differences in the percentage of children reporting that they did so, there were differences across age groups (96% older, 91% younger) and types of community (97% more affluent, 91% less affluent). Underlying these general differences were major differences between the schools. Table 7.1 presents the data for each of the nine school communities.
Table 7.1 Children who used computers in their schools by age and school

<table>
<thead>
<tr>
<th>Schools</th>
<th>Younger</th>
<th>Older</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>more affluent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1g &amp; 1b</td>
<td>100%(^a) (N=16)</td>
<td>100%(^a) (N=16)</td>
<td>100% (N=32)</td>
</tr>
<tr>
<td>2</td>
<td>94% (N=16)</td>
<td>100% (N=16)</td>
<td>97% (N=32)</td>
</tr>
<tr>
<td>6</td>
<td>81% (N=16)</td>
<td>100% (N=16)</td>
<td>91% (N=32)</td>
</tr>
<tr>
<td>9</td>
<td>100% (N=16)</td>
<td>100% (N=16)</td>
<td>100% (N=32)</td>
</tr>
<tr>
<td>less affluent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>80% (N=10)</td>
<td>87% (N=16)</td>
<td>85% (N=26)</td>
</tr>
<tr>
<td>4</td>
<td>100% (N=17)</td>
<td>100% (N=11)</td>
<td>100% (N=28)</td>
</tr>
<tr>
<td>5g &amp; 5b</td>
<td>69% (N=16)</td>
<td>100%(^a) (N=16)</td>
<td>84% (N=32)</td>
</tr>
<tr>
<td>7</td>
<td>100% (N=14)</td>
<td>100% (N=16)</td>
<td>100% (N=30)</td>
</tr>
<tr>
<td>8</td>
<td>94% (N=16)</td>
<td>80% (N=15)</td>
<td>87% (N=31)</td>
</tr>
</tbody>
</table>

\(^a\) Each of these percentages has the combined figures from the two schools. As all children reported usage, 100%, no important information about the differences between the two schools was lost through the combination. In the case of the younger children from school category 5, all attended the one school 5g.

In four of the nine school categories (more affluent schools: 1g and b, 9; and less affluent schools: 4, 7) all children reported that they used the computers in their school. In another three school categories (more affluent schools: 2, 6; and less affluent schools 5g and b), all older children reported that they used the school’s computers. In these schools the percentages of younger children reporting that they did so varied greatly from 69% (school 5g) to 81% (school 6) to 94% (school 2) in the more affluent schools.

In the remaining two less affluent schools the percentages for younger and older children also varied: in school 3, 80% of younger and 87% of older reported use; and in school 8, 94% younger and 80% older reported use. These findings suggest that the differences between types of communities stem from the differences among the less affluent schools. This issue of children’s differential access and use will continue to be explored throughout this chapter from a variety
of viewpoints, suffice to say here that as children grow older they are more likely to use computers in their schools, especially if they come from more affluent communities.

7.2.1 Frequency of computer use

In Stage Two of the study the children were asked to report how frequently they used the computers at school. Overall, 67% of children reported that they used the schools’ computers at least once a week. This average is comparable to the average reported by Paterson (1996) who found that 72% of Year 7 children in a suburban high school reported that they used a computer when in their various feeder primary schools at least once a week.

While there were no discernible differences in reported frequency of use due to type of community, there were gender and age differences. Table 7.2 presents the children’s descriptions of frequency of use by age and gender.

Table 7.2 Children’s frequency of use of the school computers by age and gender (N= 272)

<table>
<thead>
<tr>
<th></th>
<th>younger children</th>
<th></th>
<th>older children</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>boys</td>
<td>girls</td>
<td>total</td>
<td>boys</td>
</tr>
<tr>
<td>N =</td>
<td>135</td>
<td></td>
<td></td>
<td>137</td>
</tr>
<tr>
<td>less than once a week</td>
<td>43%</td>
<td>36%</td>
<td>39%</td>
<td>32%</td>
</tr>
<tr>
<td>at least once a week</td>
<td>57%</td>
<td>64%</td>
<td>61%</td>
<td>68%</td>
</tr>
<tr>
<td>total</td>
<td>6600</td>
<td>7100</td>
<td>13600</td>
<td>6700</td>
</tr>
</tbody>
</table>

In this table the original seven point scale: never, hardly ever; three or four times a term; less than once a week; about once a week; two or three times a week; at least once a day; and several hours a day; has been consolidated into two categories: less than once a week or at least once a week. This was necessary because the large number of cells involved in doing analyses by community, age and gender created too many cells with a zero or low frequency. Where important
information has been lost through this merging process, a footnote is used to indicate the nature of the lost information.

Overall, older children and girls reported themselves the most frequent users. Younger boys were the group most likely to report use less than once a week (43%)\textsuperscript{25}; and older girls the most likely group to report use at least once a week (79%). Again these differences varied between the schools. Table 7.3 presents a breakdown of the students’ responses by school, age and gender. As the number of students in each age group in each school was small, actual numbers rather than percentages have been used. Part of the table also presents two aspects of school organisation: how the computers were distributed in the schools and who had responsibility for children’s use. As well, overlaying the table, the grey shaded regions represent those groups where 100% of students said they used the computers in their schools (see Table 7.1).

The results presented in Table 7.3 are complex but significant. In three of the school categories (1g and 1b, 4, 7) almost all of the children reported that they used the school computers at least once a week. These are three of the four school categories which had 100% of their children reporting that they used the computers at school. In each of these school categories the main system of computer use was timetabled weekly classes in computer laboratories. This finding is consistent with earlier research in the US that found levels of access were higher in schools where computers were located in laboratories and students had their own computer or shared one between two (Becker, 1991).

\textsuperscript{25} The difference between younger boys and other children was even more dramatic in the original category: never, hardly ever: 34% of younger boys reported this, while 15% younger girls, 11% older boys, 8% older girls did so.
Table 7.3 Children’s reports of their frequency of use of the school computers by age and gender and school (N= 272)

<table>
<thead>
<tr>
<th>School Categories</th>
<th>younger children boys</th>
<th>girls</th>
<th>older children boys</th>
<th>girls</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG &amp; LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>8</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
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<td>3</td>
<td>3</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>7</td>
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</tr>
<tr>
<td>4</td>
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<td></td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>7</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>7</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>5G &amp; 5B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than once a week</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>at least once a week</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>✓</td>
</tr>
</tbody>
</table>

Legends

<table>
<thead>
<tr>
<th>Resource organisation</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Laboratory</td>
<td>Sp Specialist Computing Teacher</td>
</tr>
<tr>
<td>Cl Classrooms</td>
<td>Cl Classroom Teacher</td>
</tr>
<tr>
<td>Li Library</td>
<td>Li Librarian</td>
</tr>
<tr>
<td>O Other, e.g. clusters, laptops</td>
<td>O Other:</td>
</tr>
</tbody>
</table>
Within these three school categories the responsibility for teaching the children in the laboratory varied. In schools 1g and 1b there were specialist computing teachers with responsibility for all teaching in the laboratories. In school 4 there was a classroom teacher with considerable expertise, released from some classroom duties to act as support teacher for all teachers who took their own classes to the computer laboratory. In school 7, the computer laboratory was annexed to the library and the librarian had some expertise. Each class had 1 hour of scheduled library time a week. During this hour, the children rotated, a third of the class at a time, through the computer laboratory and were supervised by the classroom teacher. In each of these schools, unlike the remaining schools, structures and resources were in place to ensure that all children regularly used the computers.

In the remaining schools the picture was more complex. In each of these schools the computers were dispersed among the various classrooms, often with a small number clustered in the library and/or other withdrawal spaces. In several of these schools there were also laptop computers which could be distributed together or singly as the need arose. All of these schools had at least one computer per classroom. Generally there was a mixed pattern of frequency of use, with significant numbers of children using the computers less than once a week. The patterns of frequency, however, varied within and between schools. In school categories 2 and 6 the frequency increased with age; in schools 3 and 9 it decreased; and in 5g and b, and 8 there was no age difference. These mixtures reflected the fact that within these schools the classroom teachers held individual responsibility for use and that they had different systems for organising such use. School 5g presented a slightly different case in the sense that, while classroom teachers generally held individual responsibility for their class, there was a specialist computing teacher who worked on a withdrawal basis with small groups of children in Years 5 and 6.

The children in Stage Two did describe how they obtained access to the computers in their classrooms. They reported that turns at the computer were conditional on such things as completing classwork, asking the teacher, being
chosen by the teacher, waiting until the computer was free, getting there first or waiting for their turn on a roster. Some children noted that access sometimes relied on a teacher's memory: "The teacher just remembers who hasn't had a turn the day before" and "We used to have a list but she's forgotten". Students also noted the tendency for teachers to use the computer as a reward for good behaviour, thus advantaging some students over others: "The teacher picks you if you are good." Knupfer (1993) also noted from his research this tendency for teachers to select well behaved children or faster workers.

A variety of responses also highlighted children's perception of inequitable processes in the allocation of computer time to students in some classrooms: "Some people have had a turn but she always picks the same people"; "The teacher never picks me"; "If we're allowed to use it, everyone else is there before I can get there"; and "If you've finished your work you can use the computer. The faster workers get more turns."

The issue of girls and equitable access was more complex. Reports on the frequency of use in Table 7.2 had girls reporting more frequent usage than boys. Table 7.3 suggests these apparent differences relate to the organisation within some of the schools. Consistent with this, a small number of girls expressed concerns about equity within their classrooms: "Mostly the boys hog the computer"; "All of the boys want to have a go and they're not letting the girls have a go"; and "Normally all the boys go on before the girls go on". No such comments were made by boys concerning the girls' access to computers. This particular notion of boys dominating computers in some classrooms has been well documented in other Australian classroom research (Kinnear, 1995; Hickling-Hudson, 1992) and international research (Hedecoe, 1991; Sutton, 1991). While this study did not set out to investigate this particular aspect of computing in schools, the above comments by some of the girls did point to it being an issue for some girls in some classrooms. Furthermore, a number of children when talking about why they preferred computing at home to computing at school, referred to greater access or less competition. Again within these statements some girls referred to boys' competitive behaviour. Only one boy
mentioned competitive access per se in this context and when he did so, he did not refer to the girls as competitors, but rather, other boys.

In addition to frequency, the children in Stage Two of the study spoke about the duration of use. There were two main groups of responses. A small group of children, about 9%, replied with comments such as: "until I've finished"; "depends what I'm doing"; "depends if anyone is waiting"; "until the teacher tells you to turn it off". The remainder gave a duration in minutes, a range of possible durations, or different durations depending on circumstances. In the latter case there were two common sets of circumstances that differentiated the reported duration. These were the difference between doing a set task in class time as opposed to using the computer as part of free time or out of class time; and the difference between when they were working by themselves as opposed to working in pairs or larger groups. For the purposes of the following analysis, the larger amount of time was taken as the duration when children provided two or more times. Analyses were undertaken across schools, gender and age. While there were no discernible age or gender differences, differences between some schools were obvious. Table 7.4 presents the average duration for each of the schools, using a graphic representation of confidence intervals. 26

<table>
<thead>
<tr>
<th>Table 7.4 Average duration of computer use by school</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School</strong></td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1g</td>
</tr>
<tr>
<td>1b</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5g</td>
</tr>
<tr>
<td>5b</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

* This mean is likely to be distorted (lower) by the significant number of students who said that they took as much time as they needed to complete the task

26 See Appendix L, for a description of how the values in this table were calculated
As can be seen from Table 7.4, in two schools, 1b and 4, the average duration reported by the children was between 50 and 60 minutes, in one school, school 3, it hovered around 40 minutes and in the remaining schools between 20 and 30 minutes. The two schools with the longest duration were also the schools where 100% of the children reported usage, where almost all of the children reported using the computers at least once a week, and where they did so in scheduled sessions in the computer laboratory. The two other schools that did use scheduled sessions, schools 1g and 7, had scheduled sessions closer to 30 minutes.

Collectively the data in Tables 7.1 through to 7.4 suggests that the internal organisation in schools had a cumulative impact on children’s access to computers in terms of how many were able to use them, how often they used them, and for how long. In particular, this cumulative effect strongly favoured the boys from an affluent community attending an independent school: the very boys, who were among those who emerged from the home with the strong skills and interests. It should be noted that it also favoured children from some schools in less affluent communities, such as school 4 and 7. In these schools, patterns of organisation and responsibility were in place to ensure all children had regular access, albeit of varying duration, an average 60 mins and 20 minutes respectively. Thus, it was not affluence per se that was related to children’s access at school but school organisation. From the analysis of schools in this study, organisation was only loosely coupled to the affluence of the community.

It is important to note that this doctoral study was not designed to further investigate equity issues. In particular, it is silent on whether the children in this study had greater access to and use of school computers than their counterparts in the schools who did not have access to or use computers at home, or who only played games on their computers at home. This is an important equity issue that needs attention elsewhere. Of significance for this study is the finding that access issues for the children who do use computers in their homes are related to decisions schools make about matters of organisation and responsibility. Notwithstanding the differences, it is fair to say that all schools in this study,
which drew on a wide range of communities, had sufficient hardware for those children in the study to use the school computers about once a week for between 20-30 minutes.

This finding suggests that little has changed over the last ten years since Becker (1985) found that in the US, at least, most primary school children had access to a computer for less than 30 minutes per week. Now, as then, this is insufficient time for children to use the computers in ways similar to the way they use it at home, and for children to be able to finish substantial tasks in one sitting. A number of children in the current study expressed frustration at the insufficient time: “There’s lots of people and you only get a short time on it” and “At school there’s not enough time for twenty-eight people to use two computers”. Others compared school unfavourably to home, in terms of available time: “At home you have as much time as you want”; “You don’t have to share and there is no time limit”; and “I think it’s much easier to work at home - it just comes natural ... you have more time to think at home.”

7.2.2 Types of activities undertaken at school

According to the students in all stages of the study, computers were used in schools for a variety of purposes, activities and tasks. The activities included game playing and a range of common and exotic tasks in each of the categories identified in Figure 6.3: creating texts, using texts, communicating and using technical processes. There were notable differences between home and school non-game-playing tasks as well as major differences among the schools in both game-playing and non-game-playing activities. The differences will be further discussed in the following sections on playing games and other activities.

7.2.3 Playing games

About 70% of the children reported that they played games at school. There were major differences among schools, in terms of the number of children reporting that they played games. Table 7.5 presents the differences between schools.
Where gender differences occurred these are indicated with the a superscript ‘b’, and denoted in the adjacent column.

In four schools, more than 85% of the boys reported playing games: school 1b, a single sex boys school, 100%; school 5b, a single sex school for older boys, 100%; school 7, 93%; and school 9, 100%. In the latter two schools the percentage of girls reporting was markedly less. In four other schools between 60% and 75% of the children reported playing games. In these schools there were no overall patterns of gender difference.

In the remaining two schools gender differences were evident, and related to age as well. In school 3, older girls were the least likely to report game playing, 12%; compared to younger girls, 50%; and boys, 64%. In school 5g\textsuperscript{27}, 38% of the younger girls and 25% of the older girls compared to 63% of the boys. These patterns suggest that within school factors have an impact on whether differences occur, and that where differences do occur, boys are more likely to report playing games than girls.

<table>
<thead>
<tr>
<th>School</th>
<th>n</th>
<th>Games</th>
<th>Gender Differences in game playing</th>
<th>Typing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1g</td>
<td>16</td>
<td>87%</td>
<td></td>
<td>68%</td>
</tr>
<tr>
<td>1b</td>
<td>16</td>
<td>100%</td>
<td></td>
<td>81%</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>68%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>46%</td>
<td>64%</td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
<td>75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5g</td>
<td>24</td>
<td>56%</td>
<td>62%</td>
<td>31%</td>
</tr>
<tr>
<td>5b</td>
<td>8</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>32</td>
<td>59%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>70%</td>
<td>93%</td>
<td>50%</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>71%</td>
<td></td>
<td>92%</td>
</tr>
<tr>
<td>9</td>
<td>31</td>
<td>87%</td>
<td>100%</td>
<td>75%</td>
</tr>
</tbody>
</table>

\textsuperscript{b} a gender difference favouring boys;

\textsuperscript{27} School 5g is a single sex school for the older girls, there were no older boys.
The differences might be related to particular curriculum practices. In some cases, playing adventure games, simulations, puzzles and problem solving games was embedded within the taught curriculum. In these situations it is reasonable to assume all children in the class had an opportunity to or were expected to play games. In other cases, games of all sorts were available on machines for children to play, either within a timetabled computer lesson, at free times or out of class times. In the out-of-class times it is reasonable to assume that differences were facilitated through choice and opportunity.

Children also spoke during Stages One and Two of the study about the nature of their game playing. Some game-playing tasks were common to both the home and school environments while others were school only or home only. The home only tasks involved exotic tasks such as game building (creating scenarios and characters) and reconfiguring games. The school only tasks involved co-operative performance. Examples included working in groups to solve problems or puzzles and to complete simulations and adventure games. This mode of game playing, cooperative performance was, in fact, a reasonably common mode for children at school. This contrasts strongly with the common mode at home, namely solo performance. When children did speak about playing games together at home with family and friends they were not referring to co-operative performances. Rather, the ‘together’ referred to solo performances against competitors or in the presence of spectators. The later may have involved other children ‘coaching from the side lines’ or occasionally a more expert player ‘lending a helping hand through tricky bits’ but it did not involve co-operative planning, decision making, or shared control.

On the whole, children had little difficulty moving between the differing modes at home and at school. Given the different nature of the educational games played at school this was not surprising. Three boys did comment, however, when explaining their preferences for home computing against school computing that
they preferred to play games by themselves. Conversely two older girls also commented on how much they enjoyed playing the games in groups at school.

When children spoke about how they played games at school, their comments centred mostly on the fact that they did so in groups and that at times they had to make decisions by consensus within the group. Furthermore, they rarely had the opportunity to play most games more than once, except during free time or lunch time. The only exceptions seemed to be games such as learning-to-type games and mathematics-drill games. The obvious difference between these games and others was that in these games physical skills and memory were the focus, while the others were simulation and adventure games like CRYSTAL RAINFOREST, DINOSAUR DISCOVERY, and GOLD DUST ISLAND. In these more complex games the focus was a range of conceptual understandings and cognitive skills such as decision making and problem solving. The practice of playing such games only once is in stark contrast to home game playing, where repetitive play provided the opportunity for children to improve their performance. Given the fact that children’s access is in most cases restricted to a weekly session of 20-30 minutes duration, improving performance through repetitive play of complex games was probably not considered viable by the teachers, if considered at all. This begs the question “What is the role of these games in classroom learning”? If the processes of playing the game and improving performance are central to the learning outcomes then the opportunity for repetitive play needs to be carefully considered.

Children also provided information about the role of the teacher in their game playing. They explained that with games, such as those mentioned above or THE RIDDLE OF THE TRUMPALAR and WHERE IN THE WORLD IS CARMEN SAN DIEGO, the teacher set the goals, or provided the frameworks for playing, and at times provided accompanying worksheets or tasks related to the game for the children to complete. These latter attributes reflected that at times, teachers used games in the service of curriculum-related outcomes in areas such as Mathematics, Social Studies, Science and English. Combined with the fact that children usually only played these games once, such a pattern might suggest that
they mainly acted as motivation to undertake more conventional classroom activities in these disciplines rather than as opportunities for improving particular cognitive skills and understandings.

This context of teacher intervention provided yet another difference between home game playing and particular types of game playing at school. At home, game-playing environments were essentially adult free; at school these types of games were essentially teacher directed. Five boys commented that teacher intervention, particularly the setting of auxiliary tasks, somewhat spoilt the pleasure of playing.

In Stage Three of the study, the eleven teachers were asked briefly about the role of playing games in school computing. None of these teachers used games as part of the planned curriculum, say, an within an integrated unit of work as described above, but some knew of other teachers who did. Several did acknowledge that in the children’s spare time they played a range of games that were already installed on the classroom computers, or that there were a number of mathematics puzzles and games on the classroom computer that children were encouraged to play when they had the opportunity. The teachers’ answers pointed to the second type of game-playing experience in school: incidental game playing. This type of game playing was almost a form of educational leisure activity, in the sense that teachers took little if any part in selecting the game, monitoring its use or teaching the required skills and understandings. In this way, incidental game playing at school was more like game playing at home. Except, because of the time limitations, the children had fewer opportunities to improve performance through practice.

In three schools from Stage Two of the study, the playing of typing games did not fit into either pattern (see Table 7.5). In each of these schools there were whole school programmes to improve children’s typing. This was evidenced by the large percentage of children in each of these schools who volunteered “typing”, “typing practice”, “learning to type” or “typing games” as one of the uses of the school computer. The percentages across the three schools were: 69% of the girls
in school 1g; 81% of the boys in school 1b; and 93% of the children in school 7. There were no gender or age differences in any of the three schools. Within this framework of ‘learning to type’ it was difficult from the children’s responses to ascertain whether the software they were using would be categorised, at least by adults, as game or tutorial software. Whichever it was, the children’s responses firmly placed the activity in the ‘playing games’ category. That is, they spoke about fun, challenge and improving performance by practice, in the same way that they spoke about car racing or sports games.

The two main patterns of game playing at school, curriculum-based and incidental, when set in relief against game playing at home, raise a number of interesting issues for educators to contemplate. While the study was not designed to investigate these in detail, they will be explored further in the final chapter of this thesis.

7.2.4 Other activities

A number of non-game-playing tasks were named by the children. The common ones included writing, publishing and ‘getting’ information. These common tasks, like those in the home, belonged mainly to the ‘making texts’ and ‘using texts’ categories. While the list of common tasks in each of these categories was similar in the home and school, the list of exotic tasks reveals that a much wider variety of ‘text types’ was created in some schools. The ‘communicating’ tasks were exotic, as in the home, but much more limited in scope. Table 7.6 lists these common and exotic tasks undertaken at school. In this table the tasks in italics were found only in the schools, while the tasks in normal font were found in both home and school. Again, common tasks are in black and exotic tasks in grey.

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While some games software does incorporate elements of teaching, information, or structured practice sessions with feedback, there are separate categories of software that are drill and practice, or tutorial software which involves separate teaching and practice sessions. Both of these software categories may have elements of gaming.
Table 7.6 A classification of children’s non-game-playing activities in schools

<table>
<thead>
<tr>
<th>Activity</th>
<th>Creating texts</th>
<th>Using texts</th>
<th>Communicating</th>
<th>Using technical processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks</td>
<td>composing writing</td>
<td>locating</td>
<td>emailing</td>
<td>booting the computer</td>
</tr>
<tr>
<td></td>
<td>editing writing</td>
<td>browsing</td>
<td></td>
<td>shutting down the computer</td>
</tr>
<tr>
<td></td>
<td>decorating writing</td>
<td>searching</td>
<td></td>
<td>running software</td>
</tr>
<tr>
<td></td>
<td>constructing still images</td>
<td>viewing, listening and/or reading using</td>
<td></td>
<td>loading files</td>
</tr>
<tr>
<td></td>
<td>manipulating still images</td>
<td>organising</td>
<td></td>
<td>saving files</td>
</tr>
<tr>
<td></td>
<td>creating sounds</td>
<td></td>
<td></td>
<td>printing files</td>
</tr>
<tr>
<td></td>
<td>manipulating sounds</td>
<td></td>
<td></td>
<td>managing files</td>
</tr>
<tr>
<td></td>
<td>integrating writing, images and/or sounds</td>
<td></td>
<td></td>
<td>customising software</td>
</tr>
<tr>
<td></td>
<td>making video clips</td>
<td></td>
<td></td>
<td>fixing problems</td>
</tr>
<tr>
<td></td>
<td>making animated sequences</td>
<td></td>
<td></td>
<td>recording sounds</td>
</tr>
<tr>
<td></td>
<td>making hypertexts</td>
<td></td>
<td></td>
<td>scanning/digitising images</td>
</tr>
<tr>
<td></td>
<td>creating tables and graphs</td>
<td></td>
<td></td>
<td>dialling and connecting to network service</td>
</tr>
<tr>
<td></td>
<td>making slide shows</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend: Common Tasks - Black, Exotic Tasks - Grey school only - *Italics*,

Like patterns of game playing, children’s patterns of engagement with common non-game-playing tasks varied among and within the schools. Table 7.7 shows the common tasks reported by the children in each school. After game playing, writing was the task most commonly reported by the children.

In two schools, 4 and 9, almost all children reported writing. In one school, 1g, only 12% of the girls reported doing so. In the remaining schools the percentage varied from 36% to 75% with gender differences, in all but one case, favouring girls. From the fairly brief comments that children in Stage Two made about their writing at school, it appears that the task of writing was mainly restricted to the publishing process, that is, typing up already composed text, and decorating it with headings, borders and images. This process was commonly described as:
"type up stories"; "type things up like poems, stories, reports..."; "to write stories from draft book"; "publishing stories"; "mostly just writing up school work if it's messy... can print it and give it to the teacher"; "type heading and stories and things"; "..make the writing look nice..."; "type stories and print them out"; and "just type out things for school - stories we have written." Few children spoke about their writing in a way that implied they actually composed at the screen either individually or cooperatively: "We write down our stories..."; and "We write stories on the screen then print them." This pattern of using the computer for publishing rather than composing or editing for meaning is consistent with the earlier reports of the teachers.

Table 7.7 Children in each school reporting computer-related tasks.

<table>
<thead>
<tr>
<th>School</th>
<th>n</th>
<th>Writing</th>
<th>Drawing</th>
<th>Getting information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1g</td>
<td>16</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b</td>
<td>16</td>
<td>43%</td>
<td></td>
<td>43%</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>71%</td>
<td>28%</td>
<td>12%</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>76%</td>
<td>26%</td>
<td>11%</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
<td>96%</td>
<td>50%</td>
<td>7%</td>
</tr>
<tr>
<td>5g</td>
<td>24</td>
<td>75%</td>
<td>6%</td>
<td>25%</td>
</tr>
<tr>
<td>5b</td>
<td>8</td>
<td>50%</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>32</td>
<td>68%</td>
<td>21%</td>
<td>3%</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>36%</td>
<td>26%</td>
<td>10%</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>54%</td>
<td>48%</td>
<td>19%</td>
</tr>
<tr>
<td>9</td>
<td>31</td>
<td>93%</td>
<td>40%</td>
<td>34%</td>
</tr>
</tbody>
</table>

b a gender difference favouring boys; g a gender difference favouring girls

Drawing and getting information were less commonly reported, and in some schools were reported only by one or two children or not reported at all. There were no obvious age or gender differences in the reporting of either task. Comments about drawing included: "do quick drawing."; CLARIS WORKS for
drawing, painting and writing and KID PIX for stamping”; “putting pictures on the background”; “KID PIX is a drawing game.” The two terms that most commonly described getting information were: “finding out...” and “looking up...”.

A range of exotic tasks was also mentioned by the children. These included: designing houses; making slide shows; recording sounds; using Logowriter to create shapes and patterns; using email to communicate with students in other schools and countries; creating databases; using HYPERCARD to create cards with links; graphing; using animation and cartoon packages; making video camera connections; and scanning photographs. One important feature of these exotic activities was that most of them were school-only tasks. The two exceptions were email use and scanning images and photographs, although in the latter case, only 2 of the 276 children in Stage Two of the study did this at home.

The exotic tasks were also school specific; in fact, in all but one school they seemed to be class specific. For example, in school 2, several Year 5 children reported making slide shows in KID PIX at school; in school 9 two Year 6 children reported using email, in school 8, several Year 4 children reported creating animations. In this school, there was one across-grades project: several Year 4, 5 and 6 children reported making a CD-ROM on the history of their local area using HYPERCARD. school 4 was the exception to the rule about class-specific activities as several children in a variety of grades mentioned one or more of the following exotic activities: making databases; creating graphs; making HYPERCARD stacks; and using email.

One other feature of the analysis of children’s activities is worthy of comment. There were a significant number of cases where exotic activities were mentioned by only one child in the school, or in a grade. This phenomenon particularly applied to the use of telecommunications systems for email. In each of three schools, schools 2, 6 and 7 only one child reported using a modem for communication (email). In schools 4, 8 and 9, several children in the one grade
mentioned such use. Whether this reflected the actual pattern of use or not, is not known.

When the above patterns of engagement in common and exotic tasks were analysed in terms of differences between communities, no clear patterns emerged. The differences within types of schools were as great as the differences between. Furthermore, the differences did not relate to the organisation of the resources or areas of responsibility. Children in school 1g, a girls’ school which draws on a relatively affluent community, who attended the computer laboratory once a week under the supervision of a specialist computing teacher, engaged mainly in curriculum-integrated games and typing activities. Their counterparts in a boys school, 1b, with similar organisational structures, engaged in a variety of activities, incidental games, problem solving games, writing, getting information, and typing. Apart from one boy mentioning ‘telecommunications’, there were no reports from either school about engagement in exotic activities. The other three schools which drew on relatively affluent communities, schools 2, 6 and 9, had classroom computers and individual teacher responsibility. Again the patterns of use were different. In school 2, the main activities were incidental games and writing, with Year 4 students making a slide show. One student in Year 5 mentioned modem use. In school 6, the main activities were writing and curriculum-based games; two children mentioned using Logowriter for mathematics. No other exotic activities were reported. In school 9, the main activities were incidental games and writing, looking up information and drawing. A number of children, in ones or pairs, mentioned exotic activities such as using email, scanning photographs and creating house designs.

The schools that drew on less affluent communities also varied significantly in the nature of their common and exotic activities. In the two schools, 4 and 7, where children attended weekly laboratory sessions with their classroom teacher

29 The combined evidence of the children and the teachers was used to determine if a school mainly used curriculum-based games or incidental game playing. The children provided data in both the name of the games played and their descriptions of how they played.
but were supported by a specialist teacher or the librarian, great differences were evident. In school 4, the main activities were playing incidental and curriculum-based games, writing, drawing, and participating in a wide range of exotic activities. The exotic activities were mentioned by significant numbers of children across various grades, almost as if these computer-based tasks were set activities within the classroom curriculum. In school 7, the children rotated through 20 minutes of computer uses as part of their library lesson. In this school the main use was typing and incidental game playing. No children reported participation in any exotic activity. In the other four schools which drew on less affluent communities, 3, 5g, 5b and 8, patterns of difference were also evident. In school 3, the common activities were incidental game playing and writing. A small number of children reported going to the library to look things up, but no exotic activities were reported. In school 5g, common activities were writing and playing curriculum-based games, while in 5b they were writing and incidental game playing. In neither school were any exotic activities mentioned by the children. In school 8, writing drawing and incidental game playing were common and children in Year 4 mentioned the exotic activity of creating animations. A number of children across various grades also mentioned a local history CD-ROM project.

The patterns of use across all of these schools highlight three important findings. Firstly, children’s participation in both common and exotic activities was related to the particular school they attended. While participation in common activities seemed to be evenly distributed across a school, participation in exotic activities in all but one school seemed to be class specific. There was no relationship between the presence of a computing specialist teacher (schools 1g, 1b, 4, 5 and 7) and the nature and range of common or exotic activities.

Secondly, in some schools, not all children participated in the common activities, let alone the exotic activities. There may be a number of reasons for this. Computer-based tasks were either part of set class work or part of an optional set of activities. When part of set class work, organisational factors may have prevented some children from taking part or at least did not ensure that they did
so. When activities were optional, choice and opportunity would determine the outcome. For example, the history project in school 8 was an optional activity. Children from a variety of grades took part, but not all children in the grades were involved. One Year 4 girl described the criteria for selection: “20 people go to the library on Tuesday to make our own CD programme... whoever has shown initiative for it.” This seems to imply that the activity may have been an optional ‘extension’ activity in which children could choose to participate.\(^{30}\) This notion of optional versus expected participation had an important outcome for gendered computing. As rates of participation in the common activities of game playing and writing decreased gender differences increased. This would suggest that as activities moved from being expected to optional, gendered patterns of computing emerged that were similar to those found in the home: boys played games and girls wrote stories and other texts.

Thirdly, patterns of participation in common and exotic activities were not linked to the affluence of the community, nor to children’s participation in exotic activities at home. The former is in stark contrast to the pattern of computing at home, where exotic activities were most likely to be undertaken by children from affluent communities, albeit mediated by access to powerful resources and expertise in the home. The latter became evident in Stage Three of the study, when for 12 children, the relationship between their home-based expertise and interests and their school’s computing was analysed and found to be complex.

Some children, in Stage Three of the study, who did exhibit expertise and interest at home, did not do so at school. This was the case with two girls and one boy. In the case of the girls, neither actually engaged in any exotic activities at home, but keenly undertook a variety of common activities at school. In the case of the boy, the family had a local area network and a modem for connecting to the Internet and a variety of bulletin boards. The boy regularly accessed a number of the bulletin boards for ‘tips and cheats’ for his favourite games. In each of these

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\(^{30}\) Discussions with the two teachers in the school, in Stage Three of the study, revealed that this project was targeted at identified gifted and talented students who could choose to take part.
cases, the teachers were unaware that the children had any ‘special’ expertise or interest. In return, each of the children reported that they rarely did any computing as part of their regular classroom work.

For the children in Stage Three of the study who did exhibit confidence, competence and interest there were a variety of outcomes at school\(^{31}\). Four of these children were recognised and singled out for positions of leadership and responsibility. Of these four children, three, two girls and a boy, did partake in the range of optional exotic activities at school. One, a boy, was a leader in the above mentioned local history project. Another, a girl, was targeted as one of the school’s leaders and attended, along with other selected children, a special training programme to enhance her expertise. The third, a girl, regularly worked in the library at lunchtime, as a leader/monitor in use of the CD-ROM collection. The fourth child, a boy, was an expert touch-typist. Both in his class and in the wider school community, his skills were recognised and regularly called upon. This school was not one of the schools with an emphasis on typing skills.

For three other children, all boys, who did exhibit expertise, confidence and interest at school, the outcomes were significantly different, and reported as such by both child and teacher. One boy, David, whose snapshot appeared on p.221, was banned, as was the rest of his class, from using the computers at school after the school encountered problems with children hacking into the school’s network server. The school’s computing specialist, who in many ways mentored David, spoke of some of the other teachers as being ‘frightened’ of the level of expertise that David and some of his peers had. Another boy often lost access to computing at school as a form of punishment for his general misbehaviour. His teacher explained that as computing was important to him, its withdrawal at school was an effective punishment. In the third case, the classroom teacher who was new to the school was resistant to the notion that the child had expertise because as the teacher explained, “He had learning difficulties… particularly with reading and

\(^{31}\) Both children and teachers confirmed these outcomes.
writing... and behaviour problems.” The resource teacher, however, relied heavily on the child’s expertise in the special needs withdrawal class when she took the class to the computing room for reading and writing activities. Furthermore, the computing specialist teacher, who transferred out of the school between Stages Two and Three of the study, had formerly used this child as a leader in a range of optional exotic activities across the school, for example using digital cameras in science-based units of work.

These brief vignettes highlight some of the complexities of the relationship between home and school computing. They put paid to the notion of a simple relationship between expertise in the home and ‘privileged’ participation in school’s computing, particularly with regard to exotic activities. The last mentioned cases of the three boys also provides a rare insight into the complexity of gendered patterns of children’s school computing. Furthermore, these examples are consistent with patterns of teacher behaviour which stem from a belief that computing is not central to the primary school curriculum. It can be used as both a reward and a punishment in the way that other enjoyable but peripheral activities are used.

There were two other areas of school computing that provided further contrasts with home computing. These were the nature of the rules surrounding computing and the ways that children handled problems. In the case of school rules, the children reported that the three types of rules found in the home were also present at school: community rules; personal rules; and computer care rules. There was a significant shift, however, of emphasis from home to school. The children reported that personal rules played a major role at home. In contrast at school, computer care rules dominated the reporting. In some ways this could be seen as a shift from protecting the child who has more freedom in the home, to protecting the computer which as community property within the school is much more liable to use and abuse.

Most of the rules reported by the children about computer care were similar to those they reported in the home: “can’t mix up or delete anything”; “no getting
into the control panels”; “never bang on the keyboard”; “don’t break the computer”; “no eating or drinking”; “can’t take any programmes off”; “don’t ruin the computer”; “not allowed to exit from the game you are using”; “don’t fidget with the battery pack [on the laptop]”; and “don’t turn it straight off, use the mouse to shut it down.” One subset of these rules, however, was markedly different from and almost in opposition to the general mode of use in the home. This subset is best described as “no fiddling”: “don’t fiddle- can’t play with the computer if something is on”; “don’t fiddle around with the computer”; “don’t muck around with the format... don’t press around with the mouse and keys”; “not allowed to play around with it”; “not allowed to muck around”; and “not allowed to go into programmes that you don’t know because you might wipe them out.” In the school, these children perceived that they had permission to do certain things and that they were not allowed to do other things. More importantly, if they did not know how to do something, they were not allowed to find out for themselves through fiddling. They were expected to ask so they could find out the ‘correct’ way. This approach was counter to the natural approaches of the children at home and particularly of boys, whose major strategy was “to fiddle” both at the initial and later stages of learning. It is more in line with the younger girls’ strategy at the initial stages, but not so with older girls’ or both groups of girls’ strategies at the later stages.

Children’s handling of problems also reflected the greater emphasis on teacher directed interactions with the computer. At school about 85% of the children named the teacher as the person to call when problems arose. As one child explained: “I wouldn’t try anything myself because it’s the school’s computer, so I would go and ask someone.” Less than 12% of the children indicated that they would try themselves or ask other children before calling the teacher. There were no community or gender differences in these replies, but not surprisingly older children made up the greater proportion of the children who reported that they were prepared to try things out before calling the teacher.

There were differences between individual schools, however, in terms of the percentages of children who would call the teacher when problems arose. The
percentages of children who named the teacher varied from 63% through to 100%. It is interesting, possibly significant, that the school with the greatest proportion of children who reported that they would try to fix it themselves first, was school 3. School 3 had relatively low levels of children participating in the common activities and no exotic activities. There was no specialist in the school and computing was the responsibility of the classroom teacher. It is just possible that in the absence of strong teacher expertise and leadership, as was the case in the absence of strong parental expertise in some homes, children were more ‘in charge’ than in situations where strong adult expertise was available.

The children themselves were very aware of the differences between home and school computing. In the main, they preferred to use a computer in the home environment (73%). Some children (14%) enjoyed using a computer anywhere and did not wish to choose between the home and school environments. A typical comment was: “It doesn’t matter where you use a computer.” About 13% of the children preferred to use the computers at school. There were differences between communities and genders. In general, children from more affluent communities (83%) were more likely to prefer to do computing at home, and boys (89%) from these communities more so than girls (78%); and children from less affluent communities (63%) were less likely, again with boys (67%) having a greater preference for home than girls (60%). An analysis of individual schools revealed that in general they followed the pattern of the type of community. In schools with more affluent communities, the percentages preferring home varied from 75% in school 9 to 94% in school 6. Similarly, preferences in the schools from less affluent communities consistently had a smaller percentage of children preferring home. In this group, percentages varied from 50% in school 4 to 72% in school 5. This might suggest that school organisation was not a key factor in this preference, though it was so in degree of access (frequency and duration).

Children offered reasons for their choices. These varied from amount and quality of equipment to choice of time, duration and nature of activity. The former was the most common reason for preference of home or school. Some families had more sophisticated computer equipment than their local schools: “My computer
at home has better things on it, more information, more programmes and it’s more modern”; and “At home my computer is better and faster with more memory and programmes. I have 500 megs of memory at home. The school computers have 40 megs”. Conversely some schools had better equipment than some homes: “My computer stops in the middle of a game. School has a better computer. It works properly”; “At home our computer is old, it’s just about had it”; and “School has things that I don’t have at home, like a CD-ROM”.

Other reasons that children preferred to use the computer at home were the quieter environment, their familiarity with the computer, less restricted access and control over and ownership of the computer: “...because it’s fun at home, you have more peace and quiet and no children talking”; “I know how to use the computer better at home.”; “Because I can use it anytime I want, not like at school”; “At home, you don’t have to compete with others for a turn”; “At home, I’ve got it to myself because at school all the boys hog it”; “At home, you can do anything you want, you can choose”; “I can do whatever I want instead of what the teacher says to do. I get more time to think”; and “It’s mine and I’ve got my own things on it.” A small number of students appreciated that help was available to them at school: “You’ve got a teacher that knows how to use the computer. Mum and dad might not know much at home”; and “Mr [X] knows more about computers than my parents. He can help you more.”

While the reasons put forward by the children could not be analysed in terms of patterns of within school computing, the overall patterns of preferences could. The analysis revealed no clear patterns across the nine school categories. However, there were individual schools with striking relationships from both the more affluent and less affluent communities.

In school 4, which drew on a less affluent community, 50% of the children either preferred computing at school or said it did not matter. This was the school where all children reported weekly use of the computer for an average duration of one hour, the greatest amount of time in all the schools (see table 7.4, p.259). It was the only school where numbers of children in all grades spoke about a range
of exotic activities which were integrated into their classroom curriculum. In contrast, school 6 was the school with the lowest percentage of children choosing either school computing or both home and school (6%) among the schools drawing on more affluent communities. In this school, computers were in the classroom and were used less than once a week by the younger children and about once a week by the older children. The average duration, about 30 minutes, was about the same as those reported by other schools in this category. Generally these children only engaged in curriculum-based games and writing. There were no patterns of exotic activities mentioned by more than 1 or 2 children.

These findings suggest that the complexity of the relationships between home and school computing stems from a number of aspects. The children care about ‘better equipment’, about access and control, as well as about regular participation in activities not commonly found in the home. Overall, the differences between home and school may be summarised as follows.

1. The nature of the equipment available for use varies from home to school. In more affluent communities the better equipment is more likely to be at home. Access to better equipment is often the stated reason for children liking home computing better than school computing.

2. Children have greater control of access and use at home. A number of children mentioned that having to compete for access at school was a problem.

3. The frequency and duration of use of computers at school is limited in the main to about 30 minutes once a week. This contributes to the fact that usually where children play games at school as part of the taught curriculum there is no opportunity to play the game more than once. Hence there is no opportunity for repetitive play and learning by doing.

4. Playful learning or ‘fiddling’ is discouraged at school. Children are generally expected to seek help when they have a problem rather than explore possible solutions.
5. The same common tasks are found in both homes and schools. In the schools where exotic tasks are undertaken, generally children are creating and using a greater range of text types, for example, multimedia texts. The involvement in exotic tasks is a commonly stated reason for children enjoying computing at school more than computing at home.

Overall, affluence was a stronger influence on home computing than on school computing. School organisation seemed to influence the pattern and nature of children's use of school computers. Within any one school, especially one without coherent school programmes, the belief systems of individual teachers strongly influenced classroom use. The co-existence of particular teacher beliefs in any one school, combined with the differences in organisational and responsibility factors among schools led to a diminished relationship between affluence and cultural capital. That is, children privileged in affluent homes through access to resources and expertise were not necessarily those privileged at schools. Privilege through schooling was more likely to be associated with the presence of one or more teachers whose world view encompassed the computer as an essential. Similarly, differences in gendered patterns of computing were related to whether computing was a part of the planned and taught curriculum or whether it was an optional activity. When optional gendered patterns of school computing were found, they reflected home patterns.
Chapter 8: Summary, conclusions and implications

The final chapter, Chapter 8, provides a summary of the thesis by restating the goals of the thesis and summarising the major findings. The significance of these findings and their implications are then presented. Subsequent to this, a review of the study is undertaken, and suggestions for further research are made.

The overarching goals of the doctoral study are twofold: the primary goal is to make a contribution to the knowledge about and understanding of the reciprocal relationship between the child and the computer within the socio-cultural context of the home; the secondary goal is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools. These goals led to the development of four key questions.

1. What computing resources exist in children’s homes? What affordances do these resources enable?

2. What are the socio-cultural contexts of children’s home computing? What discourses and family practices surround children’s uses of computers? How do these discourses and family practices interact with children’s perceptions of affordances and their use?

3. What is the nature of children’s uses of the home computer? What affordances of the domestic computer do children perceive? How do children’s interactions with the computer in their home shape these affordances?

4. What are the discourses about educational computing in which primary-school teachers participate? How do the computing experiences children have at school differ from those in their home?
The educational significance of this study stems from Australian children’s increasing access to and use of home computers at a time when many governments in Australia are allocating large budgets and creating new policy frameworks for the use of computers and related technologies in schools. In general, these actions by government have been politically driven and unproblematically supported by many system-level educators. Little empirical evidence about, nor much understanding of, children’s ‘out-of-school’ experiences have helped shape these policies or programmes. This study provides, for the first time in Australia, both a descriptive and interpretive study of the interactions of children and computers in the home. One outcome of this is the development of a framework of children’s computer-based activities that takes account of the context, the purpose and the outcomes of the computer-based tasks that children undertake. Other significant outcomes are the further adaptation of the concept of affordance and the development of a middle range theory regarding how the dominant affordance of the computer ‘as playable’ is created.

The following sections present a summary of the major findings of the study and a discussion of the significance of these findings.

### 8.1 Summary of major findings

The major findings of the study are presented in four sections based on the key questions above. The first presents findings on the computing resources in children’s homes and the affordances these resources enable. The second focuses on findings about the socio-cultural contexts of children’s home computing. The third presents findings about children’s uses of computers and how the dominant affordance of the computer as ‘playable’ comes about. The final section contains a brief comment about differences between home and school computing.

#### 8.1.1 The resources in children’s homes and their affordances

The data from the various stages of the study, particularly Stage Two, revealed that there was a fairly common base of hardware and software in the homes of all children in the study. All children had access to hardware that could support game
playing, though the range of software varied. Generally they also had access to word processing and drawing software. Children from less affluent communities, however, were less likely to own CD-ROM drives and printers.

By combining the profile of ownership of hardware and software in the home, the functionality of the computer, and hence its possible affordances, were defined. In simplest terms, the affordances of both ‘toy’ (for playing games) and ‘tool’ (for doing work like writing) were possibilities for the overwhelming majority of children in all stages of the study. In some homes, usually those from the less affluent communities, older machines and lack of printers and CD-ROM drives sometimes diminished the ‘tool’ affordance.

8.1.2 The socio-cultural context of children’s domestic computing

This study found that the socio-cultural contexts of children’s domestic computing played an important part in shaping children’s interactions with computers. As a socio-cultural context, the home promoted both of the affordances of the domestic computer: the computer as a toy and the computer as a tool. These two affordances were supported through the multiple discourses within which parents and children participated. The discourses included: the computer as the future; the computer for education; the computer as a personal productivity tool; and the computer as entertainment. These discourses helped shape the symbolic meaning of the domestic computer as well as the instrumental meanings through the provision of particular hardware and software in the home. They also revealed that parents had particular conceptions of schooling and, at times, different and conflicting conceptions of childhood.

8.1.2.1 Discourses and practices surrounding the family computer

The strongest parental discourse was ‘the computer for the future’. Within this discourse, children were conceived of as adult workers in preparation. They needed to become computer literate in order to participate effectively in their future workplaces. Notably absent was any discussion about the role of computers
in future society and the importance of understanding the social and ethical consequences of evolving technologies and their uses.

Such was the strength of this discourse that parents encouraged their children to use computers at home and expected schools to participate in the development of their children’s skills. Hence the central elements in the discourse of ‘the computer for education’ were the computer as an object of learning, the child as a learner and the school as a place to prepare children for the future, that is, children should learn how to use computers in schools. In specifying what and how children were to learn, parents used the workplace notion of the ‘computer as a productivity tool’. The outcome of such thinking was that computers were viewed as essential tools for the future. Their use in school was linked to the future rather than the present and while tool use was viewed as advantageous in school in terms of present day tasks and activities, it was not viewed as essential. The underlying beliefs were that computers are about future work (of adults) not the present work (of children) and that school was about ‘preparation for work, not work itself’.32

The strong belief about the ‘computer for the future’ also combined with another common belief. Overwhelmingly, parents believed that playing computer games developed some computing skills. This relationship created a context of permission for children to play computer-based games. In most homes, parents were comfortable with children playing games, as long as there was some recreational or educational value in the activity. In this way, parents permitted children to participate in a discourse which for the children was dominant: ‘the computer as entertainment’.

These discourses interacted with a number of factors, namely, parental expertise and use, location and ‘ownership’ of the computer and sibling use. This interaction reinforced the two dominant affordances of the computer, namely, the computer as a ‘toy’ and the computer as a ‘tool’. It also reinforced a range of cultural practices. These cultural practices were gendered and related to affluence

32 This phrase relates to John Dewey’s words “Education is not preparation for life, it is life itself.”
in complex ways. In particular, parental expertise and use clearly related to gender and community affluence. Fathers from more affluent communities were most likely to have expertise and to use the computer. Affluence also impacted on use in the sense that homes from more affluent communities were more likely to have a greater variety of peripheral devices that support ‘tool’ affordance such as printers and CD-ROM drives. In many homes, however, both parents used the computer and in some homes neither parent did. Importantly, affluence and its related factors, parental expertise and resource provision, were not strongly linked to children’s common uses of the computer. There were, however, gendered patterns in both parental use and children’s use. These were complex and not as strong as those reported in earlier research on domestic computing (Silverstone et al., 1992; Hirsch, 1992; Wheelock, 1992; Murdock et al., 1992). Generally, boys’ and fathers’ patterns of use were more likely to combine toy and tool use, while older girls and mothers were more likely to focus on tool use.

When either parents or children engaged in discussion about the computer as a tool, the central notion was of a tool that made things less arduous. Using computers made it easier to get information, easier to edit (surface features - spelling, punctuation, grammar etc), and easier to make work look better. There was also discussion, but not consensus, that it made things ‘better’, that is, it improved the quality of the writing or provided ‘better’ access to ‘better’ resources. Notably, there was no discussion about these tools transforming either the processes of using and creating texts, or transforming the products themselves. The discussions were clearly centred on the role of the tool with traditional tasks and traditional paper-based products.

Furthermore, the strong focus on the ‘look’ of the texts indicated that the dominant affordance of the word processor for these parents and children was that word processors were tools to make writing look good. In this sense word processors encouraged form over function. Such an affordance is shaped by both the features of the software environment itself and the way children (and possibly parents) approached writing tasks. Similarly, with the processes of researching topics or questions, the affordances related to ‘getting information’ rather than the
more complex tasks of making sense of information and transforming it into knowledge. In both cases, then, the affordances related to the less cognitively demanding processes of using and creating texts, particularly paper-based or electronic written texts.

It was disturbing that most of the teachers in Stage three of the study shared these views and beliefs. Even with their greater knowledge of writing, of the processes of writing, and the pedagogies surrounding the processes, they too focused on the role of the word processor in improving the ‘look’ of texts, and to a lesser extent, on the ease of the editing process. Given their perceptions of this dominant affordance, perhaps they were justified in placing such a tool at the periphery of their teaching. Unfortunately, the study was not designed to allow a deeper investigation of teachers’ views of these issues to determine their actual understandings and motivations. This would indeed be an important area for future research.

The constructions of the computer as a tool that made things ‘easier’ for children created real dilemmas for many parents and teachers and for some, an ambivalence about the tool affordance. For these parents and teachers, the danger arises from the children becoming over-reliant on these tools when, as learners, they were still in the process of mastering manual skills such as handwriting. They were also concerned about children becoming accustomed to the ‘ease’ and their losing of interest in or preparedness to use more time-consuming and less convenient technologies such as books or libraries. In this sense the computer was regarded as a symbolic culprit, drawing children away from engagement with traditional literacies and technologies.

This notion of the computer as culprit also emerged in other discussions with parents and teachers. When talking about computer use in the home, particularly game playing, a number of parents and teachers spoke of computer games being like television, in the sense that they seduce children away from ideal childhood: the outdoor child engaged in imaginative play.
In both of these cases the concern is about the computer as culprit facilitating a loss of traditional childhood, in terms of how children both work and play. In each of these cases the dominant conception of the child is as ‘vulnerable’. This is in stark contrast to, and conflicts with, the sense of pride that parents, and some teachers, have about how readily children take to computers, seemingly learning to use them with little effort. In this context children are viewed as leaders, with skills and understandings that do not come as readily to older generations. Hence children are conceived of as the computer generation at the same time they are viewed as vulnerable.

8.1.2.2 Gender differences

Overall, the interaction of the affordances, the domestic cultural practices and the children’s uses, leads to different outcomes for boys and girls. A summary of the findings is given below:

1. Younger boys tend to be more attuned to the affordance of the computer as a toy. As they grow older the dual affordances of toy and tool become more prominent. On the other hand, girls are more likely to move from the position of perceiving dual affordances to one where the tool affordance predominates.

2. The gender differences evident in previous and current research in game playing in arcades, or with video-game machines, is less evident with computer-based game playing as girls gain permission to play games on computers, because they are computer-based and as such are linked to developing computer skills for the future.

3. Boys are more likely to play the types of games that get them involved in altering and configuring the computer’s operating system. Through this process they develop a better understanding of computer systems. Girls also develop expertise, but it is more likely to be software-based expertise, for example, how to use word processors or desk-top publishing software.

4. The domestic cultural context facilitates girls’ access to the family computer. This occurs because their personal preference for ‘doing work’ matches their
parents' preferences and where family rules exist they usually provide for priority access for 'work' over games at times of competition.

These findings indicate that gender differences are more complex, and possibly more subtle than previous research indicates. This complexity arises from the fact that while the domestic environment was gendered through family patterns of use and symbolic control, girls’ access to and use of computers was encouraged through practices that stemmed from the dominant discourses of 'computers as the future' and 'computers for education'. As this study and the concurrent national studies demonstrated, girls do participate in home computing in more ways and to greater degrees than found in previous studies into game playing and domestic computing. Gender differences, however, still exist in the sense that boys, particularly those from more affluent families, tend to engage in particular forms of computing that lead to greater technical knowledge.

8.1.2.3 Conceptions of childhood and of schooling

The way parents interweave their beliefs about computers as the future, about computers for education and about computers as productivity tools reveals key underlying beliefs about schooling and childhood. Schooling is seen as a place where children prepare for the future by learning important skills, knowledge and understandings. It is not a workplace, as adults understand the term, where children engage in knowledge work in the way that adult knowledge workers do. This conception leads parents to support the notion that schools are places where children use computers in order to learn about them for the future, not use them as tools to improve their productivity as adult knowledge workers do.

Throughout parental discourses there are multiple, and at time contradictory, conceptions of childhood: the child as future adult; the child as vulnerable learner; and the child as one of the computer generation. At times, the interaction of these conceptions creates tensions and dilemmas for parents and strong demands on children. Basically, parents want their children to be 'bi-literate': literate in the new technologies for the future, and literate in the traditional technologies for the present. The child, as a vulnerable learner, is at risk of losing traditional skills, or
predispositions to use traditional technologies if they become too accustomed to using the easier technologies. Within this context, as mentioned previously, some parents and teachers conceive of the computer as a culprit, a device which draws children away from traditional activities.

Teachers also shared these views. Together with parents, they did not see educational computing as essential in the primary school, in the way that reading and writing are essential. They placed educational computing as a peripheral part of the school curriculum, a part of the curriculum that was preparing children for adult-life after school. In no way was it seen as central to today’s schooling or as an essential part of children’s work at school. More importantly, both parents and all but one teacher were silent about the role of computers in improving or transforming teaching and learning. The notion that computers could be used to improve or extend existing learning opportunities or transform such opportunities was not a part of their conceptions.

8.1.3 Children’s uses of the home computer

The symbolic and instrumental meanings of the computer created for children the dual affordances of toy and tool. Children’s own actions further reinforced these affordances as well as reshaping them into new affordances. In this way children played an active part in shaping the affordances of the domestic computer. The various ways children did so will be discussed in the following sections.

8.1.3.1 Children’s common and exotic uses of computers

While the total range of tasks that all children engaged in was quite extensive, the range of common tasks was, in fact, quite limited. The four most common sets of tasks were solo or competitive game playing; composing, editing and decorating written texts; accessing and using information texts; and the technical processes needed to carry out the previous tasks. Participation in these activities did vary with age and gender, although the overwhelming majority of children engaged to some extent in all of these activities. Younger boys, in particular, were the group most likely to focus on game-playing activity, and older girls were the most likely group to engage in creating written texts for leisure. Few children engaged in
exotic activities and even fewer of these engaged in a wide range of exotic activities.

Engagement in exotic activities was related in complex ways to affluence and gender. Parental expertise, access to unusual peripheral devices and parental support to engage in exotic activities were linked to children’s engagement. Boys’ exotic activities were more likely to focus on game playing, Internet use and technical processes, while girls on processes such as desktop publishing and Internet use.

The variety of text types which children created and used was rather limited. Commonly, children used electronic texts such as CD-ROM-based encyclopedia. Exotic activities included browsing and searching Web-based texts. Once they had located them, children viewed, listened to and read these texts. They mostly used the information contained in the written text for their projects and assignments. At times, still images were copied and used to decorate texts. When it came to creating texts, the variety of text types was even more limited. Invariably the outcomes of children’s creations were paper-based written texts that were often simply information reports or narratives. These were at times decorated with selected images, borders or both. Even among children who engaged in a variety of exotic activities, there were no children who created electronic texts such as slide shows, hypertexts, or flat file data bases. Exotic text-creation activities did include manipulating images within draw or paint environments and manipulating sounds and music within a sound or music manipulation programme but these were almost never combined to create multimedia electronic texts. The one exception to this occurred with David, whose snapshot was presented in Chapter 6. David had incorporated sounds and images into his home page on the World Wide Web as part of his leisure activities. He was the only child in the study who, as such, created multimedia texts at home.

This lack of creation of multi-media texts was also found by Sefton-Green and Buckingham (1996), who were investigating adolescents’ creation of computer-based texts in their homes at the same time as this study was undertaken. They argued that even leisure-related text creation required purpose and audience.
Within the current socio-cultural context of children's home computing in 1995-6 no purposes nor audiences for the creation of multimedia texts were evident. School-related tasks which could provide purpose and audience were exclusively paper-based activities. It is reasonable to suggest that as more children access and use the Internet, the World Wide Web may provide both a purpose and audience for the creation of leisure-related electronic texts in the home. If, or when, homes and schools are connected through the Internet such leisure-related activities may even become work-related. In the meantime, as the school, which is dominated by a paper-based and written text culture, continues to shape children's work-related activities at home, most children will continue to create paper-based texts whose meaning is embedded solely within written text.

While a similar profile was found for children's common use in schools, the study did find a small number of examples where some children from some schools were creating different types of electronic texts. At that particular point in time they were stand-alone multimedia texts or data-base texts. No school in this study, in 1995-6, had engaged children in the creation of Web-based electronic texts.

8.1.3.2 *A framework of children's uses*

Children's uses of the home computer fell into two main groups: game-playing and non-game-playing activities. There were four distinct categories of non-game-playing activities: creating texts, using texts, communicating and using technical processes. These activities could be undertaken for either leisure or work-related purposes. Leisure activities could either have playful or purposeful outcomes. Figure 8.1 presents the framework of children's uses which delineates the relationship between the activities, the context of use and the outcomes.

Game playing in the home is by its very nature a leisure activity while creating texts, using texts, communicating, and technical process activities can be either leisure or work-related. Similarly, while work-related activities are by their very nature purposeful, leisure activities can be either purposeful or playful. The power
of this framework is that it provides a basis for understanding how children help to create the affordance of the computer as playable.

![Diagram of Game-Playing Activities and Non-Game-Playing Activities](image)

**Figure 8.1 A framework of children's uses**

### 8.1.3.3 The playable computer

The dominant affordance of the home computer for children was ‘the playable computer’. Such an affordance developed through children’s patterns of game playing and methods of learning to play and to improve their game performance. These patterns of learning and using spilled over to children’s other uses of the computer. Within purposeful work-related tasks, children engaged in episodes of playful behaviour to master new techniques, to try out different possibilities or to solve problems. This process was pleasurable in the same sense that play is. Their pleasure stemmed from the enjoyment of the process as much as from their performance or mastery of the computer environment in which they worked. Figure 8.2 demonstrates how all computer activities lead to playful behaviour, either through playful tasks or playful episodes within purposeful tasks.

Such pathways to playful behaviour were created through the interaction of children’s predisposition for exploratory learning and play and the interactive nature of the computer. In the gaming context such interactivity provides for
visual and, at times, auditory feedback which is central to the improvement of performance. Likewise, in text-creation contexts the visual feedback allows children to evaluate the ‘look’ of their texts. While such evaluation is central to image creation, it also dominated the process of the creation of written texts within word processors, to the point where it could be argued that the dominant affordance of the word processor for children became making written texts ‘look good’. This affordance also seemed to dominate the classroom environment, often with the unwitting collusion of teachers, who themselves at times focused on the ‘look’ of written texts.

<table>
<thead>
<tr>
<th>Game-Playing Activities</th>
<th>Non-Game-Playing Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leisure Activities</td>
<td>Work-Related Activities</td>
</tr>
<tr>
<td>Purposeful Tasks</td>
<td>Playful Tasks</td>
</tr>
<tr>
<td>Playful episodes</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 8.2 Pathways to playful behaviour when using the computer**

The domination of the computer’s affordance of ‘playable’, and children’s own predisposition to use and learn to use computers through exploratory learning are the key elements of use which demonstrate both the co-agency of the computer and the child. The computer and the child interact in reciprocal ways to shape both affordance and use, and in turn they combine to both shape the socio-cultural context of use and be shaped by it. While the level of community affluence and gender play significant roles as structural agents, their role is complex and less definitive because of this dominant affordance of the computer. This dominance provides children with essentially adult-free computing zones, within the home,
and different pathways for boys and girls to arrive at the affordance of the computer as playable and hence amenable to exploratory learning approaches.

Through these interactions, the children’s exploratory approaches and their skill in using them are extended beyond the traditional ‘early childhood’ years and employed in the majority of their interactions with this technology. Significantly, only one teacher in the study readily identified the dominance of the exploratory learning mode and speculated on whether children were developing and refining new and better (or different) ways to learn with computers in school.

### 8.1.4 Differences between home and school computing

According to Mayall (1994a, p.124) “life at school offers little scope for negotiation with the adults in authority ... or for independent activity” compared with life at home. For the majority of children in the study, their sense of control over their computing activity at school was severely limited compared to at home. In general, children had less opportunity to use computers at school, they used them on fewer occasions, and, when using them, did so for shorter periods of time and with less control over how they used them. In a small number of cases, they did not use the computer at school at all.

Significantly, the shorter periods of time that children had to use computers at school seemed insufficient to allow for exploratory learning. Furthermore, the general rule of not fiddling inhibited their use of this approach when problems or new learnings were needed. In tandem with this, few schools had any form of systematic instruction in computer use in place. The absence of such programmes suggests that schools expected children to already know or to quickly ‘pick up’ the knowledge and skills necessary to effectively use the computers for the tasks at hand. This approach would be consistent with the conception of children as ‘the computer generation’.

An alternative or complementary explanation would be that such skill development was not seen as essential for students and that ‘hit and miss’ approaches to computer use and skill development were acceptable or tolerable in
some schools. This alternative approach has credence when considered alongside the findings about teachers' understandings and beliefs. This study found that many of the teachers still considered computing to be a marginal activity with many unresolved pedagogical and technical issues. It was not seen to be central to the primary school curriculum. Teachers shared parents' views about the importance for the future, and some shared the parents' ambivalent attitude to the role of the computer as a productivity tool, being concerned about children's vulnerability to the loss of traditional skills. Generally by drawing on the 'for the future' discourse more than half of the teachers in this study were able to rationalise that computer use was not essential for the present, nor even a priority. Furthermore, the analysis of teacher's beliefs and attitudes to computer use provided insights into their conceptions of children, of curriculum processes and or schooling itself. Children was conceived of as vulnerable learners; the curriculum processes of writing as still focusing predominantly on product rather than on product and process, and on the appearance of written texts rather than the meaning of written texts; and schooling as a place for learning about computers rather than a place for working with computers.

This is a central finding of this study. As such it questions the effectiveness of the myriad of research on factors inhibiting the integration of computers into the curriculum which ignore the central role of teachers' own beliefs and conceptions (Marcinkiewicz, 1993-94; Zammit, 1992). Too often in this literature the focus is on factors relating to organisation and resources, that is, factors outside the control of teachers or the skill and abilities of the teachers.

### 8.2 Significance of the study

This study makes both a theoretical and educational contribution to the body of knowledge encompassing educational computing. These contributions will be discussed in turn below.
8.2.1 Theoretical contributions

The first aspect of the theoretical contribution relates to the study’s further adaption of Gibson’s (1979 and 1982) concept of affordance of physical properties. In the eighties, the concept was extended to the notion of social affordances focusing on social interactions and social perception. However, it has only been in the last ten years that the importance of socio-cultural context has been emphasised within this approach. Valenti and Good (1991) were among the first to argue that cultural practices facilitate and limit the perception of affordances, and allow for the creation of others. Recently, a number of authors (Qvarsell, 1989; Hughes et al., 1987; Crook, 1992; Kerr, 1995) have described children’s interactions with computers using the term “afford”. In all cases, however, they used the term as a synonym for ‘encourage’. In this sense the agency of the computer is privileged over the agency of the user and no recognition is given to the fact that interactions between user and technology can reshape and refine affordances.

In this study the concept is used as a vehicle to explain the reciprocal relationship of influence between children and computers, or more generally between people and technology or the social and the technical. Through the use of this concept, many of the problems associated with both techno-centric and socio-centric approaches are avoided. By using the concept of affordance as the central concept of the theory, the computer is neither viewed as an ‘all powerful device’ which impacts on children’s lives, nor as merely a ‘neutral technology’ whose role is shaped by its users and uses. Similarly, children are not viewed as either the helpless recipients of the social and the technical nor as all powerful agents. Both child and computer are accorded the roles of ‘actor’ and ‘acted upon’, with neither being privileged. The concept of affordance, as used in this study, also highlights the importance of the socio-cultural context within which the interactions between child and computer take place. In particular, the role of the social discourses surrounding children’s use of home computers is explored in ways that elucidate the relationship between discourse (symbolic meanings) and affordances. Using this concept a middle range theory was developed which explains how children
come to conceive of the computer as playable. In this theory, within a socio-cultural context which encourages tool use and permits game playing, children's choice of activities, and their approaches to learning and using the computer, interact with the computer's functional capabilities to create the dominant affordance of the playable computer.

This study also puts forward a tentative theory, separate from the above theory, regarding the way that the discourses in which both parents and teachers participate continues to position 'educational computing' as little more than a peripheral component of the school curriculum. This tentative theory posits that it is the dominance of and interaction between the three following conceptions, about computers, children and schooling, which positions educational computing as peripheral. These conceptions are:

1. the computer as a key to future success of the adult worker;

2. the child as a learner not a worker, and at times a vulnerable learner; and

3. the school as a place of learning, not of a place of work, a place where learning and doing are separated.

This tentative theory requires further research as it provides insight into another layer of the complex process of integrating new technologies into classrooms. Instead of just focusing on discourses surrounding technologies, it links these to discourses surrounding children and school and this linking is important. Rarely are such discourses acknowledged when researchers look at the facilitation and inhibition of change in classrooms using new technologies. Further research on the role these discourses play in shaping classroom computing will need to strengthen the empirical basis for its development by working more closely with teachers and students in classrooms where computers are used.

The study also makes a modest contribution to broader theoretical frameworks and research methodologies through the exploration and use of some of the principles of the emerging field of childhood studies (see Chapter 2 p.23). In particular, a central element of the theoretical framework was that childhood is a social
construction. This allowed the study to make problematic the various concepts of childhood that featured in parents' discourses about computing. Additionally, the central platform of the doctoral research methodology was drawn from the emerging paradigm of childhood studies. This was the accepting of children as credible informants about their use of computers and the context of their use both at home and at school. Too rarely in educational research are children's own voices accepted as important sources of data about their world and daily lives (James and Prout, 1990).

8.2.2 The educational significance of the study

The educational significance of the study stems directly from the above mentioned theoretical developments. The first relates to the role of teachers' beliefs and attitudes in positioning educational computing within the primary school curriculum. The second relates to the playable computer which enables children to use and develop skills in exploratory learning, and to use learning by doing as a preferred learning style. Each of these will be discussed in turn.

8.2.2.1 Educational computing and the curriculum

There are two important educational issues associated with the prevalent conception that schools are places where children learn about computers as the future, not places where they use them for learning or for doing work now. One relates to the separation of learning and working; the other to the centrality of computing in the primary school curriculum for now rather than the future. However, they flow one from the other. If schools were conceived of as places where children do intellectual work, and in the process of doing such work, learn skills and understandings that enhance their work and their understanding of the world in which they live, then it would be almost impossible to argue against the notion that children need the full range of intellectual tools and technologies, both traditional and new, at their disposal to best achieve the outcomes of such schooling.

The notion of the separation of learning from doing which currently permeates schooling is not new to education, nor applied only in relation to the newer
computer-based technologies. Previous historical positionings of reading and writing also separated learning from doing. In the past, both suffered from the notion that learning to read and learning to write did not involve extensive performances of reading and writing, but rather, concentration on learning sets of sub-skills such as phonics, comprehension or grammar (Saxby, 1991; Teale and Sulzby, 1986). Consequently, pedagogies of that time concentrated on learning how to read and learning how to write in isolation from the reading and writing of a range of texts. Many of today’s teachers would find such separations incomprehensible, as today’s discourses, curriculum and classroom practices firmly place learning to read in the context of reading a range of texts, and learning to write in the context of writing a range of texts (New South Wales Department of School Education, 1997).

This issue of the separation of learning and doing is also played out in the commentaries surrounding many of the current theories of learning (McInerney and McInerney, 1994). Relatively recent terms such as situated cognition, learning through apprenticeship and scaffolded learning all imply the convergence of learning and doing, that is of learning through performance. The prevalent conception of parents and teachers that learning about computers and learning to use computers are separate from using computers for learning merely reflects one side of this debate about learning in the wider educational community.

Until this debate is resolved or at least foregrounded in discussions about the use of traditional technologies and new technologies in schooling, the strong and commonly held conceptions of ‘computers as the future’ and of children as learners, will ensure that the new technologies continue to be marginalised. Thus the effective integration of new technologies into schooling requires fundamental rethinking of the conceptions of computing, of childhood, of schooling and most importantly, of learning.

8.2.2.2 Changing approaches to learning

The fundamental rethinking about learning needed for the effective integration of the new technologies into classrooms also needs to take account of the possibility
that today’s children are undergoing a fundamental shift in the way they view and understand the world and its technologies. This study provides strong support that children who regularly use the computer at home for games and other uses are predisposed to exploratory learning and learning by doing, at least when using computers. Even though this is a somewhat more modest claim than that of other authors whose claims include children as ‘aliens in the classroom’ (Green and Bigum, 1993) and ‘new kids on the block’ (Heppell, 1994), it nevertheless provides sufficient evidence to challenge curriculum makers to re-examine their conceptions of children as learners. It raises the question not only about what to teach but how to teach. Do children who regularly use computers in their homes come to school with different orientations to learning, and different sets of orientations to traditional texts, literacies and technologies? The results of this study suggest that they do.

Furthermore, while many of these changes could be viewed in positive ways, such as seeing children in charge of their own learning, they do raise further questions and issues that also need to be addressed: Do these changes include a predisposition to ‘gloss over’ the meaning of texts? Does the computer afford too much attention to the obvious (for example, by providing visual feedback for the surface features of written texts and their looks rather than structural cohesion or meaning)? Does the word processor discourage children from focusing on the less obvious but more important function of writing: to communicate effectively? Authors such as Birkerts (1996) and Stoll (1995) present rhetoric and argument that this is the case, but little empirical evidence exists to confirm their warnings. This study, through an analysis of children’s talk about how they write using a word processor both at home and at school, provides a first layer of empirical evidence. Further research is needed to explore this issue and extend its application to the creation and use of other texts.

Similarly, a range of questions emerge about the playable computer and using texts. With what are the children encouraged to play and to explore? Does computer use encourage careful and considered engagement with the content and meaning of the electronic texts they use? Do children develop a greater awareness
of the body of knowledge within which information is located through their browsing approaches? This study provides no answers. The analysis of children’s talk did reveal that many students were aware of the need to ‘put it into their own words’, but this in itself tells us little.

Overall, the results of this study highlight the importance of educators understanding the reciprocal relationships between the social and the technical such that computers in homes and schools have affordances which shape the role of computers in education. With such understandings, educators will be better placed to make informed decisions about what roles computers and children play in the processes of schooling.

8.3 Reflections on the study

This study was originally conceived in response to a problem that arose in the teaching of a graduate class of teachers who were exploring the computing skills that their students brought to school. As such, part of the development of the study was to locate a theoretical framework which had the power to describe and explain the events and relationships between children and computers in their homes.

It is a strength of the study that the final framework was blended from a diverse range of theories. It is a complementary strength that the analysis of the theories identified a convergence in both the psychological and sociological domains, and the structural and poststructural perspectives. This convergence relates to the recognition of the ‘active’ role children play in their lives and the reciprocity of agency between the individual and cultural artefacts or technologies within the socio-cultural context.

Similarly, the use of children as informants about their daily lives could be considered by some as a strength and by others as a weakness. In one sense, it would be impossible to defend the use of children’s accounts to those whose dominant conception of children is as immature and imperfect adults. For they believe that children are not capable of understanding themselves, their lives and their world sufficiently to act as reliable informants. In championing the use of
children as informants, this study did not abandon quality control measures that should be used in any research that uses accounts and reports of daily lives. Multiple sources of data and multiple researchers were used to enhance both the validity and reliability of the data.

Finally, the major constraint on the study stemmed from the fact that originally the data was collected as part of a sponsored descriptive study, under contractual time constraints. As such, data was collected and analysed in separate phases in each stage of the study, and each phase and stage of the study occurred in rapid succession. This prohibited the profitable use of theoretical sampling during the data collection phases and restricted the opportunities for anything but ‘light’ theorising between stages. Because of this constraint, most of the thorough analysis that led to the emergence of key concepts and theories was in essence retrospective and as such needs to be clearly differentiated from a grounded theoretical approach. This does not in itself detract so much from the findings of the study, but rather, acknowledges that the research methodology was at part in variance from the more tightly structured approach to grounded theory.

8.4 Further research

The study provides many signposts to future research both in the area of children and computers in homes as well as in the broader area of computers and education. Some stem from the need to investigate further, questions partially answered by the study, others are new questions that have arisen as outcomes of the study. They include questions about:

- the playable computer, such as: What is the nature of children’s engagement with the computer? With what are the children encouraged to play and to explore? Does computer use encourage children to engage with the structure, content and meaning of the electronic texts they use? Do children develop a greater awareness of the body of knowledge within which information is located through their playful approaches to finding information?
• questions about the role of teachers’ discourses in shaping classroom computing. These discourses include those about schooling, children, computing and learning.

Answering these questions and continually monitoring children’s relationships with newer technologies, such as Internet use, are vital if educators are to understand better the relationship between children’s home computing and school computing.

8.5 Concluding remarks

It is likely that Australia has some years to go before most of its homes with children have computers and related technologies, particularly those which connect homes through the Internet to children’s schools and the wider information community. This study provided a detailed snapshot of one moment along the road to such a point. In many ways the snapshot could be said to have identified an unexciting time, where younger children did little more than play games, and older children played games and worked at retrieving and presenting information for school-related projects. However, a close analysis of the socio-cultural contexts, of children’s approaches to computing and of the affordances of the computer yielded sufficient evidence to suggest that educators need to question many of the assumptions and practices underlying the way they teach in primary schools if they are to bridge the growing gap between the informal electronic learning in the home and the still predominantly paper-based written-text world of the classroom. The bridging of such a gap is imperative if the immediacy of children’s lives is to be as privileged as their ‘future’. As John Dewey said “Education is not preparation for life, it is life itself.”
References


Education Department of South Australia. (1987). *Schools computing policy*. Adelaide, Australia: Education Department of South Australia.


References


New South Wales Department of Education. (1986). *Using computers in primary schools guidelines.* Sydney, Australia: NSW Department of Education.


Appendices
Appendix A: Examples of information and Consent forms

Date, 1995

Dear Parents,

I seek your permission to interview your child about the electronic technologies they use in the home. The technologies of interest include television, telephones, video-games machines, hand-held electronic games, computers, printers, modems, and CD Rom drives. During the interviews, I will be asking the children questions about what technologies the children use, how they use them, how often and with whom they use them.

The information collected from the interviews will be used as part of a study into children's access to and use of electronic technologies in their homes. The importance of the study stems from the rapid technological changes occurring in our society. While young children are not directly affected by the changes in government and business many of them are experiencing changes in their homes and schools. As schools change in order to help prepare your children for tomorrow's world, one of the best strategies they have is to build on the range of experiences children have in their homes.

A number of children, in each of the years from K-6, will be interviewed. The interview will last about 20 minutes and will take place at times which will not disrupt your child's classroom learning. The sessions will be audiotaped to allow for accurate recording of each child's responses. The responses the children make will be kept confidential. A summary of the results will be made available to the principal later this year, but no child will be identified.

If you are prepared to give your consent please complete the following section and return it to the school by. If you have any questions or would like to know more about the study please do not hesitate to contact us during working hours on 7729200. If we are not available a message can be left with Heather Kelk x6396 and we will return your call as soon as possible.

Thank you

Toni Downes
Principal Researcher,
Faculty of Education
University of Western Sydney, Macarthur.


Consent Form

*Please use a separate form for each child in the family*

I give my permission for my child __________________________ Class: ____________________________ to be interviewed as part of the study of children’s use of electronic technologies in the home.

Signature of Parent/Guardian __________________________ Date: __________

Could you please also answer the following questions about your child. This information will be used to provide an overall picture of the children in the school, and to allow us to select a wide range of children for interview.

Please tick the appropriate box

<table>
<thead>
<tr>
<th>At home my child</th>
<th>Several hours a day</th>
<th>At least once a day</th>
<th>Two or three times a week</th>
<th>About once a week</th>
<th>Less than one a week</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>watches television</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>listens to their own music</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses the telephone to talk to friends etc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plays games on a Nintendo, SuperNintendo, Sega, Megadrive or other games machines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plays games on a computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for writing and /or drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for school projects and homework</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>uses a computer for other purposes:...........................................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>..................................................................................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*please specify*
Appendix B: Stage 1: Discussion group schedule


Who do you play games with? family? friends? yourself? How did you learn to play the games? Who helps you on the Nintendo?..on the Computer? Do you ever read the booklets that come with the games? How do you decide whether to use the computer or the Nintendo? Which do you like best for playing games? Why? Do you think you learn anything from playing games? How often do you use the computer for other things? What are the names of some of the programs you use? How often do you use it for schoolwork? What types of things do you do for school? What programs do you use for schoolwork? Which of these do you get to use at school? How do you use them? How often? Do you like using the computers at school? Why? Do you use computers at school for the same things you use them at home? Do you think learning to play games and learning at school are different? How? Which type of learning do you like best? Why?
## Appendix C: Stage 1: Content coding scheme for children's utterances

### Biographical Details

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Position in family</td>
</tr>
<tr>
<td>010</td>
<td>Do you have a computer at your home?</td>
</tr>
<tr>
<td>011</td>
<td>Do you have more than one computer?</td>
</tr>
<tr>
<td>012</td>
<td>Can you tell us a little about your computer?</td>
</tr>
<tr>
<td>020</td>
<td>Where do you keep the computer/s at your house?</td>
</tr>
<tr>
<td>030</td>
<td>Who owns the computer at your house?</td>
</tr>
<tr>
<td>035</td>
<td>How often is the computer on in your home? .... more than the TV?</td>
</tr>
</tbody>
</table>

### Home

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>060</td>
<td>Are there any rules at your house about using computers? What happens if every one wants to use the computer at once?</td>
</tr>
<tr>
<td>070</td>
<td>What are some of the programs/software you have?</td>
</tr>
</tbody>
</table>

### Uses-Games

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>What games do you have on your computer?</td>
</tr>
<tr>
<td>110</td>
<td>Which games do you play? Which games do you like best?</td>
</tr>
<tr>
<td>120</td>
<td>Do you usually play games by yourself or with someone else?</td>
</tr>
<tr>
<td>140</td>
<td>How long/often/when would you play games? Would you spend most of your time playing games or other uses?</td>
</tr>
<tr>
<td>150</td>
<td>What makes a good game?</td>
</tr>
<tr>
<td>155</td>
<td>After a while what happens in the game? Do you get bored? Do you play games over and over?</td>
</tr>
<tr>
<td>160</td>
<td>What's the difference between educational games and other games?</td>
</tr>
</tbody>
</table>

### Others

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>What other uses do you have for computers apart from playing games? writing and projects etc?</td>
</tr>
<tr>
<td>301</td>
<td>Do you write stories? Do you use the computer for writing? Do you write it on paper first or at computer?</td>
</tr>
<tr>
<td>302</td>
<td>How do you do projects on the computer? Do you write it on paper first or at computer?</td>
</tr>
<tr>
<td>320</td>
<td>Do you have a printer?</td>
</tr>
<tr>
<td>321</td>
<td>Which computer is the printer</td>
</tr>
</tbody>
</table>
attached to?
322 Are you allowed to print on your own? Any rules?
330 Do you have a modem?
331 What is a modem?
332 Are you allowed to use the modem?
333 Who uses it? what for?
350 Do you have a CD Rom computer?
351 Do you use the CD Rom?
352 What do you use it for?
353 How often do you use it?
At School
400 Do you use the computer/s at school?
401 Where are the computers kept? ...library?
410 How do you use the computer at school? What do you use it for?
411 Can/ do you use the school computer to do projects?
412 What do you use the computers/ CD Rom in the library for?
413 Are there any rules at school about using computers?
420 What games/ programs are there at school?
430 How often/ when / how long do you use the computer at school?
431 How do you get to have a turn? -rosters? groups?
440 Do you prefer to use the computers at school? do you like using the computer at school?
460 Why do you have computers at school?
470 Is there any difference between using the computers at home and at school? Do you use the computers at home and school for different things?
Learning
810 When you first started using the computer how did you learn? .. was this at home? at school?
820 How do you learn to play a new game? -home? -school?
830 How do you learn to use/work a new program? -home? -school?
840 What do you learn from using a computer? -home? -school?
850 What do you learn from playing games? -home? -school?
Videos at home
700 How many video recorders in your home?
710 What do you mostly use video recorders for?
720 Is everyone allowed to use the equipment?
Games Machines
500 Do you have a games machine at your house?
501 Why don’t you own a games machine?
510 Who owns the games machine?
520 Do you use the games machines?
530 Are there any rules for using games machines? How do you get to play the games machine if you don’t own it?
540 Where do you keep the games machine?
550 What games do you have?
560 What kinds of games do you like /best?
561 What games are boring?
570 How did you learn to use the games machine?
571  How did you get better at it?
580  How long / How often / When would you play games?
581  Why don't you play them much now?
582  Does anyone rent a game?
590  Are the games on the computer different to the games machine?
591  Why do some of you like the computer better? Which would you prefer? Which do you like best?
592  Do you know anyone who uses it a lot?

TVs at home

600  How many TVs are in your house?
610  Where do you keep them and who owns them?
620  Do you watch TV more than you play games?
630  Are there any rules about watching TV? Programs you are not allowed to watch? who decides?
631  Do you think there should be rules?
610  Programs you like?
640  Do you prefer to watch TV or use the computer?
Appendix D: Stage 1: An example of the children's coded utterances

012P01M6025: We have a CD ROM one and two laptops that belong to my mum and dad's school but they keep them at home.... .... a Macintosh Classic and a 23. Our nan and pop use the 2e, we all use the CD (Apple) and mum and dad use the two laptops. They take them backwards and forwards to work.

012P01M6022: I've got a PC. It's a normal computer and I also have an Apple Macintosh

012P01F6024: I've got an Omega 500, .............. we've got a Commodore and one in the garage. I don't know where it comes from. And my sister's got one. The one in the study is the one everyone uses and the one in the garage no one uses. And my sister has one for herself.

012P01F6026: I've got an Apple Macintosh, It's for the whole family

012P01F6027: I've just got a plain IBM

020P01F6024: mine's in a sort of room opposite the kitchen

020P01F6026: We've got a study room upstairs that's full of desks and computers

020P01M6022: My Macintosh is in my room and the IBM's in the study

020P01M6025: The CD rom is in the lounge room and the laptops can go anywhere

Mum and Dad - they're both teachers and they need them for schoolwork - they use them on the lounge

020P01F6027: We have a sort of granny flat down the back room. And yesterday we put our TV and Nintendo in it and we formed it into our study

030P01M6022: I own the Macintosh and the PC, everyone in the family because my pa bought it and my mum bought it and my uncle and aunty bought it and my other uncle bought it

030P01F6026: My mum, because she has to work for school

030P01F6024: Everyone just owns it, but my dad really bought it

030P01M6025: We all own the CD rom and the two laptops belong to my mum and dad's school

030P01F6027: My mum bought it because she bought it when she was still at University but most likely everyone owns it

040P01F6027: Reading and writing letters

040P01M6025: Games and school work

040P01M6022: Projects and games

040P01F6024: Just usually play games on the computer.

040P01F6026: Projects and writing and games .... .... I'm busy all week and in our class we get heaps of projects, so I would use it for
projects more. But I play Sega more than using the computer. I play games only occasionally.

070P01F6024: I've got Print Shop, Mavis Typing, Type Attack, Chuck Rock, Kid Pix, Super Print 1 & 2, Super Ski, Golf

070P01F6026: Print Shop, Kid Pix, Claris Works that's for typing and stuff like that.

We've got heaps of Maths games and lots of writing - works and stuff

070P01M6022: I've got Claris Works, Kid Pix, Printing and Painting, Prince of Persia, Duck Tales, Duke Newcomb, Doom 1

070P01M6025: Monkey Island 2, Dropper, a whole hard drive full of games, Claris Works, Encyclopedia

070P01F6027: We've got Banks St Writer, Print Shop. And we've got a hard disk and like where you put the floppy disks and we've got a cabinet that full of disks and we mainly use the hard disk instead of loading them in.

140P01F6026: YOU SAID BEFORE THAT SOMETIMES YOU SET UP A GAME AND PLAY IT FOR A COUPLE OF HOURS TO PLAY, IS THAT RIGHT? DO SOME OF THE GAMES TAKE A LONG TIME? Adventure games and that. If you can only get up to a certain point you get really frustrated sometimes. If you play a long adventure game and you can only get up to a certain point and you do that time and time again, then you get bored with it.

155P01F6027: YOU KNOW THOSE GAMES WHEN YOU GET TO THE END OR YOU GET PAST THE POINT THAT'S FRUSTRATING AND MAYBE EVEN GET TO THE END, THEN WOULD YOU PLAY IT AGAIN? No because you've got to get back again... ... sometimes with some computer games what you do if you get bored with it is you just experiment and look for more bits. Like say there might be more worlds and you go into some places to see how many points you can get.
## Appendix E: Stage 2: Children's interview schedule

### Biographical Details

<table>
<thead>
<tr>
<th>ID: How many brothers and sisters do you have? Who is the eldest? How old? Next? Age? etc</th>
<th>Name</th>
<th>m/f</th>
<th>m/f</th>
<th>m/f</th>
<th>m/f</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many adults are there at home? Who are they? (if split families - prompt for both homes)</td>
<td>mum</td>
<td>dad</td>
<td>other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think your parents use a computer at work (place of work)? (check for other adults in house)</td>
<td>mum</td>
<td>dad</td>
<td>other</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>yes/no</td>
<td>yes/no</td>
<td>yes/no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Home

<table>
<thead>
<tr>
<th>How many computers do you have at your house? Working? Being used?</th>
<th>yes/no</th>
<th>yes/no/don’t know</th>
<th>yes/no/don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you tell us a little about your computer? Is? Type? Appearance? (check none are games machines etc) Does the computer have a mouse?</td>
<td>desk/lap</td>
<td>desk/lap</td>
<td>desk/lap</td>
</tr>
<tr>
<td>How long have you had that computer?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who owns the computer/s at your house? (dad, mum family brothers sisters, other)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where do you keep the computer/s at your house? (shared: lounge, dining, hall, kitchen, family, whose study? whose bedroom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a printer at home? (if more than one computer - attached to which computer?) Black &amp; White/Colour?</td>
<td>Yes/no</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
<tr>
<td>B&amp;w/col</td>
<td>B&amp;w/col</td>
<td>B&amp;w/col</td>
<td></td>
</tr>
<tr>
<td>Do you use the computer/s? if No....... Why?</td>
<td>Yes/no</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
<tr>
<td>Does the computer have a CD Rom drive attached?</td>
<td>yes/no/don’t know</td>
<td>yes/no/don’t know</td>
<td>yes/no/don’t know</td>
</tr>
<tr>
<td>if yes - are you allowed to handle the CDs yourself??</td>
<td>yes/no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a modem at home? (check that they know what a modem is)</td>
<td>yes/no/ don’t know</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if yes Who uses the modem? What for? Are you allowed to use the it?</td>
<td>Yes/no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a games machines at home as well as the computer?</td>
<td>Yes/no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if yes Do you use the games machine?</td>
<td>yes/no</td>
<td>yes/no</td>
<td></td>
</tr>
<tr>
<td><strong>Stage Two: Interview Schedule</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>If yes..... As much as the computer?</strong></td>
<td><strong>If no..... Why?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who else uses the computer at your home?</td>
<td>all, dad, mum, brothers, sisters, other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anyone who doesn't?</td>
<td>dad, mum, brothers, sisters, other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What do the adults in the family use the computers for?</td>
<td>dad - work/games/other?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>................anything else?</td>
<td>mum - work/games/other?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What do your brothers and sisters use the computers for?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>................anything else?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who uses the computer most at your house?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where did you first learn to use a computer?</td>
<td>home/school/ other place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How long ago was that?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>If did not learn at home</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How long have you been using a computer at home?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>How often do you use the computer at home?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would you spend most of your time playing games or other uses?</td>
<td>games / other uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you use the computer more than you watch TV?</td>
<td>yes/no / depends/ don't know</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you prefer to use the computer by yourself or with other people?</td>
<td>self/others/depends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Why</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When you do use it with someone else who do you use it with?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At home ... When you first started using the computer how did you learn? who helped you?</td>
<td>can't remember - so long ago / don't know</td>
<td></td>
<td></td>
</tr>
<tr>
<td>taught / watched / fiddled-used/read/ don't know</td>
<td>dad, mum, brothers, sisters, others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When something goes wrong with the computer can you usually fix it yourself?</td>
<td>yes mostly sometime depends no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you good at that sort of thing? (try for elaboration)</td>
<td>yes/no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When you need help who do you mostly ask? Why?</td>
<td>dad, mum, brothers, sisters, others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What rules are there at your house about using computers?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>What happens if every one wants to use the computer at once? Are there any special rules about who gets to use it or what types of use get first priority?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Games

<table>
<thead>
<tr>
<th>Question</th>
<th>Several hours a day</th>
<th>At least once a day</th>
<th>Two or three times a week</th>
<th>About once a week</th>
<th>Less than once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you play games on the computer? (not the games machine)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Which is your favourite game? (on computer or games machine)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Why?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How do you learn to play a new game?</td>
<td>play it, read,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>watch ... who?, taugt ... by whom?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you good at playing games?</td>
<td>yes/no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When playing a game can you work most things out for yourself?</td>
<td>yes mostly sometimes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>depends no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When you need help where do you get it from?</td>
<td>dad, mum, parent,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>brother, sister, siblings, others</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>help files, manuals, clue books</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>What do you learn from playing games?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Uses - Others

<table>
<thead>
<tr>
<th>Question</th>
<th>Several hours a day</th>
<th>At least once a day</th>
<th>Two or three times a week</th>
<th>About once a week</th>
<th>Less than once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use the computer for writing?</td>
<td>yes/no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often do you use the computer for writing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are they your own stories or ones from school?</td>
<td>home/school/both</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>How do you write your stories? on paper first or straight into the computer?</td>
<td>paper/computer/both/depends on?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you print out your stories?</td>
<td>yes, no depends?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What program/software do you use for writing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How did you first learn to use the ...................(name) program?</td>
<td>use it, fiddle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>read, watch ... who?, taught ... by whom?</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When you need help with the ............(name) where do you get it from?</td>
<td>dad, mum, older</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>brother, older sister, other</td>
<td>help files, manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tell me about the last time you did some writing on the computer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you use your computer for drawing, painting or making things?</td>
<td>yes/no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What do you draw or make?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What programs do you use? (prompt for software names or some details)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How did you learn to use the ............(name) .program/s?</td>
<td>use it, fiddle, read,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>watch ... who?,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When you need help with the .......... (name) where do you get it from? if person .... Why that person?</td>
<td>dad, mum, older brother, older sister, other help files, manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tell me about the last time you used the computer to ....?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you do projects using the computer? to get info? to present info?</td>
<td>Yes/no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What programs /software do you use to do your projects?</td>
<td>Yes/no</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What other schoolwork/ homework can you/ do you do using the computer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you use any other programs? What type? What for?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What do you learn from using the computer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**At School**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use the computer/s at school?</td>
<td>yes, no</td>
</tr>
<tr>
<td>What programs do you use? What for? Do you do anything else with the computers?</td>
<td></td>
</tr>
<tr>
<td>How often/ when / how long do you use the computers at school?</td>
<td></td>
</tr>
<tr>
<td>How do you get to use them / have a turn? - rosters? groups?</td>
<td></td>
</tr>
<tr>
<td>How did you learn to use the computers at school?</td>
<td></td>
</tr>
<tr>
<td>When you are trying to do something new or something goes wrong can you mostly fix it yourself?</td>
<td>yes mostly sometimes depends no</td>
</tr>
<tr>
<td>When you need help who do you mostly ask?</td>
<td>teacher m/f</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>What rules are there at school about using computers?</td>
<td>classmate m/f?</td>
</tr>
<tr>
<td>Do you use the computers at home and school for different things? what things?</td>
<td>yes/no</td>
</tr>
<tr>
<td>What other differences are there between using the computers at home and at school?</td>
<td>yes/no</td>
</tr>
<tr>
<td>Do you prefer to use the computer at home or the computers at school? Why?</td>
<td>yes/no</td>
</tr>
<tr>
<td>What do you learn from using the computers at school?</td>
<td></td>
</tr>
<tr>
<td>Is there anything else you would like to say about using computers at home or at school?</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix F: Stage 2: Code book for Children’s Interviews

<table>
<thead>
<tr>
<th>Var_name</th>
<th>Definition</th>
<th>Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>ID</td>
<td>text</td>
<td>0000-9999</td>
</tr>
<tr>
<td>SCH</td>
<td>School</td>
<td>num (CAT)</td>
<td>1-AB/CA, 2- CO, 3- AR, 4-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AT, 5- CB/FR, 6-ME, 7-CA, 8-SR, 9-BA.</td>
</tr>
<tr>
<td>GRADE</td>
<td>Class</td>
<td>num (CAT)</td>
<td>3- Year 3, 4-Year 4, 5-Year</td>
</tr>
<tr>
<td>GENDER</td>
<td>Gender</td>
<td>num (CAT)</td>
<td>5, 6-Year 6</td>
</tr>
<tr>
<td>POS</td>
<td>position in family</td>
<td>num (CAT)</td>
<td>0- only child, 1- 10</td>
</tr>
<tr>
<td>NO_BRS</td>
<td>No of brothers in family</td>
<td>num</td>
<td>0-10</td>
</tr>
<tr>
<td>NO_SRS</td>
<td>No of sisters in family</td>
<td>num</td>
<td>0-10</td>
</tr>
<tr>
<td>NO OLDER</td>
<td>No of older Siblings</td>
<td>num</td>
<td>0-no siblings/self, 1- 10</td>
</tr>
<tr>
<td>GEN OLDER</td>
<td>Gender of older siblings</td>
<td>num (CAT)</td>
<td>0-no siblings/self, 1-Female,</td>
</tr>
<tr>
<td>GEN OLDEST</td>
<td>Gender of oldest sibling</td>
<td>num (CAT)</td>
<td>2-Male, 3-Both, 999-missing</td>
</tr>
<tr>
<td>AGE OLDEST</td>
<td>Age of oldest sibling</td>
<td>num</td>
<td>0-no siblings/self is, 1-30</td>
</tr>
<tr>
<td>NO ADULTS</td>
<td>Number of adults at home</td>
<td>num</td>
<td>0-no siblings/self is, 1-30</td>
</tr>
<tr>
<td>ONE ADULT</td>
<td>title of adult in the home if</td>
<td>num (CAT)</td>
<td>2-Male, 999-missing</td>
</tr>
<tr>
<td>OTHER ADULT</td>
<td>Title of other adult</td>
<td>text</td>
<td>2-Father, 3-others</td>
</tr>
<tr>
<td>MUM WUSE</td>
<td>Mother use of computers at work</td>
<td>num (CAT)</td>
<td>0-doesn’t go to work, 1-no, 2-no, 3-don’t know</td>
</tr>
<tr>
<td>DAD WUSE</td>
<td>Father use of computers at work</td>
<td>num (CAT)</td>
<td>0-doesn’t go to work, 1-no, 2-no, 3-don’t know</td>
</tr>
<tr>
<td>OTHER WUSE</td>
<td>Other adult use of computers at</td>
<td>num (CAT)</td>
<td>0-doesn’t go to work, 1-no, 2-no, 3-don’t know</td>
</tr>
<tr>
<td>HOME</td>
<td>How many computers do you have</td>
<td>num</td>
<td>0 - none, 1-5</td>
</tr>
<tr>
<td>C1 WORK</td>
<td>Computer 1 Working?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C1 USED</td>
<td>Computer 1 Being used?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C2 WORK</td>
<td>Computer 2 Working?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C2 USED</td>
<td>Computer 2 being used?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C3 WORK</td>
<td>Computer 3 working?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C3 USED</td>
<td>Computer 3 being used?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C4 WORK</td>
<td>Computer 4 working?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C4 USED</td>
<td>Computer 4 being used?</td>
<td>num (CAT)</td>
<td>0-no computer, 1-no, 2-yes, 3-don’t know</td>
</tr>
<tr>
<td>C1 DESC</td>
<td>Description of Computer 1</td>
<td>text</td>
<td>0- no computers, text</td>
</tr>
<tr>
<td>C2_DESC</td>
<td>Description of Computer 2</td>
<td>text</td>
<td>0 - no computer 2, text</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>------</td>
<td>------------------------</td>
</tr>
<tr>
<td>C3_DESC</td>
<td>Description of Computer 3</td>
<td>text</td>
<td>0 - no computer 2, text</td>
</tr>
<tr>
<td>C4_DESC</td>
<td>Description of Computer 4</td>
<td>text</td>
<td>0 - no computer 2, text</td>
</tr>
<tr>
<td>SELF_HOW</td>
<td>How do you work the computer?</td>
<td>text</td>
<td>text</td>
</tr>
<tr>
<td>C1_OWN</td>
<td>Who owns the computer 1 at your house?</td>
<td>num (CAT)</td>
<td>0- no computer, 1- family, all, shared, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- dad’s work, 10- mum’s work, 11-other</td>
</tr>
<tr>
<td>C1_OWN2</td>
<td>description of other owner of computer 1 at home</td>
<td>text</td>
<td>0- no extra description, text</td>
</tr>
<tr>
<td>C1_WHERE</td>
<td>Where is computer 1 kept in the home?</td>
<td>num (CAT)</td>
<td>0- no computer, 1- lounge, dining, hall, kitchen, 2- family room, spare room, playroom, kid’s study, 3- adult’s study / office, 4- adult’s bedroom, 5- bros’ bedroom, 6- srs’ bedroom, 7- my bedroom, 8- other</td>
</tr>
<tr>
<td>C2_OWNS</td>
<td>Who owns the computer 2 at your house?</td>
<td>num (CAT)</td>
<td>0- no computer 2, 1- family, all, shared, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- dad’s work, 10- mum’s work, 11-other</td>
</tr>
<tr>
<td>C2_OWN2</td>
<td>description of other owner of computer 2 at home</td>
<td>text</td>
<td>0- no computer 2, text</td>
</tr>
<tr>
<td>C2_WHERE</td>
<td>Where is computer 2 kept in the home?</td>
<td>num (CAT)</td>
<td>0- no computer 2, 1- lounge, dining, hall, kitchen, 2- family room, spare room, playroom, kid’s study, 3- adult’s study / office, 4- adult’s bedroom, 5- bros’ bedroom, 6- srs’ bedroom, 7- my bedroom, 8- other</td>
</tr>
<tr>
<td>C3_OWN</td>
<td>Who owns the computer 3 at your house?</td>
<td>num (CAT)</td>
<td>0- no computer 3, 1- family, all, shared, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- dad’s work, 10- mum’s work, 11-other</td>
</tr>
<tr>
<td>C3_OWN2</td>
<td>description of other owner of computer 3 at home</td>
<td>text</td>
<td>0- no computer 3, text</td>
</tr>
<tr>
<td>C3_WHERE</td>
<td>Where is computer 3 kept in the home?</td>
<td>num (CAT)</td>
<td>0- no computer 3, 1- lounge, dining, hall, kitchen, 2- family room, spare room, playroom, kid's study, 3- adult's study / office, 4- adult's bedroom, 5- bros' bedroom, 6- srs' bedroom, 7- my bedroom, 8- other</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>C4_OWN</td>
<td>Who owns the computer 4 at your house?</td>
<td>num (CAT)</td>
<td>0- no computer 4, 1- family, all, shared, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- dad's work, 10- mum's work, 11- other</td>
</tr>
<tr>
<td>C4_OWN2</td>
<td>description of other owner of computer 4 at home</td>
<td>text</td>
<td>0- no computer 4, text</td>
</tr>
<tr>
<td>C4_WHERE</td>
<td>Where is computer 4 kept in the home?</td>
<td>num (CAT)</td>
<td>0- no computer 4, 1- lounge, dining, hall, kitchen, 2- family room, spare room, playroom, kid's study, 3- adult's study / office, 4- adult's bedroom, 5- bros' bedroom, 6- srs' bedroom, 7- my bedroom, 8- other</td>
</tr>
<tr>
<td>BUY_OFTEN</td>
<td>How often does family buy software?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>BUY_DECIDE</td>
<td>Who decides what to buy?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>BUY_LAST</td>
<td>What was the last program bought?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>BUY_WHY</td>
<td>Why bought?</td>
<td>text</td>
<td>0- don't own computer, 1- no, 2- yes-b&amp;w, 3- yes -col, 4- don't know</td>
</tr>
<tr>
<td>C1_PRINTER</td>
<td>Is there a printer attached to computer 1?</td>
<td>num (CAT)</td>
<td>0- no printer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C1_PUSE</td>
<td>Are you allowed to use the printer attached to computer 1?</td>
<td>num (CAT)</td>
<td>0- no printer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C1_CDROM</td>
<td>Is there a CDROM attached to computer 1?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C2_PRINTER</td>
<td>Is there a printer attached to computer 2?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes-b&amp;w, 3- yes -col, 4- don't know</td>
</tr>
<tr>
<td>C2_PUSE</td>
<td>Are you allowed to use the printer attached to computer 2?</td>
<td>num (CAT)</td>
<td>0- no printer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C2_CDROM</td>
<td>Is there a CDROM attached to computer 2?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C3_PRINTER</td>
<td>Is there a printer attached to computer 3?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes-b&amp;w, 3- yes -col, 4- don't know</td>
</tr>
<tr>
<td>Variable</td>
<td>Question</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>C3_PUSE</td>
<td>Are you allowed to use the printer attached to computer 3?</td>
<td>num (CAT)</td>
<td>0- no printer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C3_CDROM</td>
<td>Is there a CDROM attached to computer 3?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C4_PRINTER</td>
<td>Is there a printer attached to computer 4?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes-b&amp;w, 3- yes -col, 4- don't know</td>
</tr>
<tr>
<td>C4_PUSE</td>
<td>Are you allowed to use the printer attached to computer 4?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes</td>
</tr>
<tr>
<td>C4_CDROM</td>
<td>Is there a CDROM attached to computer 4?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes, 3-don't know</td>
</tr>
<tr>
<td>MODEM</td>
<td>Is there a modem at home?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes, 3- don't know</td>
</tr>
<tr>
<td>MODEM WHO</td>
<td>Who uses the modem?</td>
<td>num (cat)</td>
<td>0- don't own modem, 1- family, all, shared, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- other</td>
</tr>
<tr>
<td>MODEM FOR</td>
<td>What do they use the modem for?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>MODEM_SELF</td>
<td>Are you allowed to use the modem?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes</td>
</tr>
<tr>
<td>GMAC OWN</td>
<td>Is there a games machine at home as well as the computer?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- no, 2- yes- Sega /Nintendo, 3- yes - only hand held (game boy/gear)</td>
</tr>
<tr>
<td>GMAC_USE</td>
<td>Do you use the game machine more or less than the computer</td>
<td>num (CAT)</td>
<td>0- don't own games machine, 1-more, 2-less</td>
</tr>
<tr>
<td>ELSE_USE</td>
<td>Who else uses the computer at home?</td>
<td>num (CAT)</td>
<td>0- don't own computer, 1- family, all, everyone, 2- kids, brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- other</td>
</tr>
<tr>
<td>ELSE_NOUSE</td>
<td>Anyone who doesn't?</td>
<td>num (CAT)</td>
<td>0- no one, 1- family, all, everyone, 2- brothers &amp; sisters, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- other</td>
</tr>
<tr>
<td>DAD_USE</td>
<td>What does your dad use the computer for at home?</td>
<td>list of numbers separated with commas</td>
<td>0-doesn't use, 1- works from home/ home business, 2- brings home work from office, school etc, 3- family work (budget, bills, writing letters etc), 4- voluntary work (for local organisations e.g. soccer club), 5- study, assignments, uni work</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Data Type</td>
<td>Notes</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>MUM_USE</td>
<td>What does your dad use the computer for at home?</td>
<td>list of numbers separated with commas</td>
<td>0-doesn’t use, 1- works from home/ home business, 2- brings home work from office, school etc, 3- family work (budget, bills, writing letters etc), 4- voluntary work (for local organisations e.g. soccer club), 5- study, assignments, uni work etc, 6- plays games, 7-other</td>
</tr>
<tr>
<td>SIBS_USE</td>
<td>What do your brothers and sisters use the computers for?</td>
<td>text</td>
<td>0- doesn’t use, 1- school work/ study/ projects, 2-writing, 3-games, 4--other</td>
</tr>
<tr>
<td>BROS_USE</td>
<td>What do your brothers and sisters use the computers for?</td>
<td>list of numbers separated with commas</td>
<td>0- doesn’t use, 1- school work/ study/ projects, 2-writing, 3-games, 4--other</td>
</tr>
<tr>
<td>SRS_USE</td>
<td>What do your brothers and sisters use the computers for?</td>
<td>list of numbers separated with commas</td>
<td>0- doesn’t use, 1- school work/ study/ projects, 2-writing, 3-games, 4--other</td>
</tr>
<tr>
<td>MOST_USE</td>
<td>Who uses the computer’s most at your house?</td>
<td>list of numbers separated with commas</td>
<td>0- don’t own computer, 1-family, all, everyone, 2-brothers &amp; sisters, 3-me, 4-parents, 5-dad, 6-mum, 7-brother/s, 8-sister/s, 9 - other</td>
</tr>
<tr>
<td>LEARN</td>
<td>Did you first learn to use the computer at home or at school?</td>
<td>1-home, 2-school, 3-don’t know/can’t remember</td>
<td>0- doesn’t use, 1- school work/ study/ projects, 2-writing, 3-games, 4--other</td>
</tr>
<tr>
<td>FIRST_USE</td>
<td>Can you remember the first thing you learnt on the computer?</td>
<td>text</td>
<td>1- a few weeks, 2- a few months, 3- less than a year, 4- about a year, 5- several years ago, 6- so long ago can’t remember</td>
</tr>
<tr>
<td>LEARN_AGO</td>
<td>How long ago did you first learn to use the computer at home?</td>
<td>num (CAT)</td>
<td>1- a few weeks, 2- a few months, 3- less than a year, 4- about a year, 5- several years ago, 6- so long ago can’t remember</td>
</tr>
<tr>
<td>USE_HAGO</td>
<td>If you first learnt to use a computer at school how long have you been using a computer at home?</td>
<td>num (CAT)</td>
<td>1- a few weeks, 2- a few months, 3- less than a year, 4- about a year, 5- several years ago, 6- so long ago can’t remember</td>
</tr>
<tr>
<td>USE_OFTEN</td>
<td>How often do you use the computer at home?</td>
<td>num (CAT)</td>
<td>0- never, 1- hardly ever, 2-less than once a week, 3-about once a week, 4- two or three times a week, 5- at least once a day, 6- several hours a day</td>
</tr>
<tr>
<td>LESS_TV</td>
<td>Have you watched less TV since you got the computer?</td>
<td>num (CAT)</td>
<td>0-don’t watch TV, 1-no, 2-yes</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>TALK</th>
<th>Do you talk about the computers with your friends and family?</th>
<th>num (CAT)</th>
<th>1-no, 2-yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TALK_DESC</td>
<td>Do you talk about the computers with your friends and family?</td>
<td>text</td>
<td>0- don’t talk/ no description, text</td>
</tr>
<tr>
<td>ALONE</td>
<td>Do you mostly use the computer alone or with other people?</td>
<td>num (CAT)</td>
<td>1- alone, 2- with others</td>
</tr>
<tr>
<td>USE_WITH</td>
<td>When you do use it with some one else who?</td>
<td>num (CAT)</td>
<td>0- don’t own computer, 1- family, 2- friends, 3- me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- family and friends, 10- other</td>
</tr>
<tr>
<td>HOW_LEARN</td>
<td>At home when you first started using the computer how did you learn?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>WHO_HELPED</td>
<td>who helped you at first?</td>
<td>num (CAT)</td>
<td>0- don’t own computer, 1- family, 2- friends, 3- no-one, me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- other</td>
</tr>
<tr>
<td>WHO_HELPS</td>
<td>who helps you now?</td>
<td>num (CAT)</td>
<td>0- don’t own computer, 1- family, 2- friends, 3- no-one, me, 4- parents, 5- dad, 6- mum, 7- brother/s, 8- sister/s, 9- other</td>
</tr>
<tr>
<td>WHY_HELLPER</td>
<td>why is that person the helper?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>FIX_IT</td>
<td>when something goes wrong with the computer can you usually fix it yourself?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>RULES</td>
<td>what rules are there at your house about using the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>G_OFTEN</td>
<td>How often do you play games?</td>
<td></td>
<td>0- never, 1- hardly ever, 2- less than once a week, 3- about once a week, 4- two or three times a week, 5- at least once a day, 6- several hours a day</td>
</tr>
<tr>
<td>G_FAV</td>
<td>Which is your favourite game?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G_REASON</td>
<td>Why?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>G_LEARN</td>
<td>How do you learn to play a new game?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>G_BETTER</td>
<td>How do you get better at it?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>G_LEARN</td>
<td>what do you learn from playing games?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>WRITING</td>
<td>Do you use the computer for writing?</td>
<td>num (CAT)</td>
<td>1-no, 2-yes</td>
</tr>
<tr>
<td>W_WHAT</td>
<td>What do you write?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>W_STORIES</td>
<td>Do you write stories separate from the ones you</td>
<td>num (CAT)</td>
<td>1-no, 2-yes</td>
</tr>
<tr>
<td>Code</td>
<td>Question</td>
<td>Type</td>
<td>Response Options</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
<td>--------------------</td>
</tr>
<tr>
<td>W_HOW</td>
<td>Do you write your stories, on paper or straight into the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>W_PRINT</td>
<td>Do you print out your stories?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>W_DESCRIBE</td>
<td>Describe how did your last piece of writing?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>WSOFTWARE</td>
<td>What program/software did you use for your writing?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>DRAW</td>
<td>Do you use your computer for drawing, painting or making things?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>D_WHAT</td>
<td>What do you draw or make?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>PROJECTS?</td>
<td>Do you do projects using the computer?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>P_GETINFO</td>
<td>to get information?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>P_PRESENT</td>
<td>to present information?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>P_SOFTWARE</td>
<td>What programs/software do you use to do your projects?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>P_DESCRIBE</td>
<td>Describe how did your last project using the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>HOMEWORK</td>
<td>What other schoolwork/homework can you do using the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>OTHER</td>
<td>Do you use any other programs? What type? What for?,</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>LEARN_FROM</td>
<td>What do you learn from using the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_BETTER</td>
<td>Do you think you do better at school because you have a computer at home?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>SCH_COMP</td>
<td>Do you use the computer/s at school?</td>
<td>num (CAT)</td>
<td>1- no, 2- yes</td>
</tr>
<tr>
<td>SCH_USE</td>
<td>What programs do you use? What for? Do you do anything else with the computers?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_OFTEN</td>
<td>How often do you use the computers at school?</td>
<td>num</td>
<td>0- never, hardly ever, 1- three or four times a term, 2- less than once a week, 3- about once a week, 4- two or three times a week, 5- at least once a day, 6- several hours a day</td>
</tr>
<tr>
<td>SCH_LONG</td>
<td>How long is each time at the computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_TURNS</td>
<td>How do you get to use them / have a turn? - rosters? groups?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_LEARN</td>
<td>How did you learn to use</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Question</td>
<td>Response Type</td>
<td>Values</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>SCH_HELP</td>
<td>When you need help who do you mostly ask?</td>
<td>num (CAT)</td>
<td>0-, 1- me, I'm the expert, 2- teacher, 3-male classmate, 4-female classmate, 5-other</td>
</tr>
<tr>
<td>SCH_FIX</td>
<td>What happens if something goes wrong with the school computer?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_RULES</td>
<td>What rules are there at school about using computers?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_DIFF</td>
<td>Do you use the computers at home and school for different things?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_PROJECTS</td>
<td>Do you ever use the computers at school to do projects?</td>
<td>num (CAT)</td>
<td>0- don't use computers at school, 1- no, 2- yes</td>
</tr>
<tr>
<td>SCH_OTHER</td>
<td>What other differences are there between using the computers at home and at school</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>PREFER</td>
<td>Do you prefer to use the computer at home or the computers at school?</td>
<td>num (CAT)</td>
<td>0- don't use computers at school, 1- home, 2- school</td>
</tr>
<tr>
<td>PREFER_WHY</td>
<td>Why?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SCH_LFROM</td>
<td>What do you learn from using the computers at school?</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>SAY</td>
<td>Is there anything else you would like to say about using the computers at home or at school?</td>
<td>text</td>
<td></td>
</tr>
</tbody>
</table>
Appendix G: Stage 2: Example of transcribed interview

Boy, Year 5, School 1b (I: Interviewer, S: Student)

Side One
I: Grant, do you have any brothers or sisters?
S: Oh yes, I've got 3 other brothers.
I: And how old are your brothers?
S: I'm 10, one's 17, one's 20 and one's 23.
I: So they're all older than you?
S: Yes.
I: Do they all live with you at home?
S: Um, two live with me, one is 15 um 17 and 20 that live with me. The other one who's 23 lives in New York.
I: How many adults do you have at your house?
S: Two.
I: Is that mum and dad?
S: Yes.
I: And do either mum or dad use a computer at the place where they work?
S: Yes both of them.
I: Both. Can you tell me the name of the kind of work that they do? Mum?
S: Mum works at X School Library.
I: So school library.
S: Yes. And my dad works at an accounting firm so he uses it for accounting.
I: I'll just write accounting. And Grant, how many computers do you have at home?
S: Three.
I: Are they all working at the moment? Like or are some broken?
S: No. One, we don't use it but the other two we do.
I: So you use these and this one you don't, right?
S: Yes.
I: And pick which ever one you use the most, or which ever one is the best computer and tell me a little bit about it.
S: I like, it's a laptop. It's an IBM. It's a 486 DX2-66 and it's got a PCM-CIA slot.
I: That phone is disturbing. It's got ...
S: And it's got a sound and modem card in it.
I: And the other computer?
S: That's a 486 DX4-75. And that's got a built in modem and speakers. And a quad speed CD rom.
I: I was going to ask something then and I can't remember what it is. It's a desk top computer, right?
S: Yes.
I: OK that's fine. And the one that you never use is ...
S: An Apple.
I: Apple. That's fine. Which one do you prefer to use? Which do you use the most?
S: The laptop. (*Why*)
I: Tell me how you turn the laptop on to do something on it? Like what happens and that ...
S: Well there's two levers ... you mean type in to use it or how I ...
I: Turn it on, start with that.
S: There's two levers on the side and you push them in. And then you push the screen up. And then there's
a little round button up the top that you press to turn the computer on. And then you come into screen I: where it says High Mem, it's testing the memory. And then it says all these things like PCM is installed I: and the modem card is installed. And then at the end temporary modem card is installed using interrupt 5. And then it comes onto C colon. Then if I want to use my CD rom I always, sometimes put the CD in and type DOS shell. And if I don't want to use DOS shell then I put all my games in a games directory, and I type CD games then enter and that puts in the games in the games directory like CD Doom 2.

I: That's fine. When you select the games that you want does it have a mouse or a roller?

S: Yes, a track ball.
I: A trackball, yes.
S: But I have got a mouse with it.
I: And the 486 has a mouse?
S: Yes.
I: OK fine. Who owns the laptop?
S: Well all my brothers do because we all use it mainly that one for work. And we sometimes use games for that. My brothers use it.
I: And the desktop computer?
S: They all use it but they never use the desktop, so that's mine sort of.
I: They all use it, but who would you say owns it?
S: Well me actually because they don't use it any more. They use the laptop because they take it to uni.
I: And the laptop is portable so you can use it anywhere. And the desktop computer, where do you keep it?
S: I keep it, we've got a little computer room that's right next to the study.

It's like a lounge room with all the Super Nintendo and that.

I: And the Apple, is that in there or is it packed away?

S: It's packed away.
I: Grant how often does your family buy or get new things for the computer, programs or bits and pieces?

S: Maybe once every two months.
I: And if you were going to get something new for the computer who would decide what to get?
S: I would make the suggestion but the decision would be with dad.
I: And what was the last new thing you got for either computer?
S: For the laptop I just got this game called Theme Park. And for the desktop I got a piracy version from Hong Kong of Space Simulator.
I: I won't tell anybody.
S: You get them for $7 and here they're $100.
I: I know. And why did you get Theme Park?
S: Oh actually I got it ... I subscribe to this magazine called Strategy Plus and they've got like a software page. And look down the thing and get a ticket and then you send that away and you get the programs. I've got Theme Park, you create a Theme Park, it's like Luna Park, you create your own ghost rides.

Yes, I know the one. Do either the laptop or the desktop have a printer?

S: Yes, one's got a desk jet ...
I: Mm.
S: The desktop's got a desk jet and the laptop's got a bubble jet printer.
I: OK. Black and white or colour?
S: They're both colour.
I: Are you allowed to use the printers?
S: Yes.
I: CD rom drive?
S: The desktop's got a CD rom and the laptop doesn't.
I: The modem?
S: Yes.
I: Who uses the modem?
S: I do. And sometimes my brothers because they get some information.
I: And what for? To get information and...
S: One's doing it on the JFK assassination. They get, they download information ...
I: From the Internet?
S: Yes. They extract it and put it on disk.
I: And is that what you do with it as well or do you do something else with it?
S: Oh you know Future Kids?
I: No.
S: It's for kids. It's like a computer ...
I: Club?
S: Yes like a computer club but it's meant for kids to learn. I was doing a project with my friend and we both did the project together on computers. But I didn't have the project so he just sent it through the Internet to me.
I: Mm.
S: It's through this program called Telex.
I: I know, I know the one. Right so, I'll just write this over because I'm running out of space. So you can communicate like with whoever you want to?
S: And I've got the program Compuserve and Net Launcher.
I: Compuserve and Net Launcher. Grant, do you have a games machine like a Sega, Nintendo, Game Boy?
S: Yes, I've got a Game Boy, a Super Game Boy and a Super Nintendo.
I: That's not all that important except, except do you use these more or less than the computer?
S: Well um ...
I: Like just judging by how much time you spend on them?
S: No, not at all.
I: So you use the computer more?
S: Yes I spend more time on the computer. Yes and use it a bit more.
I: And why is the computer better?
S: Mainly because of the programs and the games. Well not exactly the games but some programs like the Music programs I can create my own music and use the Internet. That's all I use it for. And you don't really realise the time that you're on the computer. You know in Windows, it's like you want to play just a game or use Word and it ends up being you start at 9 o'clock and finish at 10.30.
I: All right now, do all of your brothers that are at home use the computers?
S: Um yes.
I: Yes because you said they did uni and that kind of thing.
S: Yes they use the laptop.
I: Mum, dad, do they both use the computers that you have at home?
S: Sometimes ....
I: They've both got one at work, is that right?
S: Yes. Sometimes mum uses it home when she looks up Encarta or Word or that. My dad uses Microsoft Word, or Excel or sometimes Power Point.
I: Microsoft Word and Excel.
S: Actually Fox Pro.
I: And Fox Pro.
S: Fox Pro that's it.
I: Mum looks up Encarta and something World?
S: I think it was um World Book, I: How long ago was that, that you first started learning to use the computer?
that's it, World Book.

I: So that's for her work. And dad's stuff is that for his work or just for interest?

S: Yeah, they both ... um dad's got that at his work and Mum's got that at her work but we've got those programs at home as well.

I: At home. Your brothers, what do they use the computer for?

S: The one who's 17, does his essays on it.

I: Is he doing the HSC?

S: Yeah he's in Year 11. He uses it for his essays but he also does play games sometimes. And the one who's ...

I: Is that to relax between study?

S: Yes he has a game of Flight Simulator or something.

I: And ...

S: And the one who's 20 he's on it the whole time because he's got his university to do. He's got these assignments and things to do.

I: Who uses the computer most at your house? So would it be this brother?

S: Adam.

I: Out of everybody?

S: Well it would be out of me and Adam because he's sometimes at university.

I: And you can use it when he's not.

S: Yeah and even when I'm in bed I use it because I just take the laptop with me.

I: Did you first learn to use the computer at home or at school?

S: At home.

I: And can you remember the first thing that you learnt to do on the computer?

S: Yes, how to get into Windows. You have to type Win. That's the first thing I ever learnt.

I: How long ago was that, that you first started learning to use the computer?

S: About two or three years ago.

I: And at school, how long have ...

S: Actually I've never used it at school.

I: You've never used it at school ever?

S: Unless I was using it to look up a book.

I: Sometimes like in prep or Year 1 or Year 2, you play like games?

S: Oh in Year 3 I used to play these games.

I: OK. And about how many times in the week do you use your computer? You said that sometimes you use it for several hours because the time just whizzes by ...

S: Yes.

I: Would you use it every day or most days or a couple of times a week?

S: I wouldn't say every single day but four or five times.

I: Do you think you've watched less TV since you've got the computer or hasn't it made any difference?

S: Actually I think I've watched more TV and more computer because ...

I: Both increased together.

S: Yes because as soon as I get home I do my homework and then I've got all this time to watch TV and do computer.

I: You like to get the homework out of the way first.

S: Yes.

I: Do you know any friends or family who talk a lot about computers?

S: Yes, a really good friend of mine, his name is X.

I: School friend or outside school?

S: He's outside school. He was in the Sydney Morning Herald, a huge picture of him with computers.

I: So he talks a lot about computers?

S: Yes.
I: What, what does he talk about, the machine, the sort of equipment he's got or the games or the programs?
S: The programs we share because we just send it through the Internet. Whenever we've got new programs we just send it through, which programs we've got.
I: He's a handy friend to have. Do you mostly use your computer by yourself or with other people?
S: By myself.
I: And if you were going to use it with someone else who would it be?
S: What for?
I: For anything. So would it be someone on the Internet that you would be using it with?
S: I'll just tell you one's for the Internet and I've got a network cable through the desktop and the laptop so you know you can play two games at once. When you're (inaudible) somebody.
I: So would it be one of your brothers?
S: Yes unless a friend comes over.
I: Which one?
S: It would be the one who's 17.
I: At home when you first started learning to use the computer how did you learn?
S: When I typed I started exploring all these programs. And then I got a game. And I had to read the instructions how to install a game. And then I kept on getting games and programs, and all these sounds and modem and I just learnt off it.
I: So who helped you learn?
S: I'm not, maybe. Sometimes my friend helped me. I just explored and ... My friend did.
I: And who helps you now when you get stuck with something?
S: Stuck? I only get really stuck. Last year I got stuck with something. I deleted the File Manager.
S: Stuck? I only get really stuck. Last year I got stuck with something. I deleted the File Manager.
I: Oh that's hard.
S: No I didn't delete it but I deleted the property for it and I couldn't get into File Manager because I wanted to install the Simpson's screen saver so I had to quickly ring them up and ask how to get it back.
I: So you ring the help from ...
S: I only get stuck ... I only get stuck in Windows. If it's in Microsoft Word I get my brother to do it. The rest if I'm in trouble I just exit the program as soon as possible. And why does your brother help with Microsoft Word, why because he uses it a lot?
I: Yeah, maybe. He uses it a lot.
S: Great OK. The next question you've probably already answered. If something goes wrong with the computer can you usually fix it yourself?
I: You said mostly you could, and if you know it's serious exit as soon as possible.
S: Yes.
I: Are there any rules at your house about using the computer?
S: No.
I: No rules. I've got do homework first?
S: Yes.
I: That's kind of a rule because you've got more time to do other things. How do you share the computers with your brothers and mum and dad?
S: Mum and dad ...
I: Like who's got more important work?
S: My brothers. And like sometimes I want to do, we get a story to write down. Like on Monday we got this
project to do about Bogong Moths. And we had to write an essay on it, a story and I wanted the computer because my other brother was using the one with the modem and the one who's 20 years old was using his computer. So I was stuck so I had to do ... the first time in about two months I had to do it on a piece of paper.

I: I'll write down you have to wait until a computer is spare. Aborigines eat, they used to eat Bogong Moths.

S: I know, they still do. They have to scrape them off the walls.

I: They're only found in that region or something.

S: In NSW in the Snowy Mountains.

I: Now these are a couple of game questions. How often do you play a game on the computer? Now if you use it four or five times a week, do you use it every time for games or is some of the time you use it for projects?

S: I use it about five times a week. I use the games about twice or maybe once even. Once or twice.

I: Do you have a favourite game, Grant?

S: Yes I've got actually two favourite games. One is Rise of the Triad but I don't use it much any more because I've finished because I've got all the codes. The other one is, I've got Flight Simulator, version 5.1 and I get Flight Shop with that and I can make my own planes with that and then I fly them.

I: Finished with the codes. Was it fun working out the codes or did you get them from somebody?

S: I got them off the Internet, I just downloaded them off Compuserve and that. There's games and tricks and that. I just look under Rise of the Triad and I just download them and that.

I: You don't think it'd be more fun working them out yourself?

S: It's impossible.

I: Why did you like Rise of the Triad before you got sick of it?

S: First Stephen had it and then I borrowed it off him. And then I downloaded it onto my computer and I just liked it because of the graphics.

I: Good graphics, OK.

S: Yeah it's really good.

I: How do you learn to play a new computer game that you've never played before?

S: In second term I got Sailing Simulator called Sail 95. It's The America's Cup. And it's really hard because you have to use the rudder and you have to go ... the line and the spinnaker and all. It's really hard. Before I install it I read the instructions and sometimes I just experiment but normally I'd use the instructions.

I: Supposing it's like Sail Simulator and you experiment and it's really hard ...?

S: Yeah.

I: And it is really hard ...

S: Then I'd read the instructions.

I: And you really can't or you're really having some trouble would you then go to like Compuserve and see if you can get some help or ... ?

S: I tried doing that once but they hadn't heard of it. They only heard of it a few weeks ago and I got it in New Zealand two months ago.

I: Right, OK. How do you get better at playing a computer game?

S: I use it more often.

I: And what do you think you learn from playing computer games, games on a computer?
S: What do I learn from computer I: games?
I: Yes.
S: I learn that there I crashed or there I died, then I know to go around it or I wanted to shoot that guy down or (inaudible)
I: I think that sums it up. Do you use your computer for writing at all?
S: Yep, every single week.
I: You write stories and assignments? Anything else? Messages on the modem, Internet?
S: Yeah sometimes if I run out of letters to people.
I: So you do some things that are not for school. Do you write on paper first or straight on the computer?

Side Two

(A few questions missing due to turning tape)

S: Yeah I say I need this and I copy it onto a disk. And I put that in and I downloaded that and I use that as a ...
I: Background?
S: Yes you know how you've got the backgrounds in Windows and all that. I used that as the background to Sydney Harbour and I pinpointed my dad's work.
I: Do you do your projects or assignments on the computer?
S: Yes.
I: Usually. Do you get information?
S: Yes.
I: And you present them? Do you use ... you've already told me what you use. You use Word, Publisher, Powerpoint. For information, encyclopedias?
S: Yeah, I use, I hate Encarta and I hate Grollier. I use the World Book. It's got the most information.

World Book Interactive. Can you tell me, you've already told me about the Bogong Moth thing which is kind of a project. Can you go to the project you did before that one and tell me what you did with it?

S: Yeah. You had to invite four people, that's not including yourself, and you had to invite them for dinner. And that could include anyone who's alive or dead. And you had to make a menu up. And you had to write about them and will they all get along and why do you like them and why did you invite them.
I: Right OK. So did you do different fonts and headings and graphics? Yes? And so you had to find information about the people, particularly if you picked someone historical like ...
S: Well actually I didn't pick anyone historical because I didn't want too much
I: You didn't want go into detail.
I: That's an interesting mix. Mm OK good. Is there any other sort of homework that you can do using a computer?
S: Yeah. Sometimes I ..., well it's not really homework, but sometimes the teacher wants something because they haven't got the Internet down there. Or some friends want some codes so I get that. But I don't use it for any other homework besides that. Maybe if I'm doing maths I quickly get the calculator.
I: Calculator, yes. Do you have any other programs that might be interesting that we haven't talked
about? You've got CompuServe, S: No.
Telex ...
I: No.
S: We've got this program. I hardly ever really use it. It's Net Scape. We use Net Launcher instead.
S: Actually my class got banned from the computer at school because someone ruined the search terminal, someone deleted it, so my class got banned.
I: And any games that you use regularly apart from Doom and Rise of the Triad and Flight Simulator?
I: So you've got a few hackers in there?
S: Yes you know (inaudible) souvenir demo. It's called Wacky Wheels. S: When I grow up I want to be a hacker.
And I've got the demo versions. I bought one, I bought a different I: Of course we don't know who the S: Yeah we know.
version. I bought one that's (inaudible) S: But we won't tell anyone.
I: Yeah, you get the magazines. What do you think you learn from using the computer?
S: Yes. Did you watch ... you know the Net?
I: Yes.
S: That was really good. I like how you can change someone's identity.
I: So what did they delete the ...?
S: It was a computer for looking up books and they looked in trash. And then they said take away in the trash.
I: All right.
S: The worst thing about Windows 95 is that it is exactly like Macintosh but Macintosh has got the icons on the right and Windows 95 has got the icons on the left. It's stupid.
I: So is Windows 95 an imitation of the Macintosh?
S: Actually I looked in the Sydney Morning Herald, Macintosh is better than Windows 95. That's like CD rom software and all. But I don't fancy Windows 95, it's not the best.
I: It's got bugs.
S: Yes it's got a hundred unknown bugs.
I: At least you can find some of them out if you use it.
S: Yes I've got this virus called Junkie and it deleted the whole hard disk. And I only had that Windows, only
had a Windows virus thing. I had to buy this other one that could detect it and wipe out the hard drive.

I: Yes you have to keep updating the virus scans otherwise Junkie will figure out a way to get round it. Now tell me what they have on the school computers even though you don't use them so that I've got an idea about the range of stuff.

S: In the library they have the search terminal which got deleted. You're not allowed to use it now. They've got another two other computers, a Macintosh LC 5.

I: 575?

S: Yeah that's it. No I wasn't thinking of that one. It's an LC 3 or LC 2.

I: Oh they're old.

S: In 1993 they were the latest Macintosh.

I: And now they have Power Macintoshes and Quadras and Performas.

S: Which ones do you use?

I: I only have an LC because that's what I can afford. I'd use a Power Macintosh if I had enough money. So you've got the search terminal which helps you locate information or books. Is it like a catalogue?

S: Yes books. You can see if someone's borrowed them and you can look up Paul Jennings.

I: Authors and stuff.

S: They give you a list of books and you choose one.

I: And do you have a computer in your classroom that you're now banned from?

S: That's a LC 2. The teachers use that one because they've got a network with all the other classes.

I: And that's the Quick Mail is it?

S: Yes. I've got E-mail on my computer but it says enter the password and I don't have a clue what it is ...

I: Fiddle around until you find out.

S: I can't get into it.

I: That comes with Office, the Office package. You probably have to register and you get an E-mail address and you probably have to pay to register.

S: Yeah my dad's got E-mail through his office.

I: All right so what does your classroom computer have on it, your LC 2?

S: Before we had the network, we only got the network in maybe second term of last year. Before that people just ... Games?

I: Writing?

S: Actually we've got no games whatsoever on it.

I: No games. So is there a writing program on it?

S: They've got writing on it yeah.

I: So is it MS Word or ...?

S: Yeah but no one ever uses it and sometimes there's a little round microphone thing on the side and you speak into it and you press play.

I: So will I write hardly ever for how often do you use computers at school?

S: Never.

I: Never OK. And so there's not much point in me asking how long is your computer time or how you get a turn or how did you learn to use computers at school? That might be relevant.

S: Yeah I did, I did do an assignment on Cooma.

I: At school?

S: Which I did ...

I: Part of it?
S: I did two days of Cooma when we went on camp, I did that at school. And I learnt how to use the Word program but it's totally different to ...

I: What happens if something goes wrong with the school computer? What happened when someone deleted ... ?

S: The whole class got banned and if they find out who did it they owe the school a new computer. But they did find out.

I: Maybe making them fix it up back up again might be more appropriate than sort of buying a whole new computer. So to use an LC would you say that you used your knowledge that you had from the home computer to use that or is it just pretty basic?

S: No Macintoshes are pretty easy to learn. I don't like Macintosh but I still say that they're easier.

I: Are there any other differences between using a computer at home and at school?

S: Yes. When you turn on the computer at home it just goes into the start of DOS and when you turn on a Macintosh it just goes Welcome to Macintosh.

I: Any other differences? You obviously do more time at home, spend more time on it?

S: Yes. I think there's a lot more icons in Windows than Macintosh. It's like Windows 95 Macintosh you've only got four icons and then you open them all up and there's a whole range of icons ...

I: The icons are on the left.

S: No Macintosh, they're on the right.

I: Left on Windows. And do you prefer to use the computer at home or at school?

S: At home.

And why is that?

I: Mainly the programs and I know how to use the computer at home. Not as much at school.

S: Did you say you have better programs or more programs or just more familiar programs?

I: I've got better programs at home and I've got more programs. So for what do you learn from using the computer at school, is the answer to that, nothing?

S: No, how I can use Windows 95. It's totally easy. Because you don't have that at home?.

I: Windows 96. August 24th it comes out, it comes out actually before August 24th. I'll try to get it before that. But it might come out August the 24th.

S: Do you use the computers at home and at school for different things do you think?

I: At school sometimes I use it.

S: Is at school like mucking around?

I: Maybe if I've got a really big essay and I need to do all the work I sometimes use it at school to pull it up.

S: And what are the main things that you do at home?

I: The main things that I do at home? Like writing, assignments, Internet. Which would be your first choice of things to do?

S: Internet. And then I'd do writing because I want to get all of my homework out of the way. And then if I've still got spare time I'd use the games.
### Appendix H: Stage 3: Children's' computer use diary

<table>
<thead>
<tr>
<th>Date</th>
<th>What I did</th>
<th>Software</th>
<th>Time Started</th>
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Appendix I: Stage 3 interview schedules for children, parents and teachers.

Children’s interview schedule

1. General discussion re Diary - need to clarify each activity - motivation - where from, who with - self others, watching / doing, output / outcome
2. Other ways that you use the computer at home that is not in the diary?? (do you use the Internet at all?)
3. If you filled out a similar diary for school over the last two weeks what types of activities would be in it?
4. Other ways that you use the computer at school? - in the school library, in a school computer activity / club?
5. Where else apart from home and school do you use a computer? - friends, relatives, local library, arcades, etc....what do you / have you done with computers in these venues?
6. At home - who teaches you most about using computers / do you help / teach / show / share / with others?
7. At school - who teaches you most about using computers / do you help / teach / show / share / with others?
8. What do you think of when you think about playing with the computer at home?
9. What do you think of when you think about playing with the computer at school?
10. How is playing with the computer different from playing with other things or people?
11. What do you think of when you think about working with the computer at home?
12. What do you think of when you think about working with the computer at school?
13. What do you think of when you think about thinking with the computer at home?
14. What do you think of when you think about thinking with the computer at school?
15. What do you think of when you think about learning with the computer at home?
16. What do you think of when you think about learning with the computer at school?
17. Do you think the computer helps you work better?
18. Do you think the computer helps you think better?
19. Do you think the computer helps you learn better?
**Parents’ interview schedule**

1. When did the family buy the computers?
2. What were the reasons behind the purchase?
3. At the time of getting the computer, how did you think it would benefit your children’s education?
4. Were you and your partner able to use the computer before you purchased it? Where did you learn to do so, and where do you use them outside of the home?
5. What do you and your partner use the computer for in the home?
6. Who uses it most in the family? What do they do with it?
7. Are you happy (comfortable with the way the children are using the computer? What about (name of child in the study)?
8. How would you describe how he/she is using the computer?
9. Why do you think she/he is interesting in using the computer?
10. What do you think he/she likes about it?
11. What do you think she/he gains from using it? ... having it at home?
12. Does this match up with your expectations when you first got the computers?
13. How do you think having access to all this information helps them learn better / differently from the way you learned when you were at school?
14. Do you think using a word process or changes the way they write? How? Do you think it improves the quality of what they do?
15. How is the home different now there is a computer in it?
16. Do you know much about how she/he uses the computer at school? What are they doing? Are you happy with what’s happening at the school?
17. How do you think the school could improve its use of computers?... or how do you think they should be using the computer?
18. Do you think the educational benefits are different between the home and the school?

**Teachers’ interview schedule**

1. Do you have a computer at home? Access to the Internet? If so what do you use if for? How often do you use it?
2. What were the reasons behind the purchase?
3. At the time of getting the computer/access to the Internet, how did you think it would benefit your work as a teacher?
4. Where you (and your family) able to use the computer before you purchases it? If yes – where and how?
5. Do you use computers within the school? Which ones? What for? How often
6. What do you see the main benefits for the school? Yourself? The students?
7. How do you think schools could best use computers / use the Internet?
8. Are you happy (comfortable) with the way the children in the school / in your classroom are using the computers? What about (name of child in the study)?
9. How would you best describe your students use of the computers? .. What about (name of child in the study)?

10. Why do you think that children are interesting in using the computers? What do you think they like about it?

11. What benefits do you children gain from using a computer in their home? What about (name of child in the study)?

12. Do you think using a word processor changes the way they write? How? Do you think it improves the quality?

13. Do you think having access to all this information on CDs and the Internet helps children to learn better/ differently from the way children learning when there were not computers in schools and homes? How?

14. Do you think homes and childhood are different now there are computers everywhere? How? Is schooling different? How?

15. Do you think the educational benefits are different from home to school?
Appendix J: Stage 3: Excerpts from transcripts

Excerpt from a child’s transcript

I: Firstly can you tell me has your computing equipment that you’ve got at home changed at all since last year, since I talked to you?
S: A tiny bit. Now we’ve got a laptop. It’s just a normal laptop, with Sony 486 DX2-66, 8 RAM. We bought an external, we bought a sound card with it now. And we just use that now, just to use for word-processing. And on the 1st of November, on Saturday before you guys come we’re going out to get another computer.
I: Right because, what’s the reason for that?
S: Well it’s a bit too slow and we didn’t need it, it just didn’t turn out like that. So we’re going to get now a Pentium Pro 200
I: Have you selected that already?
S: Yes, yes. 32 RAM.
I: Yes that’s a good size.
S: And we’ll probably upgrade it to 64 or something. 32 RAM.
I: What else will it have with it?
S: An 8 speed CD rom, 32-bit sound pack. An external 33.6 kms NetComm modem.
I: An external, what did you say then?
S: An external modem, 33.6. Two megabytes of PCI video. 2.1 gigabyte hard drive. 17” monitor. What else does it have? The zip drive, you know the 100 megabyte zip drive.
I: Yeah.
S: And a flat-bed scanner, flat-top scanner, colour scanner.
I: Are you getting a printer with that?
S: We’ve already got a BJC 4000.
I: What is you printer?
S: A bubble-jet 4000.
I: If I could just go through, last year you had a laptop?
S: Yes.
I: But everyone was kind of using it, is that right, it was a bit of a ... (squash)
S: Yes.
I: Because your brothers and you were all trying to use that one, right?
S: Yes.
I: And then, oh that’s right and they took it to uni to do their work, is that right?
S: Still does. We still have trouble.
I: And then you had your 486 desktop computer with the modem and CD rom, is that right? So this is an extra, oh and there was also an Apple but nobody used it, right?
S: Yes.
I: Now so do you still have all of that?
S: No.
I: No?
S: Not the 486 desktop.
I: All right. So what have you done with that?
S: Sold it I think.
I: You think?
S: Yes.
I: You weren’t there when it happened, it just went?
S: Yes.
I: Right so do you think you advertised it or did you trade it in for the new computer or?
S: No. I think he just traded it in to one of those computer stores or something. I don’t know what my dad did with it.
I: OK so your dad did that? And the Apple, what did you do with that? You had it packed away.
S: Yes.
I: It’s still packed away?
S: Yes.
I: So on Saturday, you will have three computers again?
S: Yes.
I: Now is this new one is that going to be yours or to share with your brothers or whose is it going to be?
S: That one’s going to be my one. See I’ve got three other brothers. So that one’s going to be my one. And my other brother ...
I: What’s his name?
S: Stephen.
I: That helps me. Is it PH or V?
S: PH. He’s in New York now, doing a degree or something. And he’s coming back in January and I think we’re going to buy him the Pentium computer with everything that that has.
I: Right OK. And what are your other brothers’ names?
S: Michael, he doesn’t use a computer at all. And Adam, he’s going to upgrade the laptop and put a ..... (docking?) station and CD rom and modem and he can have that.
I: OK. All right now. Do your mum and dad use one at home at all?
S: My mum works at X in the library, so she uses the Internet and everything, the computers there. If they need to use the computer at home, I just help them. They usually just use Word or anything so.
I: So they would use yours then because Adam has his off, yes. (at uni)
S: He’s just done a major assignment for university so I didn’t get to use the computer.
I: Mm. OK that’s if mum needs to use it. And does dad ever use one at home?
S: No, he never does. Maybe once in about 6 months. He uses it for word-processing.
I: But he uses one at work?
S: Yes.
I: Because he’s an accountant.
S: He’s got one at work, yes.
I: And you’re going to put the new computer in the computer room, is that right or your bedroom?
S: It might go in my bedroom.
I: You’re not sure yet.
S: No.
I: All right, Grant, just going back to the diary, can you just remember a few of the things that were in it. You know it doesn’t have to be in order or anything, just a few activities that you had in it and can you tell me about them and why you did them and what you did?
S: I’ve got a good memory of what I did. I had to write a story for homework and then edit it. It was a draft. Then I had to do a final copy. And then print it out. And then a few hours later, my dad had to make a letter-head for a client or something. So I had to help him make it. That was for the first day.
I: All right. Just going to the letter-head, what program did you use?
S: Microsoft Word.
I: How did you do it?
S: We just started off. We just tabbed the tabs at the centre. And then we wrote you know Brian Vogel, chartered accountant on there.
I: So was there was some discussion between you and your dad about what it should look like?
S: Yes there was. We had to fix it a tiny bit.
I: You had to what, fix it?
S: Yes position it. And the date and
that.
I: Position the words and date. And I
guessed you printed it out then?
S: Yes we printed it.
I: And then would he take that and
photocopy it to make a few of them?
S: No he only needed one of them, so he
printed that one out. And
whenever he needs another one, we
saved it on the computer so he can
just print it off and then photocopy
it.
I: OK so what other sorts of different
things did you do?
S: Right now, we haven’t got the
Internet on that laptop, so my friend
Tom Jackson, he’s from the school
in 6B, he lives right opposite me. He
and me use the Internet.
I: So you go over to Tom’s and use the
Internet over there.
S: Yes sometimes. But I haven’t got
the Internet and I made my own e-
mail address. I can go to anyone’s
computer and just check my e-mail.
I: Oh I see. All right so is Tom there
when you check the e-mail?
S: Yes.
I: You’re sort of together. Who are
you getting e-mail from?
S: From my friends that I tell my e-
mail address.
I: So are these friends that you know
or are they computer friends that you
don’t know?
S: No I know them. But some of them I
don’t because I go on MIRC, you
know what MIRC is, I-R-C chat?
I: Yes.
S: You just meet some of them and
they tell you their e-mail address and
you start e-mailing them.
I: Mm. So that’s M-E-R?
S: M-I-R-C
I: M-I-R-C, yes.
S: And you meet people.
I: So you swap Internet addresses, is
that right?
S: Yes.
I: So you mail each other but you
don’t really know who they are?
S: Yes but like I met a girl called
AstroGirl, it was on AstroGirl. And
my best friend’s sister knows her.
I: Mm.
S: So I can always meet her or
something. But when I log onto
MIRC, I-R-C, you can log on to
anything, you can log on to Russia
or the USA so I log on to Sydney so
I know. But some people from
Melbourne are there or Western
Australia. So I get to know a few
people.
I: So you get to sort of know people
from other cities in Australia?
S: Yes.
I: OK. What else do you do on the
Internet? Now you had the Internet
last year, didn’t you? That was on
your ...
S: 486
I: On your 486. But that’s gone at the
moment. So you’re waiting for
Saturday the new one to get that?
S: Yes.
I: And the laptop doesn’t have it on yet
but you might get it. OK that makes
sense. What else do you do or did
you do on the Internet when you had
it?
S: The Internet, I just go to a few sites.
There’s a really good site, I told
everyone, Happy Puppy. It’s got the
top I think 20 games or 100 games
or something. And you can
download them, like Duke Nukem
and Quake and Death Rally.
I: Download games.
S: So do you want my e-mail address?
I: Oh yeah give us that, why not.
S: AV2
I: I think you’d better write it out. I’m hopeless at writing these things. I can e-mail you and you can tell me more about your diary. Are you getting out of anything right now?
S: Work. But in ten minutes we’ve got PE.
I: So is that a U is it or a V?
S: AV.
I: So I know the difference.
S: What is your e-mail address?
I: Oh I don’t have one yet. I mean I do but I don’t know what it is. Can you remember any other activities from your diary?
S: Yes. Having a game of Doom 2. Trying to finish, no not trying to finish the game because I’ve done that. Trying to find out all the secrets for each level.
I: And you did that by yourself, the game?
S: Yes.
I: And how long would you have played it for?
S: Oh you play it for ages. You don’t realise the time. You do some of the levels for at least 40 minutes sometimes. And normally I do about 4, so over an hour.
I: Good all right. Are there any other ways that you use the computer at home that wasn’t in the diary that particular week?
S: A game called Sail 95. I didn’t use that in those particular weeks.
I: Is that another one that you’ve got to have a fair amount of time to use it?
S: That one. Oh it’s a sailing simulator. It’s the America’s Cup which is pretty long. You’ve got to know how to sail a boat to use sail that. You know you’ve got to move the sails.
I: OK.
S: I want to get the game, you know Flight Sim and Quake. Or maybe, oh no.
I: So do you look for games on the Internet that you can download?
S: Yeah but I got the Duke Nukem shareware version. It doesn’t work now.
I: It doesn’t work the same as the real thing?
S: Oh it does. It’s the first six chapters or something. Like you know it doesn’t have everything that the full version has. And well now you’ve got the Shareware you don’t look forward to the real thing because you know you’ve finished all the levels. I don’t like Sharewares.
I: Let’s just go on a bit because I’m going to be running a bit late. If you filled out a similar diary for school over the last two weeks, what sorts of things would be in it as far as computer activities?
S: What, like for the school computer?
I: Yes.
S: Well using the library’s computer downloading Mazard and all that. Like I’m doing a music project so I needed to download off the CD rom.
I: So that was information that you were downloading?
S: Yes. Cracking into my teacher’s coding and Quick-Mail. I’ve done that twice.
I: Just hold on a minute because I can’t write that fast.
S: Are we running late or something?
I: Oh it doesn’t really matter I just told David that I would talk to him at 11.30 so, but that’s all right, it doesn’t matter.
S: He will tell you all about bulletin boards. He knows everything about bulletin boards.
I: Does he?
S: Yes.
I: Oh OK. Now you cracked into your teacher’s code on the e-mail and the Quick-Mail, is that the one?
S: Yes.
I: So what do you do with that, you look at what the teachers are saying to each other?
S: No.
I: No?
S: You’d get detention for that. But I told the headmaster and now he has to change the code. He’s changed it twice already.
I: Uh uh.
S: So I just got detention.
I: How did they know it was you?
S: No because they saw me do it.
I: You’ve got to be a bit sneakier than that. Did you get into trouble?
S: Oh no. And I do all the word-processing for the class usually. If someone’s writing a story, I can do it a bit faster and a bit better.
I: Now just so I’ve got this and I’m not confused, you go to the high school is it for computer lessons like in a computer room is it?
S: Yeah but it’s not IBMs it’s Macs.
I: That’s on Macs is it? Is that once a week?
S: We used to go once a week but now we don’t go.
I: At all?
S: Yes.
I: Right. And that was for one period supposed to be what forty minutes, thirty minutes?
S: Thirty minutes.
I: But why don’t you go at all now?
S: I think the class was just mucking up or something. It’s just a waste of time. You don’t learn anything in there. Except typing, like typing A-E or something.
I: All right so before that at school, was it your teacher that took you there or is there a computer teacher?
S: No it’s my teacher.
I: So he would just take the class up to the high school and spend the time in there. So he was what trying to teach you to type?
S: Yes.
I: Anything else that he was trying to teach you to do?
S: Just typing skills.
I: And I guess people weren’t too enthusiastic about that?
S: Oh they were. We’d get to go to the computer room. But people just didn’t do anything. They talked and stuff. We’d use Claris Works.
I: If you were going to change anything at school, what would you change in terms of using computers?
S: From Macs to IBM. Get the Internet in every room, every classroom. Put CD rom in every classroom. And let every boy bring in their laptop. Three people bring in their laptop, that’s all. And be allowed to do work at school.
I: So just considering the space in a classroom, considering that you’ve got to have desks and all that. How many computers do you imagine there being?
S: Per classroom, just one computer.
I: But an IBM with the Internet and CD rom.
S: And make up a roster.
I: So make a roster. OK that’s good, thanks David, Grant I mean. Where else apart from home and school do you use a computer?
S: Friends.
I: So friends.
S: At the Motor Show I once used it. I hacked into Audi’s computer.
I: At home who teaches you most about using computers?
S: My brother.
I: Um.
S: Adam.
I: And what's he studying at uni?
S: Marketing. Economics.
I: So he shows you a few things?
S: On Word. If I don't know something quickly.
I: And you kind of share things together that you've found out?
S: Like he showed me Auto Correct yesterday. Where you try and type in "the" you type in "t-e-h" and you press space-bar and it automatically
I: Good OK. We're up to 7.
S: And we've got to go to 19?
I: Yes but the bottom ones are fairly quick. At school who teaches you most about using computers?
S: Mr X. David's teacher.
I: So on the classroom computer, do you help or teach or show anyone else what to do?
S: No.
I: What do you think of when you think about playing with the computer at home?
S: Well it just sets your mind into a mode where all you think of is the game.
I: Say that again a bit more clearly. Sets your mind into a mode..
S: Where you're only thinking about the computer game.
I: Do you get a lot of time to do computer games?
S: Yes.
I: I think you told me last year that you like to do your homework first when you get home do you still do that?
S: Yes.
I: And what do you think of when you think about playing with the computer at school?
S: There are no games at school.
I: Right so what sort of software do you think the school should be using?
S: Well they shouldn't really be using Doom 2. But things like Flight simulators and car games like Need for Speed and games like that.
I: So what do those sorts of things teach you, assuming that school is there to teach you things?
S: It's just a fun-type break.
I: Do you think schools have a responsibility in the computer area to teach you like other skills?
S: No not really.
I: You know like you were saying that Adam taught you Auto Correct, that's the sort of thing I mean, like specific things?
S: No not really because we're not getting any computer time. Unless you put CD in and you could look up what the information and that but they don't really teach you here.
I: But they should, is what I'm getting at.
S: Yes they should.
I: You think they should ...
S: So people will know how to learn the Internet and learn games and know how to use CD rom.
I: Teach you how to run the Internet and teach you how to run CD rom. Anything else?
S: No that's it.
I: Yeah what about things like ...
S: Word-processing too.
I: Yes. What about graphics and designing and those sorts of computer tasks?
S: No because we wouldn't be using that in school anyway. Maybe if we were doing some multimedia presentations. But only for multimedia presentations.
I: So do you think you would be interested in doing multimedia presentations?
S: Yes where you fit the whole classroom with it.
I: So how would you learn that stuff if you go to this school?
S: They would probably hire, they would hire someone.

I: All right what was I up to? How is playing with computers different to playing with other things or people?

S: There is no other difference. All it is really is you’re having fun. You’re having fun with people, you’re having fun with computers.

I: So the people that you’re using computers with, are they in the room with you or are they on the other end?

S: On the other end of the line.

I: Yeah.

S: Like you have a game of Doom 2 networked or something.

I: And so you still see them as a person even though they’re not there in the room with you and you might not know what they look like?

S: Yes.

I: You still feel like they’re a person?

S: Yes.

I: What do you think of when you think about working with the computer at home?

S: I want to get this over and done with and let’s get out of here.

I: So it’s for assignments then?

S: Yes assignments.

I: So you think that the computer helps you to get it done faster, if you want to get it over and done with?

S: Yes it’s just sometimes I can’t be bothered writing stories so I just type it out on the computer. I find it’s quicker but other people find it takes forever.

I: Right OK. What about the thinking part of it?

S: That has to come straight into your mind. You have to think of it on the spot. So whenever you do something wrong you don’t need to use white-out. It’s just an advantage of the computer.

I: So it helps with mistakes.

S: Yes.

I: I guess what I’m getting at is, does the computer help you to generate ideas at all?

S: Sometimes. Very rarely.

I: So how does it help you with the thinking? Just go into that a bit more.

S: It makes you understand better words. Like it uses your vocabulary.

I: What about the thinking that you did when you were making the letterhead? What sorts of things did you have to think about?

S: Should that be underlined or should that be bold or italics and things like that.

I: What about working and thinking with the computer at school? Is that going on at all?

S: If we use the computer in our class we only use it for word-processing anyway.

I: So are you telling me that you don’t need to think much when you’re just doing word-processing?

S: Yes.

I: It just sort of...

S: Comes naturally.

I: How do you learn with the computer at home? We’re going onto learning now.

S: How do I learn?

I: Mm.

S: Maybe by getting new programs like MYOB and things like accounting programs sometimes. You get to use, like Excel is an example. Adam showed me how to use Excel.

I: Your brother?

S: Yes.

I: So by getting new programs you’re learning. Anything else?

S: I just play a game and you discover new levels.

I: And with information?
S: Off the Internet?
I: Mm.
S: Like if you go to a site and check it out. Downloading off the Internet.
I: So you do a fair bit of browsing around?
S: Yeah. Check out new sites.
I: What’s the most interesting one you’ve found?
S: Interesting?
I: Or the most unusual?
S: A person. It’s a home page. His name is Adrian. It’s Adrian’s page but I forget the address now.
I: And why was his interesting?
S: I don’t know. It just had a few interesting features to it. It had a picture of Sydney Harbour and Bondi Beach. It was just a nice place to go and to get different ...
I: A bit different, how, it looked a bit different?
S: It just had better features than others.
I: Pictures?
S: Pictures and you know if you want to check out here, click here. interesting
I: So you told me some of the things you were learning at school which was typing and word-processing but you would like to learn these things. So we’ve covered that. Do you think the computer helps you to work better?
S: They say now that it might be taking over. It’s on everyone’s minds and so. But you find about 50% of the people don’t like computers so it’s a personal opinion but I prefer to have computers around.
I: So you prefer to work with a computer than with a pen and paper?
S: Yes. But I don’t mind pen and paper.
I: Do you think the computer helps you to think better?
S: Just to play games or something.
I: Play in two different room?
S: Yes.
I: Yes. But you don’t think you will do that now?
S: No.
I: Is there anything else that you would like to say about computers?
S: Not really. Oh yes. Instead of getting Windows 95, I would like to get Windows NT Version 4 for networking.
I: Why is that?
S: I’ve seen it and it just looks more appealing. Windows 95 has a few more bugs and it just plays up all the time. You’re doing something right and it says illegal operation. I don’t know it’s just better.

Excerpt from transcript of parents interview

I: He knows an awful lot about computers for someone his age. How do you explain that?
P: He just has a natural interest. He’s always interested in the features, like the Sydney Morning Herald computer section on a Tuesday and he subscribes to a computer magazine and he’s sort of, always at the forefront of technology. He also has a friend who’s highly computer literate as well.
I: Is that Sam?
P: Sam ......, yeah.
I: Okay. And how did he meet Sam?
P: Well, since birth. The mothers were, you know, good friends when the kids were born.
I: So they’ve sort of done it together, the whole of their life?
P: More or less. I mean, Sam ...... was, he had a lot of equipment. We’re a little bit shy in equipment because I’m not a technology person. I like to get in, at a certain time, and not always in the market, whereas the ...... seem to be always, all these computers in a separate computer room with three terminals going at the one time with the Internet and modems and a network link between one kid at the computer and the other, those sorts of things.
I: All right. So when did your family first bring computers into the home?
P: Ah, about two years ago I bought a laptop, which I thought was the front of technology at that stage. It was a 486 DX2 66 which at that stage, was you know, prior to ...... the latest and the greatest.
I: And what was the reason that you got that?
P: Well the demand from the children seemed to be that they were ready for computers, they wanted to do assignments and things and they got me. But I didn't want to buy a desktop because I've got a couple of sons and I thought well, if I've got a desktop and it's in one child's room, then the other child's going to ..... throw that child out because he wants to work on it. And maybe if I go for a laptop, then they'll be able to take it from one room to the other and then one bedroom to the other and that actually has worked out quite well, but I think at this stage they're ready for something else again, technology's gone ahead.
I: And you have four boys, is that right?
P: Mmm (yes).
I: And no daughters?
P: No.
I: Um, Grant was telling me that Terry doesn't use a computer.
P: No, no.
I: Why is that?
P: I think it just really is the type of child. My number one, two and four are computer literate, but then Terry has never shown any interest in sitting down and doing it, that's right.
I: And what field is he in?
P: He is doing his HSC.
I: And he doesn't find he needs it for assignments or?
P: No, not at all. Whereas Grant, if he has to write an essay for homework, just goes straight to the computer and he'll do a title page and colour and, we've got a colour printer as well, and busy away there and, you know, spell check and all that sort of thing, away he goes.
I: He was telling me that you made some letterhead or something, the other day, is that right?
P: Yeah, yeah, I wanted a new business letterhead because the phone numbers and things have changed and I needed to write a letter and ...... he made it for me, that's right.
I: So that was something that you did together?
P: Yeah. See, my number two son used it the other day too, because he had a major assignment to do. He's a fourth year Economic student at New South Wales. But he found that the computer that we've got didn't have enough memory really, it's got a two hundred megabyte hard disc.
I: That's the laptop?
P: Yeah. And he became absolutely frustrated when it came to doing his university assignment on it because it involves something like sixty to seventy pages of information and the computer just, it was just frustrating, so long to print out, so slow. So we've got to go through um, next time something with a few gigabytes in it.
I: So you are planning to get another one or?
P: Well, Grant's at me, you see, he's quite good and my number one son wants a computer as well and I just really want to get to the, I know the technology never stops, but I just want to get to a plateau and they've sort of arrived at Pentium 200 now. So I don't want to rush into buy the first one, but I mean, that could be something that we would consider.
I: And Grant was saying that the 486, the desktop computer, which you also have one, that that's gone at the moment. Or is it just the laptop?
P: Just the laptop, yeah.
I: It's just the laptop, okay, oh okay. I was getting confused.
P: It isn't gone, but it's.
I: No, you still have that, but your son that's at university found it frustrating?
P: Yeah, yeah.
I: Okay. So there's just one computer at the moment?
P: The size of the memory now is frustrating. I mean, two years ago that seemed to be the um, 200 megabyte was quite adequate, you know?
I: Large, yeah. Mm, and now it's not.
P: Just amazing.
I: Okay. And it's got the modem built in?

P: Mmm.

I: That's what he said I think.

P: Yeah.

I: Okay. How has your home been different since a computer's arrived in it?

P: Well, I suppose what happened is that the computer landed up in a central spot which was a table in the family room and the children seemed to do their homework on it.

I: There'd still be some homework, though, that Grant would be

P: Oh yeah, there is.

I: asked .... pen and paper.

P: What I found, he was thinking homework and then thinking how he could apply the computer to it. Whereas my number three son, perhaps, he would think of homework and how quickly can I do it, how do I get around never, ever having to use a computer. But that's the difference.

I: Okay. Can you tell me a little bit more about how he thinks about applying the computer to the homework? What did he do when he sort of gets something?

P: Well, if he had to write a story, if it was about, just for example, they had to write what they did in the school holidays at the end of September. I mean, I suppose in the old days a child would maybe, well, you do a draft essay, cross it out and, you know, change the spelling and get your dad to check it through or something like that or not, but he goes straight to the computer and starts to write.

I: Does he ever write when it's not for homework?

P: On the computer? No.

I: Okay. At the time of getting the computer, how did you think it would benefit the children's education?

P: Well, a lot because I like them to be involved in technology and we have computer technology in our work environment as well, so I recognise the ones in our office environment who are computer literate seemed to be able to get ahead in their work and they become highly respected in the work environment too. Advancement is easier for them too.

I: As far as vocation?

P: Well in our work environment, the ones that are computer literate sort of become group leaders too.

I: So you think that it develops leadership skills, equality?

P: Mm. There's a lot in it in that there's programming and formatting and those tasks are quite difficult for the average person. And some people in those areas .... that they show leadership.

I: Mm hm. Okay. And what type of work environment are you in?

P: Chartered accountant.

I: Were you able to use the computer before you bought one?

P: No.

I: Can you use it now?

P: To a limited degree. I mean, I have a terminal in my office, but I only use it for the tasks that I want, I don't develop the tasks as I should.

I: So you don't develop the tasks around the computer?

P: No, I realise that I should and I've had a terminal for two years in my office, but I'm computer shy and I don't go inside the programs and experiment etc. as the young kids do.

I: So what you say is that it's more in use when there's a need, like ...
P: Only a need, yeah.
I: And your wife? Could she use the computer before?
P: She does use the computer in her work environment, yeah. She's a school librarian.
I: Oh, that's right. Okay. So, would she use one at home at all or is it mainly at work?
P: No, she's never used the computer at home. .......
I: So do you use the computer at home all, yourself?
P: Sometimes.
I: Like the business letterhead?
P: Mm hmm (yes).
I: Anything else?
P: It's basically about it. I mean, I do some sort of, I've had a typewriter for years and I do some manual letter typing and I found it was quite good to be able to do it on the computer and you know, Grant's the one that sort of leads you into the program and then .......
I: So, has he been like, a teacher in some sort of role?
P: Mm, mm, yes.
I: I mean, like he's taken on that role.
P: He's actually a teacher to number two son as well, he's a university student who, you know when there's a program difficulty or some sort of formatting requirement required ....... they all call out to Grant 'cause he's the Mr Fix-it too.
I: One of our questions on the survey was, do you think you can fix the computer your-self and Grant said yes, but very few children said yes. Or they said sometimes, you know, if it's not major or you know, but very few are confident enough to say yes, I can fix it.
P: There's been a few instances, you know, where something has gone wrong and he rings the place where we bought the computer from, so the computer wholesaler, he'll talk to the programmer there, just explaining the details etc. and whether the computer can be fixed at home or whether it has to be brought in. See there was a problem, at one stage we had a sound card installed and somehow it got de-installed and then we tried to install it and there was a bit of difficulty with it, so in the end I mean, Grant spoke to the programmer, and in the end I had to take it in to have it fixed, but I mean, Grant was quite forward in speaking to them about it.
I: Who in the family would use the computer the most?
P: Well, it really depends upon the volume of work, but I'd say the number two son and Grant, number four.
I: So that's Adam?
P: Adam, yeah.
I: And we talked before about them fixing it together, sort of consulting with one another, so they do that a fair bit?
P: Yeah, yeah.
I: And is that mostly just for difficulties or would they play a game or do a program together or?
P: Mainly difficulties. Because of the limited size of the memory on the computer there, you know, we had a few games and they require a lot of memory space and they sort of got out of the novelty of the games ....... we've got ...... on it, but they very rarely these days sit down and, you know, play games on it.
I: So what do Adam and Grant mostly do with it?
P: A lot of word processing.
I: Word processing. And is that mostly for school assignments?
P: Yeah. School and Adam's university assignments.
I: Anything else that they do on it?
P: Well, Grant's quite good at the Internet as well. See X ..... has got the Internet and when he goes to his place, which is quite regularly, they're on the Internet.
I: So he spends time on the Internet doing what?
P: Well, looking or corresponding with somebody. A few weeks back, he created his own Internet number or
I: Address.
P: address, yeah, and I don't know whether he told you, I took him to the Motor Show and Audi had a stand there and they had a computer there with a list of all the various Audi cars and products and things, so Grant went ......... computer and he went in to see whether his Internet address was there. I don't know how he found it, but he did.
I: And it was there?
P: Oh yeah, yeah.
I: Oh gosh. So he was successful in creating it?
P: Yeah, oh yeah. And then he replaced, he logged out and exited and then he replaced the Audi display again.
I: Oh, that was nice of him.
P: Back to where it was, yeah.
I: They didn't mind?
P: Well they didn't know what was going on.
I: No, I don't think they did. So have you found the Internet helpful to other members of the family or is it just Grant that mainly uses it?
P: Oh, I think it's just a plaything really at this stage.
I: Is that for everyone, or?
P: Do I think it's a plaything for everyone?
I: For everyone or is it just for Grant that it's a plaything?
P: Well, maybe for Grant it's a plaything. I mean, it will have its application in the future, but that is yet to come.
I: So, do you see the end use for the Internet in a sort of educational sense?
P: If it's packed with good information, it will be useful. I suppose for young children it would replace the encyclopedia.
I: And why is that?
P: Oh, there's just so much information available.
I: And large amounts of information.
P: Yeah. The other thing is and I'll tell you about, we went to Canada and where we were staying, this is in June, they had Email there, international Email, so Grant was corresponding with X .... and Emailed back to Sydney and they were writing letters to each other on the computer. Instantly corresponding with each other, hi, how are you? And here I am and things are great in Canada and how are things in Sydney?
I: I hope they worked out the time differences.
P: Yeah, yeah.
I: .......... up in the middle of the night.
P: It's not actually ringing STD, you go into cassette, he's on the international Email, X ..... and these people were as well, so.
I: So it would come into his computer, maybe in the night, and he checked it in the morning?
P: No, instantly. They were like, it was maybe nine o'clock at night and it would be like eleven o'clock in the morning in Sydney and then,
you know. Grant also, you know, he's quite familiar with that too, you know, writing the message and ........ the directory and send.

I: And Grant's said his other brother is overseas?

P: Yes.

I: Do you use that to correspond with him?

P: No. Because you need two computers and you need both set up, no, no.

I: So ........ have one?

P: No, no.

I: Right, okay. Are you happy with the way that the children are using the computer?

P: Happy with the way Grant uses the computer. Mm, very happy. He also shops around ...... he subscribes to computer magazines, and he sort of knows the type of equipment that he'd like for the next upgrade.

I: Oh, so he has a wish list?

P: He's got a big wish list. And he has no fear of ringing up these various computer companies and quoting the wish list and getting a quote.

I: A price on it.

P: Which is ...... about $4,000 I think it might be. You know, with all these, you know, Pentium Pro 200 and twelve speed CD ROM, two gigabyte memory and all that.

I: So, do you think he's like, maybe learning some skills there in his ringing up too, about these things?

P: Well, the skill that he's learning is he's up with the advance ...... technology, he knows exactly, as regards the equipment, what's at the forefront of the equipment. I mean, if you tried to say well, Grant, you know, we'll buy the Pentium 100, if it's not good enough, it maybe sort of like the bread and butter that everyone else is buying, it's sort of el cheapo, but that wouldn't be good enough for him because he's got to be at the forefront.

I: He's got to have a wallet to match though, doesn't he?

P: Not necessarily. 'Cause actually the price of all this equipment if coming down and down.

I: Very quickly.

P: Yeah. We noticed from the monthly magazine that generally, the hardware's dropping, $120, $150 a month.

I: Yeah, that's true. I got a quote on memory upgrades for my computer, it would have been about six months ago, and then I rang up again the other day just, and the price had halved.

P: Yeah, yeah.

I: With the CD, with the CD ROM type programs, does Grant do much with that kind of thing?

P: He can do.

I: What, what sort of things would he ........?

P: Oh, those sorts of things are mainly games and ......

I: So does he have any of the encyclopedias or anything like that? The sort of more educational programs.

P: No, and this is only with his friend, X ...... got all those sort of. The other thing is, people over the road who he's friendly with too, everyone's sort of getting onto the Internet and they couldn't quite get their Internet to work, they were logging into the provider or whatever it is, and Grant went over there and fixed it.

I: That's amazing. Why do you think Grant's so interested in computing?

P: I think he's got the ability and it's a challenge and I just think he likes
the challenges and he likes to be up there with it.

I: And what is it about it that he likes? The challenge, I suppose.

P: I mean, I just went to my office this morning and he was, I've got a built-in Email there too and he was deciding you know, what messages we would now delete. He was making these decisions and then he was changing the format of the background, you know, when the program goes off etc., you know, to what he liked, we'll change it for you dad. He just has a keen interest in.

I: That kind of.

P: No, actually, always doing something on it, it must give him a great satisfaction.

I: I was asking him does he always communicate with people that he knows on the Internet, or does he sometimes meet people like, that he's never met in person, and I was asking him if he thought they were still a person, you know, like does he still remember that they're not just words on a screen, but you know, he said yes, he does. So, that doesn't replace all his social activity?

P: No, no, no. He's quite an outward going child actually.

I: Does he have any other interests, like I mean, you said he played sport......

P: Yeah. Um, well sleeping over with friends is one of his interests. He likes being out and about with his peers. And not all of them are into computers either, I mean, so he's quite happy, I mean, he's got some friends that are not computer literate, so ........ Ah, no, he's just a good, all-round child really, with a lot of interests. Actually, a lot of mature interests. This computer thing is very, very mature.

I: Yeah. It's quite out of the ordinary for most children his age.

P: He's only eleven.

I: Not that he's an addict, he doesn't show those addict type qualities either.

P: I think the advantage of an Grant is that, you know, he's got a good knowledge and the add on will come easily for him. Like for me, for someone starting from scratch to obtain the base, you know, is very, very hard. Older people sort of get this mental block when it comes to computers, but you know, he's got a good retention.

I: So you see it will advantage him?

P: Oh definitely, oh yeah.

I: So what do you think ...... he's getting out of having the computer at home that he wouldn't get if your family didn't have one at all?

P: Oh just exposure to technology.

I: So what can he learn from a computer?

P: Well, all sorts of skills and not only skills for himself, but skills to be able to teach others as well. He knows his way around the programs very, very well, his word programs are really very good.

I: So do you mean that he knows the different features of the word processing packages?

P: Yeah. I noticed with my Email this morning and that, you know, he was writing messages and that and you know, he knows his way around the various. He knows his way round those programs as well as some of the staff that we've got in our office who are maybe more than double his age.

I: And has having the computer matched up with your expectations
that you had when you first got it, of what they would do with it?
P: Yes. The only thing I'm disappointed with is always being short sold on technology.
I: What do you mean by that?
P: You buy the latest technology and then six months later, you find that it really wasn't adequate, it was almost adequate and then they brought out the model which is really adequate for today.
I: And will it ever stop?
P: Maybe it won't ever stop, but I mean, I just, fancy buying a computer with two hundred megabyte of hard disc, I mean, it's just nonsense. When the standard these days is a minimum of a gigabyte, you know? How can I fall into the trap, I don't know, but you need so much memory when you, you just got the Windows 95 program, you need so much memory just for the program itself. This is actually, and the reason why I've hesitated because in the next upgrade, because I'm fearful of being short sold, if you know what I mean. Like, we get the one gigabyte or the two gigabyte and then six months later, we find the industry standard is then five gigabyte, you know?
I: That's right. How do you think having access to all this information helps them learn better or learn in a different way than they learn at school?
P: It's a different subject. Now the computerisation is a different subject and I see in sort of industry and commerce that the computerisation really has taken over technology. Everywhere you go there's computer technology. So it's extremely essential these days and I think if one's looking for an advantage in their career, they should really be computer literate.
I: Okay then. All right. So, is the computer essential as a tool or to use?
P: It's not essential, right, as my number three son found it not to be a prerequisite for anything. But those who want to take advantage of it will be more successful compared to those who don't want to take advantage of it. I mean, he could get through school just using his Encyclopedia Britannica if he wanted, manually looking it up, or if he wanted to go to the forefront of technology, go to one of the computerised programs on the Internet or whatever it is and you just grow up with the technology, it's better really.
I: How do you think using a word processor changes the way that they write?
P: Yeah, I think it does. Writing style maybe changes. You really got to practise hard at the writing style of skills because he's quite good at the keyboard, and I do think that he's had to try, regarding the formation of letters, at his age, formation of a writing style, because he's not constantly practising it...... I dare say is.
I: ....... typing ...... So how would you describe his handwriting generally?
P: Good.
I: Good, so it's generally good?
P: Yeah.
I: 'Cause we've had a few children that say that they don't like handwriting, they're handwriting's messy or whatever, I suppose they prefer to use the computer.
P: One might look at that and say well, my writing is ...... you know. I'm not a bad judge of handwriting
styles and Grant's is quite good. It may have been a little bit better had he not had the computer and he developed a sort of a nice writing style.

I: And does the word processor increase the quality of their writing at all, as in the content of it?

P: It does, because when you use the spell check program etc. and you can re-format, you can, you know, break the paragraphs and sentences up so, although you've done the work, you know, you can go back and you can re-format it, whereas if you're just writing on a piece of paper, you virtually have to write it, every time you make a change, you've got to write everything out again, so.

I: That's right. What are your views on how, using computers at school and what do you think schools should be doing in terms of computer education?

P: I think it's an important subject. I think the difficulty with the schools is that they haven't had teachers who had adequate knowledge, that teach computer studies. Actually, I think I remember when my older son was going through, I think he took computer studies for one of his subjects perhaps in Year 10, that's going back a few years now, and the teacher wasn't adequate and I think a lot of her kids dropped out of the class and, I have that memory. The teaching skills weren't adequate. Maybe the teacher was following the text book, but ........ I don't know whether it's changed now, but maybe, maybe not.

I: No. Because I think Grant could teach a lot of the teachers a thing or two.

P: Yeah. It could be that someone, you know, who's done a science degree or maths teaching, has said okay, I'll take the computer studies class, we'll give it a go, because he has a slight interest so he sort of follows the text book through but doesn't have any sort of in-depth knowledge.

I: So should there be provision for students with different levels, I guess, of ability with their computer studies?

P: I mean, it's an HSC subject so we need to have the teachers who know the topic in order to teach it.

I: I guess what I'm thinking is that given some further instruction, Grant could probably pass the HSC now, almost, in that subject, I'm not saying every subject, so you know, like if he took it as an elective in school, what would they be able to do for him?

P: I think by the time he's ready to do the HSC, there'd be so many advances. Actually, I did ask him that and I read the Herald about the computer studies HSC exam paper and they just commented on batch control, those sort of things, and I mentioned that to Grant and he didn't actually know what batch control was I mean, it could be something that he could learn about. But yes, he could do with a little bit of pre-study of ........

I: Yeah. So it sort of makes you wonder, well what's he going to spend his time doing in high school?

P: No. I mean, there's a lot of subjects.

I: It's not the only subject.

P: No, no, no. Oh gosh, there's all sorts of, the level of maths and other things.
I: So, are you happy with what is happening at school for him with regards computers?
P: I don't hear a lot of feedback from Grant as to what's happening with computers at school. I only see his technical ability when we, sort of talk about it.
I: So how do you think the school could improve its use of computers?
P: That's a difficult question for me because I haven't examined what the school is doing with the computers.
I: So a quick summary would be there's a computer room in the high school, which I think has Macintosh computers, but I'm not certain on that, and so there's a difference in the ..., and the classes in the three to six years go to the hub of the high school to use that room.
P: He's always been severely criticising the teacher, the fact that they had Apple equipment there and stating now that it should be IBM compatible equipment and he sort of had sort of a tongue in cheek argument with the teacher all the time, you know, that the IBM's are better and the Apple was sort of second rate and then when Apple had this sort of, in the middle of the year, you know, they suffered heavily in losses etc. he was taken clippings from the paper ..... Apple lost two billion dollars this year etc. There I told you.
I: So he'd like to see them get some IBM compatible?
P: Yeah, yeah.
I: And then as well as that, they have some computers in the library which have the encyclopedias on and he mentioned looking up, he was doing a project on Mozart and he was looking up.
P: What was available, what books were available. That sort of task is very easy for Grant, just to look up in a library.
I: Locating information.
P: Yeah, yeah. Tell me, were there many in the school of Grant's age etc., of that ability?
I: Um, at Cranbrook?
P: Yeah.
I: Not many over the whole of ..... 
P: Oh well, just tell me, Cranbrook and then what you've seen.
I: Ah, no, not many of his ability. No, the other boy, David ..... , that I'm talking to his parents later this afternoon, yeah, he's also that ability, but not many elsewhere. Oh, I can think of one or two.
P: What about over Sydney generally, have you looked at a lot of schools.....?
I: Oh, generally?
P: Yeah, generally.
I: No, not that much. Or that have, it's funny, some children have the ability beyond the computing equipment that they have and others have the computing equipment, but not the ability, so um, I'd say it's probably more his interest, his keen interest, that makes him exceptional, yeah, like I say, if you have the ability, you've got to want to use it.
P: Yeah, yeah.
I: But yeah, I can think of one or two in other schools, that are up to that, but not many girls.
P: No. There's also a show on 2GB that we both have a little bit of an interest in it. I have an interest in it for Grant and that is a fellow from Morse Computers in Castle Hill, he has a talkback show on 2GB with Brian Wiltshire and anyone in
the community can ring up and ask about problems with their computer equipment, programming of equipment and whether they've got enough memory and all sorts of technical problems and Grant loves to listen to that. We both listen to is. He understands quite readily what the problems are and what the people are talking about. Not that he can solve them.

I: So that would be one evening wouldn't it, in the week?

P: Yeah. He finds it interesting to see what problems people have and as the shows going on, he'll give his comments, he's only got a ...... that's the problem, he needs to update to a Pentium, you know, he can't run all his programs. He understands quite well what technical problems are in ......

I: He understands the technical ......

P: I'd say as he goes on and he has problems to solve.

I: Because he seems to tackle them quite readily.

P: There is a thing, you know, when they think of a number three child and Grant, not that the technology is there, the child has to show a willingness to grasp it because the technology has been there for all the kids and you find that one doesn't want to know about it and the other one is hungry for more information all the time about it, wants to learn, wants to be involved and advance himself.

Two boys out of the same family.

I: So is it like a hobby for Grant or is it more than that?

P: Yeah, yeah. Well it is a hobby because a hobby is something, you know, that, beyond the day-to-day tasks .... study or employment or whatever.

I: Do you think the educational benefits are different in the home environment than the school environment ...... just comparing the two as far as computers are concerned?

P: I suppose when one has their own computer they can sort of do more with it or experiment or go to it at any time, whereas there is an allocation of time I suppose at the school and you're not supposed to muck around with it and if you're seen to be doing something that's maybe not quite right, then, he feels comfortable with his own.

I: School there's more set tasks that .......... Okay, I think that might be all unless you'd like to say anything else.

P: Is there a review in a year or two to see what developments have taken place or that's the end of it?

I: What changes? That's as far as I know, no there won't be, but there were.

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**Excerpts from a teacher's transcripts**

I: Okay. So do you have a computer at home?

T: Yes.

I: Had it for long?

T: 4 years, 5 years

I: What do you have?

T: We have an old McIntosh classic black and white. Its outdated now.

I: Right. So when you say "we" do you mind telling me who else is in your home?
T: My wife, who’s the main computer user. She bought it. She’s the Computer Co-ordinator at another school.
I: Right.
T: And I’m a secondary user mainly. I’ve got 2 boys though they don’t use it much.
I: Right. So are they pre-school, primary school?
T: One’s pre, one’s infants.
I: Okay. So mainly your wife would use it for what types of things?
T: All sorts of things. Mainly word processing, database, spreadsheets, that sort of thing.
I: When you use it, what would you use it for?
T: Mainly word processing.
I: Okay. In terms of your program here or?
T: I used to then I got kind of sick of having ........ that stuffed up and then I just thought I’m just going back to writing it. That’s how I go now. I do things like perpetual letters to parents on computer, which is easier to get back up and, ummm, just a few files and that but I’m not a big computer user.
I: Okay. So when you first bought it was mainly for use by your wife.
T: Yep.
I: Now is she a Computer Co-ordinator in a High School or Primary School?
T: Primary School.
I: Primary School. She’s got a few other responsibilities.
T: Yep.
I: Okay. When you first bought it, I mean has it lived up to its expectations?
T: Umm, yes, I think it has. Its surprising how quick its gone out of date. My wife tells me that its worth about $150.00 on the open market when we paid about $2,500.00 for it 5 years ago.
I: Yeah.
T: So, that’s a bit of a shock. But we always knew that was going to happen. Ummm, yeah, to update, your looking at about $3,000.00 with nothing for a trade in. It would be a good computer just for kids in the classroom to do word processing on, you know
I: Yeah.
T: If we’re gonna shift it and get a new one.
I: A couple of classrooms I’ve been in here on previous reasons, I’ve noticed some old machines just being used in corners as word processors.
T: Yeah. Actually, one of the teachers over in 4-5H, they used to be called, her husband was with IBM and he had 5 old IBM’s they were throwing out and she said “Oh, I ........” and actually we use them as a back stop for bad kids who’d nick of over there and they’d have games on the IBM. Which was like a child minding tool but would also have a positive ...... at the time. They would go over their and teach them some games and that
I: Yep. So it was teaching like a ........ system?
T: Yeah. Not, not officially it was more like a
I: ........
T: Yeah, a bit of both. You could use it either way. I think all of us got a bit confused about which way we should go with it, you know what I mean, because some times the kids go to it but sometimes the kids would go over there, not as punishment, but they should have been punished and they would end up on the computer or something, so, that got a bit hazy at times.
I: Oh, well I find the same thing, I mean I got 3 kids at home and 1 is sent to his room its a real punishment and the other when she’s sent to her room its just a delight. 2 seconds later she’s off in “fairy land” .... but, in the school do you use computers much at all?

T: Well, I had some big plans, I mean every teacher hasn’t got the perfect class but I’ve got a fairly difficult class, I think, well, it changes from day to day. I did plan to have programs that ran parallel to the themes we were doing and had kids, for say a 2 hour block, working on the program and that’s how I planned it but it never seemed to work because one thing or another, other kids would see the kids on the computer and demand things that weren’t ummm, they couldn’t figure the fact that that was their go. They saw kids on the computer so they were always there and I just eventually barred it and instead of kids finishing their work as a motivation, which I now is a terrible use for the computers as everyone should be hands on, then I’m sure everyone here has had a fair bit of computer time this year, but its not how I envisaged using the computers.

I: No.

T: With a different set of kids you would hope, I would hope that maybe next year or next time around or whatever. It hasn’t been ideal, I know.

I: So what would you the kids in this room have access to?

T: Well, we have 2 new Macs in that room, they’re put away at night, in the storerooms and we had an old ...... oh, and we also had a extra ........ So there’s 2 .......... and 2 Macs. One kid from next door brought in a stack of old ......... disc games and things like that to play games on the computer and the others had disks, CD’s and that, different programs ....... and things like that. Phil can actually do that because the guy next door has got a hand picked class and he can actually say go there, ...... programs. But my kids won’t. They were just going, huh, change the names on all the hard drives.

I: You didn’t get to hand pick your class?

T: No. I wasn’t here. I came in about May.

I: Unusual. What age group have you got?

T: 16.

I: So, given a different set of kids and a different management issues with the class, you could imagine doing what you set out to do?

T: I probably still could and I probably should but, I don’t now, once I’ve gotten work in its just easier than say “Right, lets start something new”. I found also that sharing the room, you often have to communicate really clearly with the guy next door about who’s going to use it when and, even then, you really don’t stick to what you said because things come up at schools, and, I don’t know.

I: So, the 4 computers that you named are actually shared between 2 classes?

T: Yep, but they do move. We’ve got the best computers but other people are always wanting it saying “can we do this” and it goes for a week somewhere and then comes back. So it does move around the place.

I: Right. What about the oasis system in the school. Do you have anything to do with that?

T: Me, no.
I: Umm, do you do any of your own admin. on the school computers or do you wait until you get home to do you letters and stuff?

T: Always wait until I get home. We can, they’re there but its a matter of actually asking the DP or one of the ....... Usually they say “Yeah, go for it, no worries”. But you know what schools like, you rush in and if the thing doesn’t print you get frustrated and usually if you’re doing it at school its a last minute rush anyway. So, you know what I mean, you do it at home and I’m that sort of person who likes to come to school ready, with a clean slate, you know.

I: So there’s lots of differences between the pressures on you during the school day and how you get to use it and almost the relative calm of doing things from home.

T: Oh yeah. Well in the early school days, this class has just not worked like, ummm, as part of a program.

I: Yep. Now, if there were no constraints on you whatever, right, and you had whatever you wanted to have and you had all the support you needed, what do you reckon you could do. What would you dream about doing?

T: Well, I suppose, the dream would be to have potentially driven, you know, to have whatever disk you wanted and have every kid doing the same thing simultaneously. Whether that education is perfect or whatever I’m not so sure but my old school used to have a computer room and there was like, there was 12 computers in that room and so the kids would share and that was almost a whole class. Or, alternatively, one kid at a time and the others just do their own thing for half an hour and then they would just swap. And that seemed to work really well but for some reason that was changed and

I: Even at your old school?
T: Yep.
I: Yeah.

T: I thought that was a better system because you had the computer time and if you didn’t go every kid would remind you and every teacher would see you walking up their to go their so you felt like this is part of it, I’m using it, I’m using it the way it was intended rather than, I’m sure, I mean if I’m not using it I’m sure other people are using it.

I: So, in your old school when you had a system that you were more comfortable with, did you manage to do it in line with the curriculum like you’re trying here?

T: Yes. Not , ah, you couldn’t link this really as closely to the themes you are doing but, because it wasn’t networked? ah, I don’t know what its called, is that networked when you have one transcriber and the computer monitors work of that drive.

I: Yeah, yep.

T: It wasn’t networked, they’d have their own disk drive. They used to have to type 12 pieces of software which was suitable and after the kids had done say, the story writing or problem solving from last week, they would just rotate one.

I: Yep.

T: But even that had problems. The kids would say “oh, but we done that last week”. But you get past that.

I: And did you do much writing in your old school?

T: Yeah, yeah, a bit. I had a 4th grade so it was, we did the writing program.

I: And here, are you in a position to letting the kids go in there and do
any of their typing for stories or whatever?

T: Yeah, yeah, we can sure. I tend not to simply because, I mean there’s half, more than half, that can do it fairly well and the other half is wasting that opportunity and you get this feeling that what’s gonna happen when I go in their, they’re gonna be on the wrong program or they’re going to have changed headings, or titles, or mucked things up and looked up other files and

I: And this particular group, they give you a tough time in other ways and, I mean, do you also constrain how you do other things because of them?

T: Yep, yep.

I: And how many bad ones do you have now?

T: As for kids?

I: Yeah.

T: I had 6 really tough students and then I went on a months leave and they got a young casual and, on the first Monday, the Supervisor Jan said “this is not working” so she took 3 of them and they’re still gone. So my class is much more settled, but I’ve still got 3 ratbags.

I: Mmm.

T: And ummm.

I: Did they happen to be someone ADD at school?

T: Ah, no they’re not. They’re not identified, no.

I: Its just that I’ve worked in schools myself and I’ve been in schools were it doesn’t really exist. I mean there are troublesome kids but, they’re moved into other schools and .......

T: Well, 2 of them are ....... and one of them has serious home problems. 3 that left, 1 of them was .........., another one was ..........basically and the third one has also really severe home problems. So that mix of those 6, that was enough. I mean there’s a whole lot of kids who would get game once they started up

I: Yep. Ah yes. There’s always the followers.

T: It just was, like, heads down the whole time.

I: Now with the kids, have you had much sense about how many kids in the class have computers at home?

T: Yeah. I would say about a third.

I: And do you know

T: They haven’t been surveyed.

I: Do you notice any difference in the work they do?

T: Ah, well, any projects like, that are done on computer, are fantastic to read. They are presented perfectly and on the backboard are a whole stack of kids work, some are computer generated and some that are hand written. I mean, you try and see past that a bit but you’ve got to take that into account when its presented like that.

I: Do you think that they might get it, I mean, it might be that your better kids anyway are the kids with computers in their homes. Do you actually think that it helps them, ummm, formulate their ideas better or is it just a matter of presentation?

T: Ummm, yes I think it does but I don’t think its that glaring. You know, actually with this class I’ve got a group of 5 or 6 kids who are really, really high academically and they don’t present anything on the computer. So its, its half does half doesn’t. Ummm, I suppose with Jessica and a few of the others, its more motivated for them because they don’t have to labour over writing two or three times until they get it right its just a matter of pushing delete, or whatever, if its a
mistake and re-reading each line. I’m sure is what happens.

I: And do some of those kids also have CD’s in their home where you find they bring in new information?

T: That hasn’t happened at all.

I: No.

T: No. At lot of them will find CD’s that were put in there, in the computer room, and ............. at lunchtime and, in fact, one of my kids, one of the mischievous ones got in their at lunchtime, snuck in at lunchtime and got up the information about the Antarctic for a project and just printed and got like 5 pages, and stapled it together and handed it in as a project. Of the school CD.

I: How’d you go?

T: Well, I just talked to him about it. He said “well, I’ve done the right thing, I’ve found the information, I printed it up”. So .

I: What was your response to that?

T: Well, I gave him a mark but it wasn’t very good because it wasn’t written in his own words, ...........

I: So, they would need permission or would they?

T: Well, Phil and I, he doesn’t know it but we’re sort of different ends to the scale. He’s a lot younger than me and he’s got a bit more energy for the kids in general .......... whereas mines a full battle and so when the bells goes out and I’m almost a door locker. Don’t come in. This is not your area. But he has kids coming in, you can take yo-yo’s in there and, talk with him and are on the computer the whole time. That sort of filters through in the year, because these kids know what they’re doing. They say well, “Mr. Withers then why can’t we stay, why can’t we do that, why can’t we do this?” and I’m saying “No, that’s against the class rules, that’s against the school rules”. So, I’m just a bit of a ogre guy really.

I: So, next year will you put your hand up for that class?

T: Well, um, if the shoe doesn’t come around. But I think they know what’s happened this year, so, hopefully that will go in my favour.

I: Do you actually know when they thought it on purpose?

T: Yeah, well, what happened a whole lot of people were whingeing about different kids, and they used to be whingeing about such and such and such and such and so the Supervisor, who’s a very nice lady, but I’m not really sure what she does. She said “Don’t worry, give me all the kids that you don’t want, give them to me”. So 6B is loaded with the worst kids in the world. Jan has about the worst class.

I: Yeah, I’ve spoken to Jan and she’s ............. Some person came in while I was there ........

T: Yeah, I hate her class. Well, my class is okay since she took my 3 ratbags. Oh we’re about even. She took 2 ratbags and we got a third one so my class has settled and Herr’s has gone worse. But there’s still that element because they’ve heard all that behaviour and that and they cause fights . I hate it. I had a kid in who said “No, no. Why? Why?” And a lot of kids try that out. It adds to the pressure.

I: Ah, it doesn’t matter. I mean, we’re just talking about the class. I was, I was saying to you about whether it was difficult before that and.

T: Yes it was and she just said I’ll take all the ratbags. And I think the girl who was here said “Oh, well that’s not really fair, I’ll take a couple” and that’s basically hand-picked because
of .................So, yeah, a hand-picked class. Average. Very ordinary class.

I: Okay, well, if you hand-picked your class for next year and you had anything you wanted in terms of computing, do you think the way teaching and the learning happening in this classroom would vary much?

T: I would hope to think so but I don’t know if I’ve the technical expertise. I’d have to do some courses, I’m doing one tomorrow actually, simply because I’m being left behind.

I: Right.

T: But I’d have to do some courses and just make sure I’m up with what the kids are doing because I’m up a grade higher and I’m sure they’d leave me behind, with what they knew as they walked in the door the first day.

I: And that would be because of what they’ve got from home or from other classes?

T: Ummm, I think a lot of its to do with other classes. I know in their, those kids in their, because they have a lot of access they know exactly how to run things and to change them. I, I would really have to think to change headings and things on that. But, yeah, a lot of its to do with home too, yeah, its a bit of that.

I: Nothing rubs off from you at home, from your home?

T: Well, my wife and I don’t really talk computers cause she, I get quite frustrated and she hates telling me things and I’m one of those people who hate being told. I’d rather go and do a course.

I: Yeah, okay, all right. I just thought that if you lived with her, some, some

T: Yeah, I’m sure if you got everything going in a class that, you know, was to your favour then you’d go pretty well at it and hope that things would change quickly and

I: In 10 years time, you know when all the intellect stuff comes in that the Government says is gonna come in and you have intellect ......., you know, in the classrooms at school and computers everywhere, do you think schools will be better off? Do you think education will be better?

T: Oh, I think there’s and up and a down for everything. Its got to be better because there’s gonna be more choice on how to do things, how to offer different subjects. But, I think in a situation like, if, if kids who are difficult I think they’ll find ways to muck you up because of the systems that are in place.

I: Yeah.

T: You know what I mean. Because we have the Internet over in the library and kids are always saying, when something comes up in class when they either can’t do it, or they’re hot or they’re bothered, or someone’s annoying them, they’ll come to you and say “Can we go to the library, Mr. C said we can send for you anytime we like, we’ll go now and work on the Internet” and No, you have a job to do, sit down.

I: Mmm.

T: But if I chose some other kids in class, you knew what they were doing or had finished, the others would scream unfair, why do they get to go! And I find its just a huge fight that I haven’t got the energy to fight with them over that so I don’t even buy into the issue. I don’t send them over there. I say if you’d like to look up the Internet, go in library time or go at lunchtime second half, its open second half. Your first priority is right here matey and, unless you’ve finished, and you’ve finished now.
I: Right. And do any of these kids show evidence of having the Internet at home?
T: No, I haven’t seen any.
I: No.
T: No.
I: It’s not as common as people think in homes. Is your wife thinking about getting it in because of her job?
T: Oh, actually, she’s got it on at school about 6 weeks ago.
I: Is she thinking about getting it at home.
T: Ah, I’m sure she’d love to but, I mean, I don’t know who pays the bills but, I think it is worth it. We’ve got it at school, at both schools. What’s the point. Ummm, especially with the phone lines and service fees and things. So. Well, I’m holding off.
I: So, she’s got it at school and its here at school too, I suppose?
T: Yeah. Although its very slow, even in school hours.
I: I know. I have access at home and I do most of my work at University between 5 - 7 in the morning.
T: Between 5 - 7, in the morning, at Uni?
I: Well I’m here, no, I’m at home
T: Oh, okay
I: Talking to the Internet through the University
T: Oh, okay
I: And that’s at 5 in the morning. I mean, I happen to be a person who works early and goes to be early.
T: Yeah, I’m an early person myself.
I: So I’m often up. I won’t stay up late in order to finish something. I’ll get up early.
T: Mmm.
I: Okay, I’m happy to bring that to a close. Is there anything else you want to say about computing, life, children?
T: Oh. Well, ummm, I feel like I’m being left behind. Seriously. Especially when kids come in and say “This won’t run. Can you help me?” and you know you’ve got, maybe, a lesson coming to a close and you might have 2 minutes to get in there and sort it out. You can’t do it. I haven’t got the expertise to say what’s wrong, you’ve got too much on the screen, trash this, trash that. You know what I mean?
I: Yep.
T: And its only time on the computer. I know that. But its time I don’t have. Because I’m not, I’m not seriously interested in computers. But, I don’t know.
I: I know, I mean, I’m not convinced that they are at the very heart of what classrooms need to be about. Others might.
T: Mmm.
I: But there’s certainly other things you can do with your time.
T: Mmm.
Appendix K: Stage 3: Family sketches.

In the thirteen Stage 3 families that were studied in great detail nine had both parents using computers at work, one had a single mother who used the computer at work, one had a mother and not a father who used a computer at work and two families had neither parent using the computer at work. However, parental expertise and participation were found to draw on more than the workplace and to influence family computing in different ways. In most cases community involvement and/or personal interest combined with use/non-use at work to create a fuller more complex picture of family computing.

In one family, Family A, the nature of the home computing was shaped by the participation of the whole family in the running of a local sports club. Though both parents came in contact with computers in their workplaces, their equipping of the family home with an extensive range of computing equipment, including zip drives, scanner and digital camera, stemmed from the use of the family computer to produce the club’s newsletter. These parents participated keenly in the family computing related to the flying club and actively encouraged both son and daughter to develop expertise in multimedia, desktop publishing and Internet use.

In family B, where neither parent used the computer at work both parents used a very old computer in the home that had the capacity to word process in a foreign language and script. They used this computer for a wide range of personal and community writing tasks. While they were confident users of the older computer they had no interest in learning how to operate a new computer they purchased for the benefit of their children’s education. They left many of the decisions about the new computer to their eldest son and to an uncle who was regularly called on to provide assistance and advice. Although the new computer had a modem, the family were not connected to the Internet because of the cost. It is worth noting that the child in the study, the eldest son, also had significant support from the school, in terms of access to extra-curricular projects with an enthusiastic male teacher. Importantly, in this family, the parents were very keen for their children to build leisure interests around the computer, as it kept the children happy and safe inside the home. The mother expressed real concerns about the safety of their neighbourhood:

... keep them at home where they can stay and do their work and play with the computer. It will help them to improve their skill. And otherwise they might go outside and play with other kids and who knows who they might play with. It might be some bad kid who would have an influence on them in the use of drugs or other bad habits.” (mother through an interpreter)

A third family of six girls, Family C, had neither parent using a computer in the workplace. The purchase of
the home computer was directly related to the girls’ education, in particular, the sixteen year old daughter’s (the eldest girl) study of computing at secondary school. This daughter had a major influence in the decision of what to purchase. She also was the local expert within the home and the computer was kept in her bedroom so she could maintain control. The only software on the computer was the software that came as part of the original purchase package. While the eldest daughter was very keen to get Internet access (the computer came with a modem), the family could not afford to do so. The eldest daughter’s expertise came from the course she was doing at school, as did her desire to get access to the Internet. The child in the study, the third eldest daughter, did not get any support from her school. The parent’s did not participate in home computing in any way, although the daughter in the study did report that the parents had set rules about the use of the computer.

In two families, Families D &E, fathers self identified as keen hobbyists. They too used computers in their work but it was their personal interests which took these families beyond the normal range of resources. Both had been involved in computers for many years. One set up a local area network in the home so that the various computers could share printers and the CD Rom drive (Family D), another amassed a collection of over 100 CD software titles, many of which were educational titles for himself and his children (Family E). Both of these fathers took lead roles in their families’ computing. In another family where, the father did not use a computer in his workplace and took little interest at all in computing, a brother-in-law, an enthusiast game player, provided the local expertise and support (Family F). He helped equip the home and set up a local area network for group game playing and was a regular game player in the home.

From the mothers that took a lead in the family computing a number of different pictures emerged. In one family, Family G, the mother who frequently worked from home, ran a graphic design business, was very enthusiastic and enjoyed computer use in both the design and management aspects of her work. She made the resource decisions in the home, mainly based on her business needs and the educational needs of the children. The children were actively but subtly dissuaded from regularly playing games on the computer. The Internet connection in the home was primarily for business purposes but was available to children under supervision.

In another family, Family H, the mother used a variety of software at work and also kept the books for her husband’s small business at home. She made all decisions in the family related to the computer and actively supported the children’s use of the home computer for educational purposes. In this family there were no separately purchased computer games and the children were discouraged from playing any games at all. The sole purpose of this home computer was as a ‘tool’ to support the children’s education and to allow her to manage the finances of the family business. The mother was in the process of upgrading the computing equipment but
commented that she was not sure if the Internet was going to be of much value to the children’s education.

In another family, Family I, the mother, a single parent was able to provide little in the way of resources in the home. She used the resources at work for her son in a variety of ways. She often typed up his assignments and looked up information while at work. Sometimes the mother and son would go into work at night to use the computer. The only computer in their home was an old 286 desktop donated by her boss when it had become obsolete in the workplace. This was mainly used for playing msdos-based public domain games. There was no word processing software or printer in the home.
Appendix L: Construction of Table 7.4.

Originally the statistics, in this table, for the nine school categories were generated using MINITAB’s One Way Analysis of Variance. The table was then altered manually to separate out the mean duration for each of the two schools in categories 1 and 5. This was done, because there were observable differences within both sets of these schools. The four means, standard deviations and confidence intervals were calculated separately, using EXCEL’s statistical functions and included within the table in place of the two original values for school category 1 and 5.

The pattern of missing data, as defined here, varied markedly across the schools. In schools 2 and 9, (both more affluent schools), the majority of cases were of the latter kind, where children commented about being able to use the computer until they had finished or that the duration depended on what had to be done. In schools 3, 5 and 8 the cases were more likely to be those where the children claimed that they used the computer hardly ever or not at all.

**Average duration of computer use by school**

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Pooled StDev = 15.80

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An explanation for the unusually large numbers of missing data relates to the large number of children who were gave non quantifiable answers or to the number of children who reported that they did not use the computer at all. Included in the missing data were: 7 cases (2%) of genuinely missing data; 17 cases (6%) where children claimed that they did not use the computer at all and hence null responses for duration were recorded; and the 24 cases (9%), mentioned above, where the responses could not be quantified because the children responded in terms related to time taken to complete the task.
Children's use of computers in their homes

Toni Irene Downes

A thesis presented to the
University of Western Sydney Macarthur
in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

December 1998

© Toni Downes December 1998
This thesis is dedicated to my parents, my husband and my children.

Throughout my life my parents, Kath and Keith, have not only encouraged me to dream and reach for my dreams, they have also in a loving and practical way ensured that I have had every opportunity to do so.

My husband, Michael, has inspired me throughout my marriage. He helped me to become a better writer and consistently encouraged me in my early attempts. His patience is rewarded in this thesis. Over the years he has been a constant source of support for all my academic endeavours and professional pursuits. On many occasions he has taken on more than his fair share of parenting and household responsibilities.

This thesis is about children’s use of computers in their homes. Some of my early ideas arose from observations of my own children. I am grateful for the insights they have provided for me and for their patience and assistance during the writing up phase of this doctorate.
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Statement of Authentication

The work presented in this thesis, is to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

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Toni Downes
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## Abbreviations

<table>
<thead>
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<th>Description</th>
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<tbody>
<tr>
<td>ABA</td>
<td>The Australian Broadcasting Authority</td>
</tr>
<tr>
<td>ABS</td>
<td>The Australian Bureau of Statistics</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Compact Disk - Read Only Memory</td>
</tr>
<tr>
<td>HSC</td>
<td>Higher School Certificate</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>MHZ</td>
<td>Megahertz</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic and Cultural Development</td>
</tr>
</tbody>
</table>
Abstract

This project explores the interactions of young children with computers in their homes. Its essential goals are twofold. The primary goal is one of better understanding the reciprocal relationship between the child and the computer within the socio-cultural context of the home. The secondary goal is to inform the work of teachers and educators who are seeking to develop programmes using computing technologies within schools.

A blended theoretical framework is constructed from published literature in the areas of ecological psychology, cultural studies and the newly emerging paradigm of childhood studies. The key concepts are: affordance, a perceivable property that relates to both the observer and the observed; discourse, a recurring theme or phrase which expresses underlying knowledge or beliefs; and the notion of childhood as a social construction.

This framework is used to investigate primary-school-aged children’s use of computers in their homes. It focuses on:

- the resources available and what affordances these enable,
- the socio-cultural contexts, the discourses and the family practices,
- the nature of the use and the affordances the children perceive, and
- how school experiences differ from those at home and the impact of teachers’ discourses about educational computing.

A multi-method, multi-staged study was used to investigate the experiences of five hundred Sydney children from diverse socio-economic and cultural backgrounds who regularly used a computer at home. The key methods of data analysis were macro-level discourse analysis and a combination of tabulations and cross-tabulations of basic quantitative data.
Significant findings of the study were:

◊ Common activities comprised: game playing; composing, editing and decorating written texts; and using information texts.

◊ Complex and subtle gender and socio-economic differences interacted with varying rules, resources, discourses, affordances, parental and sibling expertise and patterns of family use.

◊ Parental discourses and computing resources combined to generate key affordances of: the computer as toy and the computer as tool.

◊ Parental discourses revealed different and at times competing conceptions of childhood and computers - children are both ‘experts’ and vulnerable, while the computer is both essential for the future but also a ‘culprit’, drawing children away from traditional activities and skills.

◊ Children’s patterns of learning and use are relatively constant across age, gender and family background - they generally learn by exploring and the dominant affordance is the computer as ‘playable’.

◊ Teachers’ discourses and conceptions about schooling, children, teaching and learning lead to the marginalisation of computer use within the primary school curriculum.

◊ Children’s experiences of computers at school vary widely but generally they have less access, less control and less time to use computers in ways that allow them to draw on the expertise and approaches they have developed at home.

The study has both theoretical and educational significance. The theoretical significance stems from the further adaption of Gibson’s (1979 and 1982) concept of affordance to provide a framework that privileges neither the individual nor the technology and that recognises the role of socio-cultural context in shaping the perceptions of the affordances. Using this framework a middle range theory is developed to explain how children come to perceive the computer as ‘playable’. The study also puts forward a tentative theory regarding the ways that parents’ and teachers’ discourses position educational computing as marginal to the primary school curriculum. The educational significance stems
directly from the above mentioned theoretical developments and from the other issues raised in the study. The other issues relate to conceptions of learning, the types of learning that computers afford, and the possibility that children’s approaches to learning are changing as a direct result of their interactions with computers.