Young, Competent Internet-Users: A Theory-Based Profile

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Doctor of Philosophy

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CERTIFICATE

I certify that this thesis has not already been submitted for any degree and is not being submitted as part of candidature for any other degree.

I also certify that this thesis has been written by me and that any help I have received in preparing this thesis, and all sources used have been acknowledged in this thesis.

Signature of Candidate

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PUBLICATIONS AND PRESENTATIONS

Publications and presentations associated with this research include the following:

Publications

Young, K. (2005) Direct from the Source: The value of 'think-aloud' data in understanding Web-based learning. Journal of Educational Enquiry, vol. 6 no. 1 (accepted for publication in May edition)

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Presentations

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ABSTRACT

This thesis presents a qualitative case study of the skills and characteristics of five competent Internet users aged between 10 and 13 years as they engage in Internet activities reflective of their day-to-day use of this culturally valued cognitive tool. The thesis focuses on their learning during these activities and describes the educational profiles of these young learners.

To uncover and more fully understand the learning experiences of young, competent Internet users an integrated theoretical framework was established. Specifically, relevant components of Situated Cognition, Distributed Cognition and Activity Theory, combined with understandings from several cognitive theories developed my understanding of the Internet-mediated learning environment. This integrated theoretical framework resulted in an Internet-Mediated Learning Model which has enabled a holistic understanding of this complex learning system. This model identifies the three major components making up the Internet-mediated learning system: individual, mediating tool (the Internet) and society, and acknowledges the intertwined relationship between these three elements.

The Internet-Mediated Learning Model considers the cognitive processing capabilities and active participation of the individual; the design features and distributive properties of the Internet; and the transmission of social knowledge and participation in local and global communities afforded by Internet-mediated activity.

The integrated theoretical framework was also instrumental in the research design of this study. Most importantly, as a result of the theoretical stance underpinning the study it was deemed appropriate to allow the participants to engage in Internet-mediated activity which was reflective of their day-to-day use of this tool, that is, authentic activity.

The data were collected in two distinct phases using four research methods: questionnaire, observations, think-aloud protocols and follow-up interviews. In the

first phase a questionnaire, which included a practical component, was developed to ensure the selection of participants who were competent Internet users. Each participant then chose their own Internet-mediated activity in which to participate. Whilst the participants independently completed this activity they were observed and asked to think-aloud. In the second phase, after analysis of the initial data, a follow-up interview was conducted to further explore some of the issues which emerged from the first phase of data collection. This interview also included a practical component using the Internet.

Analysis of the data resulted in a profile of the young, competent Internet-user. This profile revealed learning characteristics and skills of the user captured in three broad areas which, for this study, have been titled: Participant Citizen, Tool-Mediated Citizen and Adaptive Citizen.

The Participant Citizen captures the skills and knowledge being developed during Internet-mediated activity which relate to transmission of social knowledge and practices and which enable Internet-users to participate in local and global communities. The Tool-Mediated Citizen uncovers learning related to the design features of the Internet and considers the distributive properties of the tool. The Adapative Citizen reveals learner characteristics which enable Internet-users to manage and negotiate the Internet-mediated environment.

Taken together, the Internet-Mediated Learning Model and profile of the young, competent Internet-user provide an in-depth understanding of learning in this unique and complex environment. This study highlights the value in reconsidering the learner skills and characteristics relevant to current and future generations and questioning our application of preconceived notions of learning to the new and relatively unexplored Internet-mediated learning environment.

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1. INTRODUCTION TO THE RESEARCH

How would you feel if you couldn't use the Internet anymore?

"I would die, the Internet's pretty much my best thing to do."

Emily, aged 11
16 September 2003

1.1 Impetus for the Research

Prior to this study I worked as a special education teacher in the Sydney region of New South Wales. During my time as an educator I observed children and considered the ways in which they seemed different to previous generations. I listened to the comments of teachers and parents on children's behaviours at school and home and began to wonder about the influences on their development.

This led me to consider the technologies which are available to children from younger and younger ages. At this stage I drew upon my own experiences and thought how different my world was now that I had daily access to the Internet. I realised the Internet had impacted upon my working life, my social life and my day-to-day chores in substantial ways. I, like many others, adapted easily to the Internet environment and used it to my advantage.

Considering there are children today who have known no other world than one which allows them access to the Internet I wondered how different they may be to the adults who look after them and teach them. While many of us, as adults, have learned to incorporate the Internet into our lives this process is very different from those experienced by children exposed to the Internet from an early stage in their development.

I was thus drawn to examine, in some way, the impact of the Internet on children. This led to the research aim described below.

1.2 Research Aims and Goals

I entered this research with a general intent to explore the impact of the Internet on children. Over time this idea evolved into a more specific and definable aim:

> *To investigate the skills and characteristics of young, competent Internet-users as they engage in authentic Internet-mediated activity.*

Whilst in the process of defining this research aim, two underpinning goals emerged. The achievement of these two goals was necessary for the primary aim to be satisfied. The two goals of this study were to:

1. develop a strong theoretical framework which facilitates understanding of the complex Internet-mediated learning environment;

2. build a profile of the young, competent Internet user which provides some insight into their learning.

This research aim and the related goals emerged primarily as a result of my early review of the literature related to learning in a technologically-rich world. This body of literature provides the rationale for this study and is presented below.

1.3 Rationale for the Study

I believe, similar to Miller (2000), that the human brain has evolved over thousands of years as a result of the tools developed and valued in society. Also, technologies have the power to shape us and our ways of thinking about the world as much as we use them to reshape the world.

Given this, I consider there is a need to understand how tools, such as the Internet, can impact upon human cognition. I note that there is much conjecture on the ways in which technologies may impact on the human mind. Some authors, such as Creighton (2000), present a broad view in suggesting that Internet-mediated learning is having a profound impact on how we, as a society, acquire and master new skills and absorb information.

Others are more precise in identifying the impact of technology on children. Oppenheimer (1997), for example, reports the view of William Winn who contends that high-tech children think differently from the rest of us *"... they develop hypertext minds. They leap around. It is though their cognitive strategies were parallel, not sequential"* (p. 13). Oppenheimer (1997) also identifies a contrasting view held by some psychologists *"... that the computer screen flattens information into narrow, sequential data. This kind of material, they believe, exercises mostly one half of the brain – the left hemisphere, where primarily sequential thinking occurs..."* (p. 13).

While it is unknown exactly the ways in which technologies such as the Internet may affect human development I concur with others that the Internet is certainly a tool with the potential to have some impact. Views held in this area include that of Salomon and Perkins (1998) who believe that some tools not only enrich one's cognition but aptly transform it. Similarly, Wertsch and Rupert (1993) hold that the tools to which a person is exposed, influence or mediate new patterns of thought and mental functioning. Given this, I consider studies, such as those presented here, are useful and timely in uncovering some of the ways in which Internet-mediated activity impact upon children's learning and long-term development.

Views related to the impact of technological tools (such as the Internet) played an important role in the development of this study. I believe that unless we begin to explore the ways in which the Internet affects human cognition we will be extremely limited in understanding current and future generations who are using the Internet regularly.

Importantly, the potential of technologies to impact upon human development is not limited to areas of individual cognition. Also affected is the way in which we view the world as a result of our active engagement with such technologies. Indeed, learning with tools could be viewed as enculturation into the society in which the learning takes place (Putnam & Borko, 2000). This is considered a two-fold process whereby society also changes through the ideas and ways of thinking that individuals and groups bring to the situation (Putnam & Borko, 2000). Considering these ideas, I see it as imperative that we also take the social implications of Internet-mediated learning into account in any study aimed to uncover learning experiences. This study is therefore aimed at both

uncovering some of the learner skills and characteristics of the individual Internet-user, and also considering the social implications of the development and use of the Internet in societies where it is valued.

In summary, the arguments which underpin the rationale for this study include a belief that:

(a) tools (such as the Internet) have the power to affect human cognition;
(b) tools (such as the Internet) impact upon the future development of societies;
(c) tools (such as the Internet) can change the skills necessary to participate in one's community.

Given this, I consider it timely that we engage in exploratory studies to begin to understand the potential of the Internet to affect learning, as evidenced through both individual cognition and the related social implications. Further, it is important that we develop an understanding of what actually occurs in the Internet-mediated environment rather than trying to fit learners into pre-existing moulds or merely predicting the potential learning experiences of Internet-users.

In addition to considering the impact of the Internet on human learning, I was mindful of views such as Hooper and Hokanson's (2000) that two phenomena are influencing education today: (1) our developing understandings of how learning occurs; and (2) the introduction and ubiquitous use of technology in education. As Hooper and Hokanson (2000) suggest there has been little effort to connect the two ideas by applying contemporary learning theory to the use of technology. Although I was not inclined to examine Internet-mediated learning in formal education settings this view highlighted to me the importance of gaining some understanding of Internet-mediated learning through studies such as this, as a necessary pre-requisite to the integration of the Internet into formal learning experiences. I was concerned that we currently lack an integration of theory with experience to identify children's learning in an Internet-mediated environment. This position made me very desirous of developing a strong theoretical framework to support this, and future studies in the area.

Further, I consider that what will have the most profound impact on learners is use of the Internet during informal and self-directed activities, whereby children and adults alike use the Internet to satisfy personal needs both for work and leisure. Hence, this study places emphasis on exploring learning in authentic contexts to capture the learner skills and characteristics of the participants as evident in their daily lives.

Studies such as this, which focus on the individual and social implications of authentic Internet-mediated activity and develop a strong theoretical framework to support such research, are necessary as we move into a technological age that affords learning experiences unlike those previously available. Indeed, as Adams and Hamm (2000) note, books, television and computers have previously been examined to identify their role in mediating human existence; it is now the turn of the Internet.

1.4 Significance of the Study

The real value of this study is two-fold. Firstly, Internet-mediated learning is a new field and, naturally at this early stage, little is known about the potential impact of this environment on learners and their learning experiences. Of particular note, there is very little research into the learning experiences of children using the Internet. Where this research does exist it often fails to examine Internet activity reflective of children's day-to-day usage. This issue is discussed in detail in Chapter 2 but, at this stage, I note that this study aims to provide some inroads into this relatively unexplored area.

Secondly, much of the research in this field fails to develop a solid theoretical framework. Indeed, it has been my intention to take account of what is currently understood of learning and apply the relevant components of several learning theories to develop a strong framework to examine learning in the Internet-mediated environment. In doing this I develop an Internet-Mediated Learning Model which provides a useful framework for both research design and analysis. The development of this Internet-Mediated Learning Model is presented in Chapter 3.

1.5 Overview of Research Design

I have structured this study under the qualitative paradigm. The case under study comprises five children (three girls and two boys) aged between 10- and 11-years at the commencement of the study. These children were identified as competent Internet users through a questionnaire which included questions of their Internet usage and practical activities which allowed me to observe their online behaviours.

As shall be explored throughout the thesis one of my primary aims was to capture the learning experiences of the children using the Internet in ways which were, as far as possible, reflective of their day-to-day usage. I thus asked each participant to identify an activity they would like to undertake on the Internet. I observed each participant individually as they engaged in their chosen Internet-mediated activity. At this time I asked them to think-aloud their thoughts and these were captured on audio-tape.

After initial analysis of the observational and think-aloud data I developed a structured interview format to further explore some of the emerging themes. The interview comprised of a traditional question/answer section and also included a practical component which asked the participants to complete certain Internet-mediated activities.

I took an interpretive approach to data analysis and also found great value in the developing Internet-Mediated Learning Model to support and enhance these findings.

As shall be discussed in detail throughout the thesis I found this research methodology and the methods very useful for obtaining relevant and sufficient data to achieve the stated aim of this study.

1.6 Focus of the Study

The Internet is complex, in terms of its diverse functions, and there are many different areas which could be investigated in any study of Internet-mediated learning. Indeed, as shall be highlighted in Part Two of the literature review the interest in Internet-mediated learning is extremely varied across a range of fields. In order that any research is kept

manageable and achieves a defined purpose it is essential that the researcher sufficiently narrow their focus. It was, therefore, necessary for me to determine exactly what this study would, and would not, investigate. Setting these parameters enables me, and the reader, to identify where this study fits within this broad range of research.

One important point to make is that when I refer to Internet-users I am referring to those people across the globe who have regular access to the Internet and use it for business, education or leisure. I certainly acknowledge that there are significant issues related to the digital divide and many people across the globe do not have access to the Internet. I also acknowledge that there are many people who could, but choose not to, use the Internet.

The other components of my research which I believe need to be defined are 'young Internet-users' and 'competent Internet-users'. For the purposes of this thesis 'young Internet-users' refer to children aged between 10 years and 13 years of age. Further, when I refer to them as 'competent Internet-users' I mean that they have demonstrated confidence and success at various Internet-mediated activities. The children were noted to self-identify their skill in using the Internet and I also observed their competence during a practical component included in the initial questionnaire used to identify research participants. Importantly, however, I do not imply that they hold some expertise, merely that they are comfortable using the Internet and do so on a regular basis.

To further clarify what is being studied in this research I acknowledge those areas which are recognised areas for investigation in Internet-mediated environments but which are not the focus of this thesis. These are discussed below.

As I was interested to explore the learning experiences of individuals I did not engage in activities that encouraged social interactions. Although I consider learning to be a social process and I acknowledge the Internet as a powerful tool to facilitate social interactions it was not within the scope of this study to examine these types of interactions. Given this, I do not look at students working co-operatively together on the Internet. Nor, do I

examine students or classes or schools working collaboratively with other students, classes or schools to complete online activities.

This study is aimed at understanding Internet-mediated learning as it occurs in real-life contexts. I do not, therefore, evaluate any specific online programs or activities especially designed for this or any other research study. Also, I am not reviewing any specific web sites or Internet applications. Rather, I have allowed the children in this study to access any web site or tool they choose to gain an insight into learning experiences that are reflective of their usual day-to-day use of the Internet.

Finally, I am not looking to determine the role of the Internet in promoting or impeding learning of factual content. Given the evolving nature of what 'is known' and the continual broadening of knowledge it is my strong belief that the value of the Internet is in the provision of socio-culturally relevant knowledge and skills rather than development of factual knowledge. Given this, I aim to uncover any and all learner skills and characteristics evident during Internet-mediated activity. Indeed, as shall be explored throughout the thesis the learning experiences of young, competent Internet-users may not necessarily accord with our traditional views of learning. I consider that we should avoid trying to fit this generation of learners into moulds which were created before the advent of technologies such as the Internet.

The focus of this study is to investigate the learner skills and characteristics of young, competent Internet users and develop a strong theoretical framework which strengthens our understanding of Internet-mediated learning.

1.7 Overview of the Chapters

Chapter 1 has presented a brief overview of the study to identify its aims, purpose and methods. Chapter 2 moves to explore the literature in this area. Part one of Chapter 2 is devoted to developing an understanding of the current context of learning in our technological age. This section commences with my conceptualisation of 'learning' and 'the Internet' for this thesis. I then explore the role of the Internet as a cognitive tool before examining issues related to the changing nature of learning in the 21st century. To

ensure a complete overview of the current context I conclude this section with detail of rates and types of Internet usage by children and adolescents.

Part two of the literature review examines the research studies in this field. This review includes studies which have examined hypertext and multimedia environments as the Internet is comprised of these elements. This section then moves to focus upon studies related to Internet-mediated learning, in particular, studies of children's Internet-mediated learning experiences. This section then presents analysis of the predominant research methodologies identified in the literature and highlights current and future directions for research based on the studies which have been reviewed.

Chapter 2 concludes by identifying the need for a strong theoretical framework through which to explore Internet-mediated learning. Given this, Chapter 3 develops such a framework. The chapter commences with discussion of various cognitive learning theories which impacted upon my understanding of learning in an Internet-mediated environment. Following this I explore the three theories which have together provided an integrated theoretical framework for understanding Internet-mediated learning: Situated Cognition, Distributed Cognition and Activity Theory. I then move to demonstrate how this integrated theoretical approach led to the development of an Internet-Mediated Learning Model.

Having reviewed the literature and identified the theoretical framework for this study I present, in Chapter 4, the methodology and research methods for this study. The measures taken to increase research quality and rigour, the research process and analysis of the research methods utilised are prominent in this chapter.

The thesis then progresses to present the findings of the study. Chapter 5 commences by establishing the individual as the primary unit of analysis and then goes on present a profile of the young, competent Internet-user which emerged as a result of this study. In the final section I strengthen understanding of the learner profile by taking account of the Internet-Mediated Learning Model which was developed in Chapter 3.

In conclusion to the thesis, Chapter 6 reviews the major findings of the study and highlights elements of the research design and theoretical framework which have been particularly useful to understanding learning in the Internet-mediated environment. Finally the implications for this study and future directions for research are presented.

1.8 Conclusion

The Internet is a relatively new tool available to children and adults alike for use in both formal and informal learning and working environments. As shall be highlighted in Chapter 2 Internet use for some children in some parts of the world is continually growing and, given this, it is important that we begin to understand the learning experiences taking place in this environment. However, it is also imperative that we do not limit our understanding of what occurs in this environment to preconceived notions of learning that may not necessarily fit or reflect Internet-mediated experiences. This study is, therefore, focused on identifying the actual learner skills and characteristics of young, competent Internet-users as evident when they engage in online activities reflective of their day-to-day use of the Internet.

Chapter 1 has presented a brief overview of the study and I now move to present each of the chapters identified in section 1.7 above, commencing with the literature review in Chapter 2.

2. LITERATURE REVIEW

Chapter 2 is presented in two parts. The first section examines learning and the Internet. Specifically, I commence by explaining what is meant by 'learning' for the purposes of this thesis. I then discuss the Internet in terms of its role as a cognitive tool. In doing this, I present an analogy of the printing press to demonstrate the impact of cognitive tools on learning and society generally. I then move to discuss issues of learning in this technological age, particularly the potential impact of the Internet on learning and the changing nature of learning. In reviewing the changing nature of learning I also examine some of the learning competencies identified in the literature as relevant for the 21st century and consider issues of informal learning. Part one concludes by examining the current context of the Internet in children's lives through identification of the types and rates of Internet usage by children and adolescents.

The second part of this literature review is focused on the broad research base which exists in the area of learning with hypermedia, multimedia and/or Internet technologies. I identify the prominent research interests across diverse fields and then narrow this review to examine those studies primarily focused on the Internet and learning. I conclude this review of literature with the studies which examine the Internet and children/adolescents, as these are most relevant to my study. Finally, I comment upon the prevalent research methods and the areas identified for future research.

After review of the relevant literature body as described above, this chapter concludes by establishing my position, namely, that what is needed is a strong theoretical framework for understanding Internet-mediated learning. Such a model is presented in Chapter 3.

PART 1 – LEARNING AND THE INTERNET

2.1 How 'Learning' is Conceptualised in this Study

Many terms are associated with learning: intelligence, thinking, cognition, wisdom, and understanding, to name but a few. It is a complex process with many interrelated

components and is a concept that has no readily agreeable definition. However, in order to present a study that explores the learner skills and characteristics of children in an Internet-mediated environment it is necessary to define my position on learning to ensure a clear interpretation of the concept is conveyed to the reader.

Learning can be viewed as a continuous process and is not considered merely to be the acquisition of knowledge but rather, the constant revision and reconstruction of what is already known (Gordon, 2000; Putnam & Borko, 2000). Hence, meaningful learning refers to continual shifts in understanding to make sense of present reality (Dahlgren, 1997). As Biggs (1987) suggests, it is through learning that we construct our experiences of the world.

Some have sought to identify the process of learning through stages. One of the most recognised developmental theories is that of Jean Piaget who identified four stages through which children progress: sensory-motor, pre-operational, concrete operations and formal operations (Berger & Thompson, 1995). This type of stage related development provides useful insights into what is expected of children's cognitive development as they progress toward adulthood. Similarly, Kolb's Learning Cycle (1984) presents a theory of experiential learning which relates to stages of cognitive growth and development. The core of this theory is the learner's progression through a learning cycle made up of: concrete experience, reflective observation, abstract conceptualisation and active experimentation (Atherton, 2003). Others have moved away from identifying 'stages' to instead identify the outcomes of learning. Biggs & Collins, for example, consider the sequential restructuring of understanding through a process of prestructural, unistructural, multistructural, relational and extended abstract (Dahlgren, 1997; Biggs & Collins, 1982)

It is not only the process of learning which is important but also understanding what it is that we learn. Simons, van der Linden and Duffy (2000, p. 13) refer to, amongst other things:

(i) learning to think (which comprises two kinds of skills: general (eg. analogical reasoning, critical thinking, logical reasoning) and discipline specific);

(ii) learning to learn (which comprises various kinds of learning skills, eg. cognitive skills of deep learning strategies, overview skills, transfer skills, metacognitive learning skills).

Biggs (1987) also considers what it is that we can learn and suggests that we learn five forms of knowledge:

(i) tacit – that which we can do but not verbalise;
(ii) intuitive – that which guides our mental processes but we cannot justify;
(iii) declarative – that which we can tell others about but not necessarily use;
(iv) procedural – that which we use to handle the world;
(v) conditional – that which we use to handle the world and ourselves.

Similarly, Anderson (cited in Hooper & Hokanson, 2000), identifies the two forms of knowledge: declarative and procedural. Declarative knowledge under this view refers to specific knowledge about a topic (ie. building information). Procedural knowledge, on the other hand, refers to the processes that transform knowledge (ie. thinking). Bereiter (2002) also notes that, in the cognitive sciences, two forms of knowledge are valued: declarative (knowing-that) and procedural (knowing-how)

We see in these discussions a focus on learning as related to building knowledge. Breck (2000) considers knowledge as that which is crucial for a young person to acquire to participate fully in society. What is noteworthy in this view is an issue which was originally raised by German sociologist, Max Scheler, in 1926: that different types of knowledge change at different speeds (Jarvis, 2001). Jarvis (2001) goes on to suggest that in today's world, knowledge appears to be changing minute-by-minute and second-by-second.

Based on the discussion presented above, my initial conceptions of learning were of a process which resulted in two definable, interrelated learning outcomes:

(i) *Information Skills*

Increasing one's bank of information of the facts and beliefs held by a given society;

(ii) *Knowledge Skills*

Developing the skills necessary to make use of, apply and construct new information: the process of learning.

I believed that both elements took place as an ongoing, simultaneous interaction between an individual and his/her experiences with others and the environment.

These two forms of learning take account of what has traditionally been valued and measured when considering what learning has been achieved. Articulating my understanding of these traditional views of learning was particularly important in the preparatory stages of this research. This process forced me to consider whether I actually wanted to evaluate student information and knowledge building as a result of engagement with the Internet. What subsequently became apparent to me was that I did not want to limit myself to a specific view of learning but instead wanted to open my conceptions of learning to enable me to view the data as broadly as possible to really capture the unique nature of the Internet as a learning environment. Taking this approach ensured I remained focused on the broad concept of learning which was paramount to 'keeping my eyes open' to various forms of learning rather than limiting my interpretation of the data to what has previously been determined through analysis of learning in other environments which are fundamentally different to the Internet. Had I remained limited to my initial view of learning as described above it would not have facilitated understanding of learners' roles in participating in societies in a rapidly changing world and would have seen me ignore the socio-cultural aspects of learning.

Given this, I continued to explore the notion of learning, particularly through review of literature in the area of Situated Cognition and Distributed Cognition (see, for example, Barab & Plucker, 2002, Fetherston, 1998, Duncan & Leander, undated). This process encouraged me to expand my original conceptions of learning and, while drawing upon learning processes, learning stages and learning experiences as described above, I also developed an understanding that any study of learning must encompass the related socio-cultural implications. Under the situative perspective of learning it is apparent that what is learned cannot readily be separated from how it is learned (Brown, Collins & Duguid, 1989; Lave, 1992). Given this, learning is viewed as embedded in the social and

physical context in which it is experienced. Further, it is held that learning through available tools results in an enculturation to the society in which the learner participates. This notion became particularly important to me in my study of student learning in an Internet-mediated environment and became paramount for investigation through this study. Indeed, rather than limited my examination of learning to the development of simple information and knowledge skills I was more desirous of exploring how the participants learned culturally valuable understandings which enabled their active participation in community practices.

This understanding enabled me to also consider a broader concept of learning which included the 'roles' which are taken on by learners, in this case when the participants engaged with the Internet. These learner characteristics were drawn from the situative and distributive concepts related to the manner in which learners develop language (jargon) and exhibit behaviours as a result of their social transactions and engagement with socially valued tools. I became desirous of uncovering these socially relevant forms of learning which were evident during Internet-mediated activity.

Further expanding my view of learning and providing a useful vehicle to explore the learning experiences of young, competent Internet users are principles underpinning Distributed Cognition. The theory of Distributed Cognition is explored in detail in Chapter 3, as is Situated Cognition. However, in terms of this theory's impact on my understanding of learning it raised my awareness regarding the interactive nature of the learner, the tool facilitating the learning experience and the situation in which the tool is utilised (Rogers & Scaife, 1997). It became apparent to me that in my study of Internet-mediated learning one of the most important components would be the nature of learning resulting directly from the nature of the tool which facilitated learning. This encouraged me to view learning not just in terms of what information the learner appeared to have gained, but rather, their broader development as a result of the learning environment in which they were participating.

Based on this expanded notion of learning which I developed through the process of this thesis construction, my goal in examining the learning experiences of young, component Internet users was to avoid limiting analysis of the data to traditional forms of learning valued in today's society but rather to look for any evidence of the participants' learning

experiences (particularly under situative and distributive views of learning) as a result of their engagement with the Internet. What resonates as extremely important to me when considering the nature of learning is a belief that the transitional nature of learning is not only relevant to the individual, but reflects the evolving nature of knowledge which is embedded in society at a given point in time (Brown, Collins & Duguid, 1989). This idea is explored further in section 2.2.2 where I consider the place of the Internet as a culturally valued cognitive tool.

Thus, my goal was to avoid limiting analysis of the data to traditional forms of learning valued in today's society but rather to look for any evidence of the participants' learning experiences (cognitive, social and/or affective) as a result of their engagement with the Internet.

My conceptualisation of learning is an important consideration for this study. What also requires clarification for the purpose of this thesis is the nature of the Internet and I now move to explore this issue with particular emphasis on the Internet as a cognitive tool.

2.2 How the Internet is Conceptualised in this Study

2.2.1 Characteristics of the Internet

The Internet is comprised of numerous components and this study has allowed for any or all of them to be used by the children taking part in this study. Specifically, the components of the Internet to which I refer are:

* the World Wide Web – the millions of web sites connected through hypertext links;
* email communications;
* instant messaging services;
* chatrooms.

As will be detailed later, my research design enabled the participants to use and/or discuss any of these features of the Internet. As all of these features are available to Internet users the consequence of this diverse usage should be acknowledged in any study of the Internet in its authentic state.

2.2.2 The Internet as a Culturally-Valued Cognitive Tool

In this study the Internet is viewed as a culturally valued cognitive tool and the theoretical position underpinning my decision to class the Internet as such a tool is presented in detail in Chapter 4. However, in order to clarify my position on cognitive tools for this thesis, I discuss the nature of cognitive tools generally before moving to locate the Internet as a cognitive tool. I conclude this section with the analogy of the printing press which, I contend, is a culturally valued cognitive tool that demonstrates the impact of such tools on human learning and evolution of society.

2.2.2.1 The Nature of Cognitive Tools

The use of cognitive tools has been acknowledged as far back as primitive humans' use of stones or marks on trees to calculate sums or record events (Reeves, Laffey, & Marlino, 1997). Indeed, throughout history we have seen the impact of various tools, such as cutlery, signage, writing implements and calculators, on the development of societies.

There exists a relationship between tools and their impact on human existence, especially when we consider that tools reflect the experiences of others as they invented or modified a tool for use by themselves and/or others (Riva, 2001). Tools are the product of human and cultural historical activity and serve as frames of reference for individual thinking in context (Daniels, 2001; Glassman, 2001).

The effective use of a cognitive tool is not limited to mastery of its technicalities, but also involves engaging the tool to develop one's cognitive skills, as well as developing some awareness of the tool's impact on society (Rychen, 2002). Thus, a tool is not just 'used', but rather, influences and is influenced by an individual's action and, therefore, both reflects and affects human development (Glassman, 2001; Salomon & Perkins, 1998).

In terms of child development, cognitive functioning becomes embedded in what the child is doing while learning to use culturally valued cognitive tools (Arievitch & Stetsenko, 2000). Indeed, Salomon & Perkins (1998) suggest that widely adopted tools send messages through their presence. They use the example of the typewriter, keyboard and printers which signal the importance of speed over the personal touch of calligraphic style. When considering media technologies such as the Internet, culture is a vital factor in understanding how certain technologies become part of everyday life. Media technologies enter cultural settings in ways that extend the characteristic traditions, values and styles that are already in place while at the same they also challenge and transform the foundations of culture (Lull, 2000). To explore this issue in detail, the discussion now moves to identify specific factors which support my argument that the Internet is a cognitive tool.

2.2.2.2 The Internet as a Cognitive Tool

The Internet's role as a cognitive tool is particularly evident when considering the way in which it was initially developed to meet the needs of certain communities before rapidly evolving to meet the growing demands of society. Consider, for a moment, that the Internet came into existence to meet the need of the United States Defence Department to possess interconnected computers which could remain functioning if one part was destroyed during attack (Shannon, 2004). Historical review of the Internet's growth suggests that initial development of the individual technologies to meet specific needs (eg. packet-switching networks in Europe) has, over time, combined to meet needs and demands of other communities (eg. universities) before evolving into a form many of us value and utilise in our daily lives. This is the nature of cognitive tools.

Importantly, there are numerous aspects of the Internet that promote it as a unique cognitive tool that has the potential to significantly impact upon current and future generations. The literature abounds with descriptions of the characteristics of the Internet that make it a tool unlike any previously available. The specific features of the Internet and their potential impact on human and social development are discussed in detail later in this chapter at section 2.3.1. This section will instead focus on my argument that the Internet is a culturally valued cognitive tool.

Prior to encountering the theories that underpin my integrated theoretical framework for understanding Internet-mediated learning (these theories are discussed in detail in Chapter 3), I had developed some understandings of Salomon's (1979) Symbol Systems. The theory of Symbol Systems holds that various forms of media (eg. radio, television) are capable of conveying content via different inherent symbol systems (Salomon & Perkins, 1998; Kozma, 1991). Salomon's work surmises that these different systems affect knowledge acquisition because of their capabilities in highlighting different aspect of content and their varying degrees of ease of use. These factors subsequently affect the level of processing required of the learner and create different cognitive processes at different levels of efficiency. In other words, the form in which information is presented can determine how it is processed in the mind and hence, how it can be learned. For example, under this theory it was believed that television required less mental processing than reading and, subsequently, the meanings secured from viewing television would be less elaborate than those secured from reading (Cobb, 1997).

I thus began to wonder about the potential impact of the Internet on human learning, based on its multimedia and hypertext design. The Internet certainly presents material in forms that require interpretation and application by the human mind, in ways not previously necessary or even available. If, like Miller (2000), we consider the human brain has evolved over thousands of years as a result of the tools developed and valued in society, it becomes easy to argue that Internet technologies have the power to shape us and our ways of thinking about the world as much as we use them to reshape the world.

Importantly, when considering the value of a cognitive tool in society, Mishra, Spiro and Feltovich (1996) have noted that the effects of particular technologies on cognition, knowledge and society at large are generally not immediately apparent, instead often taking decades or more to be appreciated. We have seen this with the printing press. Indeed, to better appreciate the potential impact of the Internet as a cognitive tool I believe it is useful to align its development with that of the printing press which, with the luxury of time, we can now appreciate as having enormous impact on human development and society generally.

2.2.2.3 Analogy with the Printing Press

Invention of the printing press is attributed to Johannes Gutenberg of Germany, who demonstrated the practicality of movable type through his publication of 200 copies of the two-volume Gutenberg Bible in 1452 (Kreis, 2004). Although he attempted to keep his technique a secret, word spread and before 1500 some 2500 European cities had acquired a press (Kreis, 2004). Already the first parallel can be drawn between the growth of the printing press and the phenomenal growth of the Internet which is considered to have grown from ten websites in 1991 to over 45,000,000 in 2003 (Zakon, 2004).

Mishra, et al. (1996) note that ancient arguments about the effect of print on human thinking are raised in Plato's work where it is suggested that writing (and books) would destroy thought because books make statements and they don't argue back. It was claimed that this passivity would undermine reflective thought and the ability to think deeply about things, to question and examine every assertion. However, while I would concur that print has had an effect on human thinking and intellectual revolution, it is not necessarily in the form predicted by Plato.

This is a fundamental argument underpinning this study: we can *predict* how the Internet *might* impact upon learning based on our understanding of learning in other environments but, unless we start to investigate learning in authentic Internet-based contexts, we will be limited in our understanding of its *actual* impact.

With hindsight we can identify the impact of the printing press. The effect was not immediate but, as Allen (2002b) identifies, the effect of the printing press was undoubted because *"no other form of communication introduced reproduction and permanence to such a great extent, and no other form freed the human mind from memory routines that had cost people space for new ideas"* (p. 2). Further, Allen's (2002a) identifies issues associated with the production of printed text such as, a move from public to private reading experiences, erosion of the control of the church and the standardisation of languages which can now be attributed to fundamental changes in society. The introduction of printed materials has mediated human activity in ways that have had a

fundamental impact on the individual and society more broadly. What will we write of the impact of the Internet in the years, decades and centuries to come?

The Internet environment is radically different from other forms of media previously used by humans to exchange and store what we know. It is the unique features of the Internet that make it unlike anything previously available. I strongly believe that because of this we cannot simply and automatically transfer what we know of learning in other environments to understanding learning in this particular environment. In what follows, I identify a range of Internet features which researchers and commentators believe will have either a positive or negative impact on learning. It is important to understand the unique features of the Internet before entering a study of Internet-mediated learning. I believe researchers need an in-depth understanding of any tool under study to enable analysis of users' engagement with the tool and the greater social implications of its use.

2.3 Learning in a Technological Age

2.3.1 Potential Impact of the Internet on Learning

Analysis of the nature and structure of the Internet lead me to consider that it is comprised of non-linear hypertext pages which can incorporate a range of multimedia features. Given this, I have chosen to extend my review of literature to studies of other hypertext and multimedia environments. I believe that what has been reported on these environments is applicable to Internet-mediated learning and, particularly, this literature was influential on my initial conceptions of the impact of the Internet on human learning.

Having reviewed an extensive range of literature on the effects (or predicted effects) of hypermedia, multimedia and Internet environments (see, for example, Breck, 2002; Driscoll, 2002; MacKeogh, 2002; Tancock, 2002; Bowler, Large & Rejskind; 2001; Fetherston, 2001; Hargis, 2001; Wolfe, 2001; Gordon, 2000; Hannafin, Land & Oliver, 1999; Dillon & Gabbard, 1998; Windschitl, 1998; Field, 1998; Oppenheimer, 1997; McLellan, 1996; Nielsen, 1995), I distilled these papers to come to the conclusion that there are five main areas to be considered:

(1) demands on human senses, perception and memory;

(2) communicative issues;

(3) issues of information distribution, access and retrieval;

(4) quality and quantity of available information;

(5) levels of interactivity and learner control.

Importantly, while I acknowledge there exists a broad range of other factors discussed in the literature I have limited the discussion below to those areas which have proved most relevant to this study.

Like Hartley (2001) I see that some areas promoted to benefit learners in an Internet environment can be considered by others to impede learning. Given this, each of the points below can be taken as a positive or negative depending on the view of learning held by the reader. As my study does not aim to evaluate the effectiveness of the Internet to promote or impede learning I do not present arguments for the positive or negative but instead identify these issues for consideration and note that understanding of them has assisted in my collection and analysis of data.

Table 2.1 below presents an overview of the areas of the Internet which have potential to impact on human learning.

Areas of Potential Impact of the Internet on Human Learning	
Demands on Human Senses, ,Perception and Memory	• The Internet provides opportunities for multisensory learning (integration of words, pictures, sounds and moving graphics). • The user controls information flow and access through hand/mouse interactions. • The speed with which information can be retrieved may overload human perceptions. • The Internet extends procedural memory through off-loading of automated tasks. • The Internet requires users to selectively attend to appropriate components, raising issues of distraction. • Issues of distraction may affect maintaining of attention (selective/divided/lapses). • The division of attention may affect the building of appropriate schema in memory.
Communication Issues	• The Internet allows connection between user and broader community. • Users benefit from exposure to the experiences of others. • The individual has the opportunity to become an active member of the global community. • The Internet can promote fast, direct feedback from others - it allows both synchronous and asynchronous communications • The Internet is changing the nature of the traditional information flow in

Areas of Potential Impact of the Internet on Human Learning	
	communities. • The user may publish and publicly contribute to the world's body of knowledge.
Issues of Information access, distribution and retrieval	• Information is no longer presented in simple linear, logical fashion. • There are opportunities for incidental forms of learning. • Potential for increased demands on learner to be able to search, browse and collect information effectively. • May require some ability for multitasking between Internet and other computer applications. • Requires mastery of technical requirements associated with Internet usage. • Changes the way people interact with print – they must become critical consumers and learn to assemble information into a coherent product. • Allows access to the human knowledge developed over thousands of years which may previously been limited to a selected few. • Learning is not bound by space and time. Instead, information across the spectrum of knowledge that was previously limited in access to books, libraries and museums can be accessed. • The Internet and word processing packages allow for simple 'cut-and-paste' of information which may not be processed or understood.
Quality and Quantity of Available Information	• There is an ever-increasing body of current and up-to-date knowledge on-hand. • The high quantity of information will require the ability to skim and scan information for relevance. • The amount of available information may lead to information overload and information anxiety between what is known and what we think we should know. • The amount of available information may lead to disorientation and requires understanding of available tools (backtrack, history lists, bookmarks) • The available information is not necessarily good information and may expose users to misinformation, propaganda, etc. • Internet-users are required to organise large, ill-structured masses of information. • The Internet allows for presentation of multiple perspectives and great diversity of content.
Levels of Interactivity and Learner Control	• There is a move from simply absorbing material to personally navigating and finding information. • Browsing and searching has the potential to promote curiosity and motivation. • Non-linear links make it possible to examine content from various angles. • Hypertext can highlight critical sections of text more clearly. • Interactivity may increase user's attention, concentration and amount of time devoted to learning activities. • The learner control may stimulate and motivate the user to search for more extensive information. • The nature of the Internet requires one to build awareness of their own progress leading to high expectations for self-monitoring and self-regulation. • The Internet can facilitate both autonomous and collaborative learning experiences • The Internet has the potential to cater for individual differences historically created in traditional educational environments

Table 2.1: Areas of potential impact of the Internet on human learning

As mentioned previously these five areas are drawn from a variety of sources; some of which are discussion-based opinion, for example, Windschitl (1998) who presents analysis of (amongst other things) the potential impact of the Internet to reduce low-level tasks to allow user to concentrate on high-level tasks, the flexibility with which information can be accessed and the effects of global communication. Similarly, Owston (1997) examines issues of flexibility and also the potential of the Internet to promote critical thinking. Research studies were also valuable in contributing to the five categories developed above. Studies were diverse in nature and revealed such things as the effects of hypermedia, multimedia or Internet technology on reading and writing skills (Tancock, 2002) and access to abundant, up-to-date information (Breck, 2002). This literature is further reviewed in Part 2 of the Literature Review.

On reflection about the points raised in Table 2.1 above, I surmised the following process (shown in Figure 2.1 below) exists during independent Internet-mediated activity. This process depicts the activities involved in actively identifying, seeking, using and transforming information to promote personally relevant learning during Internet-mediated activity.

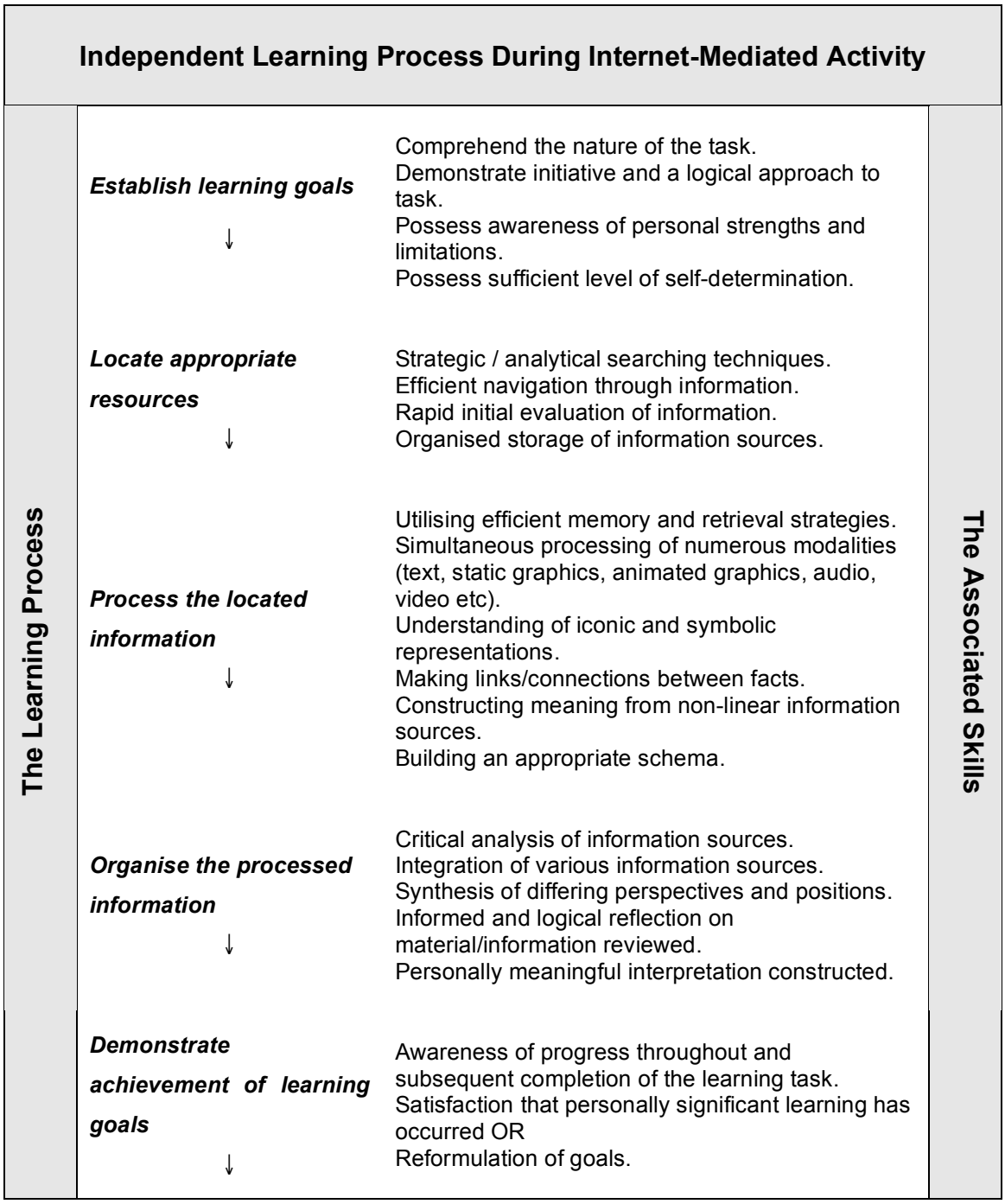


Figure 2.1: The independent learning process during Internet-mediated activity

In addition to the numerous issues raised above, a further consideration of the Internet as a cognitive tool is the relationship between user (in the case of this study, children) and the physical components of the tool. Interestingly, Breck (2002, p. 33) shares the experiences of an elementary teacher from the United States who claims that he has never had to show a little boy how to use the mouse, he just puts it in their hand and off they go.

To further highlight this point Breck (2002) shares the experiences of another teacher when introducing the mouse to 4-year olds:

"The effective technique, he explained, is just to put the mouse in her hand. First, he said, she will put it in her mouth, but that gets her nowhere. Then she will hold it up to her ear and listen, but that doesn't help either. Then rubs it on her clothes. Soon, she will notice another kid nearby who has the mouse down on the pad, moving it around. So she will put it down and move it, and in no time will understand how that moves something on the monitor screen. Once she connects what is happening on the screen to her mouse she will always know how to use the device" (pp. 33-34).

I believe this natural, early interaction between child and tool provides invaluable insights to a study such as this, as it represents the future generation's changing exposure to technology in day-to-day life.

There are an abundant array of Internet features that have the potential to impact upon learners and their learning. Indeed, many of our changing conceptions of the desirable learning competencies for today's citizens can be considered to have evolved, to some extent, through advancements in technologies such as the Internet. Whilst discussion abounds on the likely effects of specific elements of Internet-based technology on human learning, there is little in terms of empirical research devoted to understanding the unique ways in which the Internet might promote, impede, or fundamentally change either the way in which we learn, or the development of related skills.

2.3.2 The Changing Nature of Learning

Like myself, many in the educational field have considered the impact of technologies, such as the Internet, on learning. This interest is reflected in two particular areas throughout the literature:

1. learning competencies for the 21st Century; and
2. informal learning.

I consider in a study of Internet-mediated learning it is important to identify the learning competencies which are *predicted* to be relevant for members of technology-rich societies. Also relevant to the study at hand is recognition that opportunities for informal learning are certainly promoted by the Internet. As shall be demonstrated in section 2.4 below the rates of informal Internet usage for children and adolescents is relatively high in some parts of the world. Given this, it is imperative that we recognise the issues related to informal learning experiences and Internet usage to better understand this generation of learners. These two issues are now discussed.

2.3.2.1 Learning Competencies for the 21st Century

The term *new learning* can be used to depict new learning outcomes, new kinds of learning processes, and new instructional methods that are both wanted by society and currently stressed in psychological and educational theory (deKock, Sleegers & Voeten, 2004).

Talk of learning in the 21st century or learning in the Age of Information encompasses the broader notion of lifelong learning. This refers to individuals being equipped with the knowledge and skills necessary to participate in today's and future society. Careful consideration of these skills is therefore important, especially if we consider that the abilities, approaches and skills for learning that a person gains from childhood provide a context and resource for learning and performing later in life (Sharples 2000).

As we have progressed from the Industrial Age to the Information Age learning competencies have been identified that reflect changes in society. For instance, in the field of education we have come to appreciate that learning does not just occur during periods of formal education, but throughout one's lifetime (Alheit & Dausien, 2002; MacKeaogh, 2002; Griffin & Brownhill, 2000; Field, 1998). Literature has also continued to emerge detailing the competencies necessary for the lifelong learner in the 21st century. A clear example of such competencies is presented in the report of EnGauge (2003) 21st Century Skills for 21st Century Learners as shown in Figure 2.2 below.

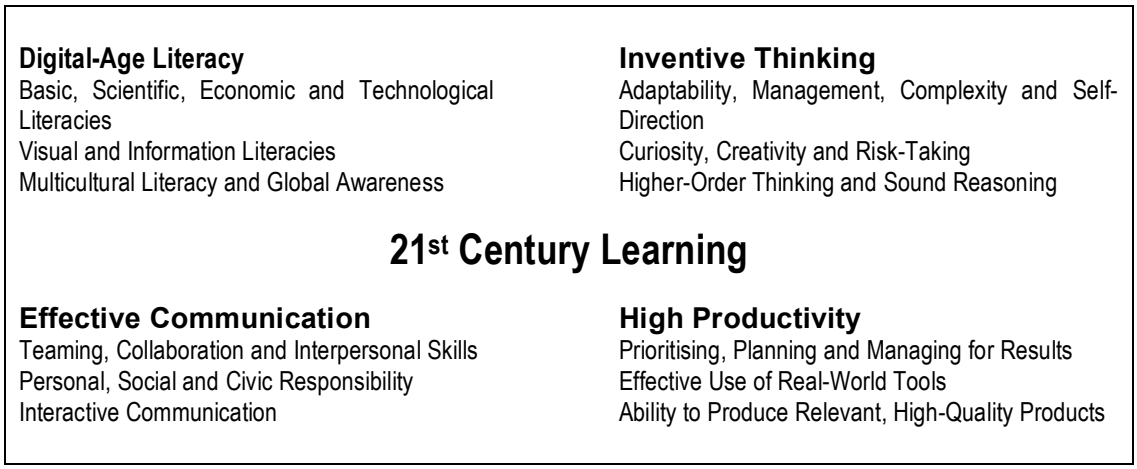


Figure 2.2: EnGauge (2003) 21st Century Skills for 21st Century Learners

The example above is reflective of literature which exists across the spectrum of life stages. Review of discussions at the primary, secondary and tertiary levels of education, along with identified workplace competencies has allowed me to ascertain commonalities of skills and personal learner characteristics evident across the board. Naturally this literature is interested in the 'whole' person and thus competencies reflect a broad range of social, cognitive, affective and physical skills. For the purpose of this study, however, I have set parameters and included for discussion only those most relevant to a study of Internet-mediated learning. Given this, in Table 2.2 below I present a range of competencies currently espoused in the literature as essential for 21st learners and I note the potential relationship between each and the Internet.

Competencies for 21st Century Learners Identified in the Literature		
Skill	**Description**	**Relationship with Internet**
Mastery of Tools	In order to maximise learning potential throughout one's lifetime it is necessary to possess the skills required to utilise culturally valued cognitive tools (Rychen, 2002).	We should not limit our focus to students using the Internet as a giant reference book, but rather, focus on development of relevant and related skills and effective learner characteristics that will subsequently be used throughout a person's lifetime (Schrock in Conte, 2000).
Communication Skills	In our ever increasingly hyper-connected world, communication is paramount. It provides the social nexus whereby interpersonal relations, entertainment and local and global influences intersect, interact and influence each other (Lull, 2000). It is necessary that one can express themselves, argue and analyse using a variety of communication tools (Rychen, 2002; Baker, in Klein, et al. 1998).	The Internet enables forms of communication that were not previously available, particularly when we consider these communications occur on a global scale. In societies where the Internet is highly valued, competence in effectively communicating with this tool is essential to become an active member of certain communities.

Competencies for 21st Century Learners Identified in the Literature		
Skill	**Description**	**Relationship with Internet**
Effective Handling of Information	There has been a shift toward being able to effectively search for and use information. While factual knowledge is plentiful, what is needed are the intellectual skills necessary to give value to information and transform it into useful knowledge systems (Hargis, 2001; Reil, in Conte, 2000).	Technologies such as the Internet require learners to be capable of searching for, processing, using and transferring greater amounts of available information. It is also necessary that the learner recognises the place of the Internet with other available sources of information.
Media Literacy	Furstenberg (in Ludewig, 2001) describes media literacy as the theory and practice of understanding the underlying messages presented through visual codes. Understanding not only of the media itself but also its social and cultural implications.	The Internet is one medium which has promoted a need for media literacy. A broad range of individuals and organisations send messages through the Internet using various multimedia technologies. It is important, therefore, that Internet-users are capable of identifying and interpreting these representations.
Adaptivity/Flexiblity	Today's learner needs the capacity to direct and redirect, change and deal with the transformations taking place in society as a whole (Rychen, 2002). Toffler (cited in Rosenberg, 2001, p. 9) contends that "*the illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn"*.	The Internet is a constantly evolving tool. With technological advancements the Internet continues to adapt to meet the demands of its users. Given this, it is necessary for active Internet users to constantly adapt and remain flexible to maximise their engagement with this tool.
Autonomy/Self-Direction	The autonomous individual should aim to develop independence and his/her own responsibility for developing his/her learning, in other words, learning how to learn (Griffin & Brownhill, 2001).	The Internet has the potential to promote autonomous learning. Learning is no longer space-bound and limited to formal learning institutions. Individuals require the skills of autonomy and self-direction when using the Internet if they are to fulfil learning goals independently.

Table 2.2: 21st Century Learner Competencies Identified in the Literature

In addition to the list above, we must also consider the traditional higher order thinking skills which are still valued today. Skills such as critical thinking, reflection and problem solving can also be considered relevant to learning in an Internet-mediated environment.

This study does not aim to determine whether currently identified competencies, such as those listed above, are needed to learn in an Internet environment. Nor do I aim to determine if these competencies are fostered in the Internet-mediated environment. Rather, my aim is to establish what learning is actually evident when children use the Internet without being limited to those traditional forms of learning identified above. Again I reiterate that this study does not focus upon measuring the participants' factual

knowledge of the content explored. However, the value in identifying learning competencies relevant to learning and technology is two-fold:

(1) it enabled me to understand the competencies currently valued and predicted to be of value to citizens living in the 21st century;
(2) it raised my awareness of the limitations that may exist in simply applying traditional forms of learning to a new and unique learning context.

When considering the value of applying these skills to learning in an Internet-mediated environment, I concur wholeheartedly with the comments of authors such as Lesgold (2000) and Bonk & Cunningham (1998) that what is known at this point in time, is that the Information Age is markedly different from eras gone by. This makes it unlikely that past understandings of learning will be sufficient to capture all facets of learning in the 21st century. I believe that we do not currently have sufficient understanding of the learning experiences of individuals, which result from new technologies such as the Internet.

As indicated at the outset of this section, the role of technology is not just noted in the development of learning competencies relevant to today's learners, but has also played a significant role in the growth and recognition of informal learning and this comprises the second component of this discussion.

2.3.2.2 Informal Learning Experiences of Children and Adolescents

I did not commence this study with an awareness of the relevance of informal learning to the Internet. However, after engagement with the research participants and subsequent reading on the day-to-day Internet activities of children and adolescents, I came to realise that Internet use was highly informal, even when learning how to use it in the first instance. Given this, I could not overlook analysis of issues related to informal learning.

The current view of learning, particularly when it is viewed as 'lifelong', has resulted in a definite shift away from thinking about learning only as it occurs in formal educational environments. Today it is recognised that learning is a permanent process throughout one's lifetime and occurs in every aspect of one's life (Griffin & Brownhill, 2001;

Sharples, 2000). Informal learning acknowledges that much of what is learned comes from experiences in life and interactions with family, friends and neighbours, rather than being limited to formal education institutes (Harrison, 2003; Overwein, 2000).

Melber & Abraham (1999) loosely define informal learning as learning that occurs outside of a classroom setting. This environment can encourage learning in ways that a traditional environment may not. Obviously the Internet can be accessed at home and this encourages its use outside formal settings. Also, informal learning through the Internet may increase the likelihood of incidental learning. Northcote and Kendle (undated) comment on the possibilities of the Internet to motivate and promote incidental learning, particularly through its use as a recreational medium. Cook (2004) concurs that the Internet presents an important informal learning environment where individuals are personally motivated by the programs available on the Internet (eg. email and Google searches).

Imel (2003) put forth the Internet as an ideal medium for fostering and supporting informal adult learning and Gray (1999, cited in Imel, 2003) considers that it *"could possibly be classified as one of the most powerful and important self-directed learning tools in existence"* (p. 120). I take this further to suggest this is the case not only for adults, but indeed, is the case for children and adolescents, especially when we consider the increasing rates of informal Internet usage recorded for children and adolescents.

The research undertaken by agencies such as the NESTA Futurelab (Sefton-Green, 2003) have been very important in identifying the informal learning taking place with children and technology, out of formal educational environments. Sefton-Green (2003) notes that many children are immersed in technology-related activities (such as Internet usage) in their homes and with their friends.

I now move in the following section to explore some of the statistics which highlight children and adolescents' recent Internet usage

2.4 Rates and Types of Internet Usage by Children and Adolescents

Reports to emerge over the past five years suggest trends of increased Internet usage by children and adolescents. In Australia, for example, 58.5% of 12-14 year olds are reported to use the Internet at home, 39% of 15-18 year olds use the Internet daily and 75% of 18-24 year olds have access to the Internet at home or work (Pitman, et al., 2003). Similar trends are evident throughout the world with growth of Internet usage at home by Britain's youth increasing from 45% in 2001 to 56% in 2002 and increased usage at school from 56% in 2001 to 71% in 2002 (Hayward, et al., 2002). The trend continues in the United States where 9–12 year olds have a recorded growth in their Internet-based 'exploring' activities to 58% - up from 22% in 2000 (enGauge, 2003).

The most common forms of engagement by Australian children have been found to be email and information searches (Aisbett, 2001). Children were also found to use the Internet for entertainment activities, such as downloading games and music, participating in chatrooms or utilising instant messaging services. Similarly, Livingstone, Bober & Helsper (2004) reported United Kingdom youth (9-19 year olds) as using the Internet to communicate, for peer-to-peer interactions and to seek information.

To highlight the position of this generation of learners I believe the importance some adolescents place on Internet access is captured in a quote of a 16-year old American boy which is shared by Subrahmanyam, et al., (2000, p. 123) *"I really want to move to Antarctica - I'd want my cat and Internet access and I'd be happy"*.

To this point I have identified the Internet as a cognitive tool and discussed its potential to impact upon learning and the changing nature of learning for the 21st century. I have also presented an overview of current usage by children and adolescents and now move in Part 2 of this literature review to examine the relevant empirical research body.

PART 2 – REVIEW OF RESEARCH STUDIES

2.5 Research Across Diverse Fields

Upon commencing this study in March 2002 I found that empirical studies which examined Internet-mediated learning were extremely limited in number and, where they did exist, were not readily applicable to my study as they examined learners at a tertiary level and were often focused on distance learning.

As mentioned previously in this chapter at section 2.3.1 above, I see the relevance in applying understanding of hypermedia and multimedia environments to the Internet as the Internet comprises these features. Given this, I have also reviewed these studies where they were aimed at understanding the learning which occurred in these environments.

My analysis of empirical research in the field is broken down into four distinct parts:

1. understanding learning in hypertext or multimedia environments;
2. studies of Internet-mediated learning;
3. studies of children and adolescents and the Internet;
4. review of research methods.

Part 2 then concludes by identifying the current and future directions for research in this field which highlight the need for a strong theoretical framework for understanding Internet-mediated learning.

2.5.1 Studies of learning in hypertext and multimedia environments

Studies of the effect of learning with hypertext or multimedia primarily fall into two categories:

- comparative studies; and
- studies evaluating specific technologies or programs.

One type of comparative study prevalent in the literature is that which compares student performance in traditional learning environments with technology-based hypermedia or multimedia environments. Ellis (2001), for example, evaluated the performance of adult learners, where some participants were presented with traditional written text and others computer-based multimedia enhanced tutorials. Similarly, Riding & Grimley (1999) compared the results of eleven-year olds exposed to either multimedia presentations or traditional methods of teaching science.

I believe these types of comparisons are limited because they generally just present old learning materials in the technological form. This does not take advantage of the features of the new medium and so cannot capture the unique forms of learning which may emerge. Where positive findings toward the technology-based presentations are found there are many other external factors, such as the motivational effects of new media in formal educational environments, which must also be taken into consideration. I believe what is often being measured are two vastly different things that are perhaps not comparable.

Another type of comparative study is that measuring learning as a result of changes to specific variables of the hypertext or multimedia environment. Mayer & Moreno (2002, 1998) have been particularly prolific in this area in relation to multimedia presentations. As a result of evaluating media effects (such as contiguity, interaction, split-attention, spatial continuity, temporal continuity and coherence) their studies have led to the development of the Cognitive Theory of Multimedia Learning. This is a theory I have found useful in my understanding of the effects of media in learning (discussed in detail in Chapter 3 at section 3.3.1), but which I feel is limited, in that it does not take account of the broader context of learning within a given society.

Other studies of this nature include those with university students (see for example, Barab, Young & Wang, 1999) which have relied upon the modification of single aspects of media presentation to compare results of student achievement. These types of studies may be useful for instructional design but, again, do not 'uncover' learning as desired by this study.

A further type of study which was predominant in the literature on learning in hypermedia or multimedia environments was seen in studies that evaluated the effectiveness of a specific program which had been especially designed in the hope of maximising learning outcomes for students. Studies of this nature include those with adults (Dreher, 1997); with University students at all levels (Konradt & Sulz, 2001; Last, et at., 2001; Yang, 2001; Guimares, Chambel & Bidarra, 2000) and school children (Mayes, Kibby & Anderson, undated-a; Trushell, Burrell & Maitland, 2001; Chambers, 1999). Again these studies are examples of extremely broad ranges of hypermedia and

multimedia applications. The value in reviewing these studies was to inform me of problems which exist in trying to fit these new learning environments into our traditional notions of learning. The types of studies identified here generally have preconceived ideas about what 'good' learning will look like and they evaluate student performance on whether this 'good' learning is evident or not.

Although the above studies are not directly Internet-based they were extremely useful in the initial stages of my research design. Firstly they raised my awareness of the many intricacies within these environments which may impact upon learners. Secondly, they helped to establish an obvious gap in the literature whereby few studies were found to attempt to uncover the learning that actually occurs when children use hypermedia and/or multimedia presentations. Instead, it appears that many are trying to fit old models of learning to new learning contexts. Review of these studies confirmed for me that I did not want to limit my study of Internet-mediated learning to pre-existing notions of learning but instead saw a real need to allow the learning actually evident in this environment to emerge directly from the data.

Although the literature was quite limited at the commencement of this study, as I progressed more studies specifically examining Internet-mediated learning began to surface and I now move to review these studies.

2.5.2 Studies of Internet-mediated learning

As with the studies in the field of hypermedia and multimedia learning environments presented above, the Internet represents a diverse field of study and so can be explored by looking at many different Internet features, using many different research methods, with many different research participants. The most prevalent forms of research I found in the literature were:

1. studies of the effects of online tools/programs;
2. comparative studies (Internet v. print);
3. exploratory use of the Internet.

Presentation of traditional learning materials online has been one of the most common uses of the Internet in formal educational institutions. A broad range of studies have been conducted across Australia, Europe and the United States that attempt to evaluate the effectiveness of such delivery on student learning. See, for example, Ehman (2001); Hargis (2001); Parikh & Verma (2001); Grabe & Sigler (2001); Cann (1999); Oliver & Omari (1999); Corrent-Agostinho, Hedberg & Lefoe (1998). One study that is more applicable to my own study is that of Tanock (2002) as she examines the learning of nine- and ten-year olds. Studies involving primary age students have been relatively rare. Tanock (2002), however, was interested to uncover the reading and writing experiences of children as they interacted with texts created with computer and Internet technologies. While there are many interesting insights presented as a result of this study one of the limitations I saw in a study such as this was that traditional materials were merely being transformed into online forms (Webquest) and I feel this does not reflect the full potential of the Internet, especially as it is used in day-to-day life.

The studies of Eveland & Dunwoody (2002, 2001) in the field of Media Communications have been useful in understanding issues related to learning in an Internet environment compared with learning with print media. I have found these studies particularly helpful because, in some, they have utilised my preferred research method of the think-aloud protocol. However, again in these comparisons of print and Internet I believe two fundamentally different forms of media cannot readily be compared. However, I consider the comparative studies of print and Internet media which I have identified, highlight the diverse fields in which interest in Internet-mediated learning lies.

The third type of study identified is those which have investigated the Internet in a more naturalistic form. These studies align more closely with mine. Three which were particularly useful in assisting me in determining the most appropriate research goal and subsequent research design are those of Ross (1998), Land and Greene (2000) and Hess (1999).

Ross' (1998) research is similar in that it is an Australian study, however, the participants were older students in two senior high school classes. The study examined how students

made use of Internet information in the process of their learning. Specifically, this study attempted to identify learning barriers and to develop and implement teaching of information literacy and critical literacy to address these concerns. It was a comparative study whereby one class was assigned traditional information sources and the other group accessed the Internet. Although the goal of the study was significantly different to mine, this study is one of the few which I came across at this time that observed students as they use the Internet in a more realistic form (ie. students independently looking for information to achieve a stated goal).

Land and Greene (2000) engaged undergraduate students to examine the ways in which learners identify and locate information for an open-ended task and how they integrate this into a complex project based context. This study is similar to mine in that the researchers observed individuals whilst they were engaged in goal-directed Internet-mediated activity. The study also relied upon my preferred data collection method, think-aloud protocols. I found this study particularly useful in that, although the researchers had some pre-existing categories to organise the data, they allowed new themes to be inferred from the data also. Such themes included evidence of children's 'question drift' whereby they changed inquiry when search results were unsuccessful and learners were able to draw upon metacognitive knowledge to compensate for lack of system and domain knowledge. Land and Greene's (2000) approach to elicit broad forms of 'learning' aligned with my views on interpretive research (discussed in Chapter 4 at section 4.1 and 4.10.1).

The study of Hess (1999) was also useful to the development of my research study. Hess' (1999) study aimed to describe and interpret the cognitive strategies used for information retrieval of one post-graduate student. I felt particularly drawn to this study because: (1) it allowed the participant to search for information on a personally relevant topic; and, (2) it relied on the think-aloud method of data collection. This study revealed a major limitation in scope with respect to my research goal because of the inexperience of the research participant in using the Internet. It is stated by Hess (1999) that the major finding of the study involves the fundamental concern and experience of information overload due to the user's knowledge and personal characteristics. The participant, as a novice Internet user, was particularly overloaded by the experience. It was my

contention that young, competent users would not experience the same disorientation and fear as older, less experienced users and this study of Hess (1999) identified limitations that arose when the user could not comfortably use the tool under study.

What is most notable about all of the studies mentioned throughout this section is that they generally omit younger children as a research group and instead studies are most often conducted with adolescents, university students or adults. I believe that the experiences of adults using a tool such as the Internet are fundamentally different to younger learners. In order to understand the needs of future generations we need to gain an insight into their own early experiences, rather than limiting ourselves to the experiences of older learners.

2.5.3 Studies of children's Internet-mediated learning

As my study examines children's Internet-mediated learning in as natural state as a research situation will enable, my goal was to locate studies with a similar purpose. However, what I have found is that studies involving children's Internet use are often limited to prescriptive uses of the Internet where the researcher, not the Internet-user, remains in control of what is accessed on the Internet.

Sullivan, Norris, Peet & Soloway (1999), for example, investigated the Internet use of eighteen 12- to 16-year olds but confined the participants to two purposefully chosen websites: www.disney.com and www.edmunds.com. Interesting issues to arise related to the design of Internet sites. For example, orientation and navigation aids were found to be an important feature when designing web sites for children; children may perceive (or at least treat) web animations as a distraction to be removed (by scrolling them out of their visual field); and there was no measurable difference between children's search success or perceived usability of the two very different web sites which were compared. Although useful I believe this study (and others of a similar nature) is limited to the evaluation of the web sites rather than students' cognitive behaviours and learning processes.

One study which does align more closely with my own is a Canadian study by Bowler, Large & Rejskind (2001). This study followed three grade-six students as they accessed,

interpreted and used information found on the Internet to complete a class assignment. Some interesting insights into student learning emerged from the video-taping of the students' behaviours and their interactions with each other. These included insights such as: questions teachers ask will drive information-seeing and knowledge-making process; efficient use of the web implies a background of knowledge about computers and inquiry; and, cooperative learning restricted the variety of student responses to the questions posed by the teachers. However, although the participants chose their own research focus it was restricted to a topic and guiding questions set by the class teacher. A further difference between this and my study was reliance in the Bowler, et al. (2001) study on Bloom's Taxonomy of Higher Order Thinking as a measure of learning. As stated previously, I am hesitant to limit learning in this environment to those traditionally valued forms. Also, the small group situation encouraged a great portion of data to be related to social interactions which, although interesting and important, are not relevant to the goals of my study.

Research projects which I believe are particularly valuable to this field of study are those which have moved away from traditional educational environments and have instead conducted research in less-formal learning environments, such as the Shared-Spaces Program in the United Kingdom (Buckingham, Sefton-Green & Willett, undated; Sefton-Green, 2003; Sefton-Green & Willett, 2003). The objective of this program is to:

"*…investigate children and young people's learning in and about 'digital cultures' ….aimed to look at the style, structure and content of learning in relation to digital technologies in informal settings often overlooked by schools such as homes, libraries and community centres"* (p. 2).

As part of this research three projects were set up at an informal arts and media centre in North London. These projects included a computer game making class, a cybercafe and an investigation into chatrooms. I see these types of studies as the most useful in moving us toward a clearer understanding of this current generation of young learners, their skills, needs and preferences because they examine learning as it occurs in context and attempt to uncover children's perceptions rather than apply preconceived ideas.

Another field of study to emerge more recently is that which aims to uncover what motivates children and adolescents' Internet use; studies which ask the why, how, when and where of Internet-mediated learning through the use of surveys and interviews with children and their parents. Livingstone and her colleagues (Livingstone & Bober, 2004; Livingstone, Bober & Helsper, 2004; Livingstone, 2003) have been dominant in this area. Research conducted has revealed insights into children's independent Internet usage. The research indicated the following main activities:

- 90% work for school or college
- 94% to get information for other tings
- 72% send and receive emails
- 70% play games online
- 55% send and receive instant messages
- 45% download music
- 21% use chatrooms.

This type of research provides insights into other areas of online usage that may cause concern such as children providing their personal details to people they have never met particularly to enter competitions. Also revealed are statistics such as 30% of 9-19 year olds who go online at least once a week have made an online acquaintance. These types of studies provide real insight into the culture of the future.

Similarly, Holloway & Valentine (2003) have engaged in insightful research in this area to identify the role of information and communication technologies in the lives of children, their parents and teachers.

Others have had similar research interests but with wider range of modern technologies. Facer, Sutherland, Furlong & Furlong (2001) focused on the value in trying to understand information and communication technology usage from a young-person's perspective. Their research revealed that young people consider their ICT use is driven by the ways in which they see it relevant to the achievement in other already existing objectives in their daily lives. Similarly, O'Connell, Price & Barrow (2004) have articulated such a goal, but go further to extend their research to technologies such as

mobile phones. Subrahmanyam, Kraut, Greenfield & Gross (2001, 2000) are another team who are interested in the effects of home computer use (which includes Internet access) on children/adolescents' physical, cognitive and social development. Studies conducted by these researchers have highlighted issues related to the effects of at-home computer usage on social development and relationships, including impact on friendships and family, using computers for communication and effects on perceptions of reality. These insights are particularly useful in uncovering the socio-cultural implications of Internet usage.

I noted earlier that many varied research methods have been applied to study learning in hypermedia, multimedia and Internet environments. The studies outlined above have been undertaken using a variety of research methodologies and methods. I move now, in the following section, to analyse the predominant research methods and identify how the review of this literature impacted upon my own research design.

2.6 Analysis of Predominant Research Methodologies

As can be seen from the review of literature presented above, interest in this field is diverse. It naturally follows that a broad range of research methodologies and methods have been utilised. Keeping in mind the stated research goals for this study I will first identify a range of research methods evident in the studies presented in this literature review and highlight the limitations of applying such methods to my study. I will then identify those studies that have utilised methods that have contributed to the development of my own study.

The methods I have identified as quite prevalent in the literature but which would fail to achieve my desired research goals include the following:

(a) Pre- and post-testing of learning

This research method is inappropriate for my study as it is only capable of capturing predetermined forms of learning, it does not allow for types of learning to be uncovered.

(b) Comparative studies between print and hypermedia/multimedia

Again, this approach would not allow for forms of learning to emerge, rather it relies on testing preconceived skills. Importantly, I also believe it is impossible to compare two very different forms of media.

(c) Evaluation of user performance with specific online tools or web sites

As my goal is to capture learning as it occurs when children use the Internet in a form which is reflective of their day-to-day usage, I do not believe a prescriptive Internet-mediated activity achieves that goal. This approach would also have limited my study to the specific design features of the chosen online tool or web site rather than encompassing any or all of the features available online. Also, I was hesitant to base my study on a tool or web site which may not still be in existence at the conclusion of my study.

(d) Surveys and interviews with children, parents and teachers

Some very useful information on the views of children, parents and teachers emerges when they are directly asked about their Internet activities. However, this approach is limited in that it relies upon the research participants being able to either: (a) accurately recall their activities; and/or (b) provide actual, rather than desirable, accounts of their experiences. It is my belief that in order to identify the learner skills and characteristics evident in an Internet-mediated environment it is necessary to immerse the user in that environment and watch their actions and listen to their thoughts. These findings can then be supported through follow-up questioning on what was observed and/or heard.

From analysis of the studies of others, I determined several aspects which I believed would limit the achievement of my research goals. The considerations I identified included the need to:

(a) Avoid participants who are inexperienced Internet-users as the focus of findings may necessarily be limited to their hesitancy and navigational problems which may override any other forms of learning which may be evident.

(b) Avoid reliance on third parties to describe the learning of children. Rather than collecting teacher or parent perceptions of what has been learned or what might be learned while children are using the Internet, more can be gained by going directly to the source of information, the children themselves.

(c) Avoid reliance on children's self-reports alone as they can be less accurate. Instead observe and listen to children while they are actually engaged in Internet-mediated activity.

(d) Avoid limiting my perceptions of learning to those currently valued, particularly the higher-order skills which are often touted as being promoted through Internet-mediated learning experiences. Instead, keep an open mind to all forms of learning which may emerge.

In summary, based on my review of research across a broad range of fields interested in some form of Internet-mediated learning I established the following as essential for the design of my study:

(a) Select participants who are confident and competent Internet-users.

(b) Allow participants to engage in Internet-mediated activity which is, as far as possible, reflective of their everyday use. This includes allowing the participants to access the full range of Internet features available to reflect the flexibility and complexity of Internet-based experiences.

(c) Have participants work on the Internet individually, rather than in pairs or a co-operative groups to maximise data related to cognitive processes, rather than social interactions.

(d) Capture Internet-mediated learning in context through observations and think-alouds, both of which have been used successfully by myself and others in the field (see for example Eveland & Dunwoody, 2002; Yang, 2001; Leblanc, et al, 2001; Hess, 1999; Ross, 1998).

In addition to taking the above insights from my review of literature I also gained insight into potential areas for current and future research directions and these are discussed in what follows.

2.7 Identified Current and Future Research Directions

As indicated throughout this discussion the literature in the field evolves from a diverse range of fields with different priorities and goals. There is certainly no consensus on what constitutes a research priority.

There are certain research methods which I have identified as necessary for extending understanding of Internet-mediated learning. I shall not revisit these methods but note they are important considerations for future directions in research.

In presenting the Internet as a culturally valued cognitive tool it is my contention that to best understand the potential impact of this tool on learning and the future evolution of society we need to investigate how the current generation utilises the tool and uncover what actually occurs when they use the tool in ways reflective of their day-to-day practices.

I believe that what is needed at this point in time is a greater understanding of the Internet in informal situations, rather than trying to examine its role in traditional educational institutions. Sefton-Green (2003) particularly highlights the need to consider a broad range of technologies as they occur in children's day-to-day lives. Colley et al. (2003) consider adults' Internet use and suggest there is a lack of research about informal adult learning and, until we have this, we are prevented from fully understanding the extent and type of learning taking place. I concur, but believe this is also essential from the child's perspective, particularly given the high rates of informal Internet use identified. What is needed is a greater shift toward valuing children as a unique, and extremely important group, to be studied in this context. Indeed, as Kellner (2002, pp. 91-93) suggests, children play a key role in establishing the emerging nature of Internet-related practices. She believes that we should undertake a research approach which is

primarily child-centred rather than technology- or media-centred. In doing so Kellner (2002) suggests that researchers should avoid construing children as passive or vulnerable, as incomplete adults rather than as agents in their own right.

Children, as a research priority in this area, should be supported by studies which investigate learning with the Internet in its most natural form. I believe that without growth in research which enables some insight into the Internet-based environment as participants of our society currently use it, we will be limited in understanding the abilities of and difficulties faced by learners who engage in this environment during times of both formal education and leisure. Indeed, if one views the Internet as a cognitive tool then, similar to cognitive tools which have gone before, such as writing implements, printed text and calculators, its impact on current and future generations of learners is likely to be profound. Hence, the context in which the Internet is used and valued must be understood in order to study the multidimensional consequences of Internet-related practices (Kellner, 2002).

In addition to identifying potential areas for future research as I have suggested above, another very important research issue is developing a strong theoretical position to understand this phenomenon. After my own review of literature I strongly concur with Jackson & Anagnostopoulou (2001) who also found that much of the literature on Internet-mediated learning has no real grounding in theories of learning. Jackson & Anagnostopoulou (2001) contend that where reference is made to any learning theory it is done in a superficial way. I believe this is one of the major problems associated with investigations into Internet-mediated learning and most definitely a priority for researchers in this field.

2.8 Conclusion

Throughout Chapter 2 I have attempted to make explicit my position on the nature of learning both in the 21st century and through an Internet-mediated environment. In doing this I have established the beliefs and understandings I held when entering the data collection phase of this research. Chapter 2 has presented a concise overview of the range of issues which have been raised in the diverse literature base focused on the potential of Internet-mediated activity to affect human learning.

Importantly, in section 2.6 above I have identified those research approaches which I believe most appropriate to extend understanding of Internet-mediated learning. In the preceding section I presented children working on the Internet in authentic contexts as a research priority. Along with these issues, what has become most apparent to me through review of the discussion articles and research studies presented in this chapter is that we lack a strong theoretical framework with which to ground this broad range of studies from diverse fields and using diverse methodologies. While reviewing this literature over the past three years my understanding of different theoretical perspectives and their place in understanding Internet-mediated learning has continued to evolve.

As a result of review of literature in the area I consider the most appropriate research design for this study is a qualitative case-study using the data emerging from children's informal Internet usage and collected through questionnaires, observations, think-aloud protocols and follow-up interviews.

Given this, in Chapter 3 I now move to discuss the theories that have impacted upon my development (and thus the development of this study) and present an integrated theoretical framework which has been used to develop an Internet-Mediated Learning Model. This model, I believe, provides researchers (with broad research interests) a strong framework in which to situate their research in order that we may develop some consistency in our understandings of learning within the Internet-mediated environment.

3. DEVELOPING THE INTERNET-MEDIATED LEARNING MODEL

Chapter 2 outlined the diverse range of research methods, interests and fields which contribute to our body of understanding of Internet-mediated learning. The chapter concluded with my suggestion that what would be beneficial is a theoretical framework which helps develop our understanding of the situation under study and provides an appropriate framework for research design and data analysis.

Chapter 3 is thus devoted to establishing and explaining the integrated theoretical framework I have used to develop the Internet-Mediated Learning Model. This model has provided me with a very useful framework to position my own study. I believe this integrated theoretical framework and resultant Internet-Mediated Learning Model can be utilised by others from a diverse range of fields who are interested in understanding learning in an Internet-mediated environment.

3.1 My evolving position on Internet-mediated learning

I entered this research study with a basic belief that learning occurred as a result of an individual's interactions with others and the environment. I considered the individual characteristics of the learner, combined with life experiences, greatly determined what was known and how it was learned.

As was identified in Chapter 2, section 2.6, as a result of my initial review of literature related to hypermedia, multimedia and Internet technologies generally, it became apparent that many studies were limited to focusing on a single element of the learning situation. While this is important to the growing body of knowledge, it seemed to me to be limited in explaining this new environment and its impact on human development more broadly. However, these early studies of hypermedia and multimedia resulted in several cognitive theories being developed and/or specifically applied to learning in technological environments. These theories greatly aided my understanding of ways in which the Internet might promote, impede and/or actually alter the learning processes and competencies of future generations. One of the cognitive learning theories which

had significant impact on me was the Cognitive Theory of Multimedia Learning developed by Mayer & Moreno (2002, 1998) which incorporates Cognitive Load Theory and Dual-Coding Theory. Two other theories important to my developing understanding were Cognitive Flexibility Theory and Flow Experience. I move in section 3.2 to discuss each of these theories along with my understanding of information processing generally as these theories, when combined, gave me some understanding of ways in which the Internet may impact on human cognition and learning.

What is most pertinent to note is that this initial review of research literature and accompanying cognitive theories raised my consciousness about the complexity of Internet-mediated learning. It made me desirous of developing a study which enabled exploration of the many complex and interrelated components relevant to the unique Internet-based learning environment, rather than focusing on a single component in isolation. It became apparent to me that achieving my research goal would not be possible if I limited myself to one or even several cognitive theories. I came to realise that the impact of the Internet was relevant across a broader learning system that included the various Internet users, the Internet itself and the broader community in which the Internet was used.

After my initial exposure to the cognitive theories I continued to review the literature and found that several authors had considered principles of Situated Cognition and Distributed Cognition (see, for example, Hutchins, 2000; Greeno, 1998; Lave & Wenger, 1991; Brown, Collins & Duguid, 1989), in an attempt to understand learning in various technological environments. The elements of Situated Cognition and Distributed Cognition presented in these discussions made a great deal of sense to me and highlighted the possibility of moving beyond cognitive theories to examine learning in the Internet-mediated environment. I thus began to investigate the theories of Situated and Distributed Cognition in more depth. Over time, however, I began to consider that these two theories were not sufficiently able to capture all facets of the learning situation that I believed necessary to develop understanding in this area. I was subsequently drawn to Activity Theory. This more general theory provided additional scope that was relevant to achieving my stated research goals. Hence, I have used a range of theoretical perspectives which has led to the resultant Internet-Mediated Learning Model.

This chapter is devoted to firstly outlining the cognitive theories which have impacted upon my own development. Secondly, I explore the relevant aspects of each theory which have contributed to my understanding of Internet-mediated learning. Finally, I integrate these theories in order to develop an Internet-Mediated Learning Model which provides a useful framework for investigating and analysing learning in the Internet environment.

3.2 Review of the Contributing Cognitive Theories

Acknowledging the cognitive theories which are prevalent in cognitive-based research into a range of technological and multimedia areas is particularly important to me as these theories confirm my belief that there are similarities in the way we learn, but that we also each have unique processing techniques and abilities which make us and our learning experiences unique. While I acknowledge that the individual is but one component of a learning situation, their uniqueness cannot be ignored. Any theoretical framework which attempts to develop an understanding of learning cannot ignore that which is brought to it by the cognitive processing capabilities of the individual. Nor can we ignore the processing demands that result from the design and presentation features of the Internet.

3.2.1 Information Processing

My prior knowledge of information processing generally was a major contributor to my original hypothesis leading to this research, that competent Internet users may be receiving, processing and transforming information (ie. learning) in ways previously unseen, when they are using this tool. At this point, I will briefly identify several widely accepted and agreed aspects of human cognition which have been established through information processing theories. This is done to acknowledge my own understanding of human information processing as this knowledge has naturally impacted upon my understanding of Internet-mediated learning.

I have identified three broad components of information processing which have assisted me in understanding Internet-mediated learning. Firstly, the relationship between human cognition and our senses, secondly issues related to building memory and finally, the

importance of memory storage and retrieval. My hypothesis on the potential role of each of these broad concepts to effect learning during Internet-mediated activity is highlighted in what follows.

(1) The Internet is a stimulating environment which can engage many human senses and impact upon our attention to stimuli:

a. the sensory register allows humans to perceive sights, sounds, smells, tastes and touches. These senses form a complex interactive configuration through our nervous system to develop the key features of the acquisition of knowledge – the brain's ability to connect to the outside world, which in turn allows us to interact with our environment;

b. the degree to which we attend to stimuli presented in the environment can be affected by our mental set (conscious decision to attend to specific sensory input); the physical properties of the stimulus; and, physiological or internal states (ie. the overriding needs of an individual);

c. the relationship between attention and information processing is understood in six principle areas: selective attention; bottleneck; attention as a resource; lapses in attention and maintaining attention
(Anderson, 2000; Benjafield, 1997).

(2) Building memory is fundament to human learning. The cognitive demands of the Internet may impact (positively or negatively) upon one's ability to build memory:

a. memory comprises three types: sensory, short-term and long-term;

b. the three phases of the memory process are: encoding information at acquisition (sensory) stage; filing material for future use (ie. storage and retention); retrieval of stored material;

c. in order to make sense of material that is selected to be stored into long-term memory the incoming information combines with previously held schemas already in existence in the long-term memory.
(Anderson, 2000; Benjafield, 1997; Barber, 1988)

(3) The nature of the Internet environment may stimulate and engage forms of long-term memory:

a. episodic memory (related to personal experience and events);
b. semantic memory (deals with storage and knowledge of one's environments (eg. language, concepts));
c. procedural memory (memory for skills and other cognitive operations - knowledge which is automated eg. riding a bike);
d. declarative memory (concerned with facts and events)

(Benjafield, 1997).

These basic principles have evolved over time and have subsequently been used in the development of specific cognitive theories such as those presented below.

Importantly, I note that I am an educator, not a cognitive scientist, and do not profess to have an in-depth knowledge or understanding of human cognition. Nor do I profess to have fully explored the range of cognitive theories which exist and could be relevantly applied in some way to Internet-mediated learning. What is presented here is an overview of the theories that were particularly important to my initial understanding of learning with technology, particularly hypermedia and multimedia environments which are reflective of the design features of the Internet. In what follows I present a brief description of the three theories with which I became most familiar in my initial review of literature in this field.

3.2.2 Cognitive Theory of Multimedia Learning

The first theory to be presented is the Cognitive Theory of Multimedia Learning which was developed by Mayer & Moreno (2002, 1998). I found this theory particularly useful because, in addition to incorporating understandings attributed to constructivist views of learning, it relies on the theories of Cognitive Load and Dual-Coding Theory. Cognitive Load Theory and Dual-Coding Theory are two theories I encountered separately in my early attempts to understand learning in technological environments and I could see clearly how these two theories could be applied to learning in the Internet environment. By examining the Cognitive Theory of Multimedia Learning I will subsume discussions

from the literature on Cognitive Load Theory and Dual-Coding Theory, as did Mayer & Moreno.

Through their theory Mayer & Moreno assert that cognitive construction depends on the cognitive processing of the learner during learning. The Cognitive Theory of Multimedia Learning thus evolved based on the following assumptions:

1. each working memory store has a limited capacity (aligns with Cognitive Load Theory);
2. working memory includes independent auditorally and visually working memories (aligns with Dual-Coding Theory);
3. humans have separate systems for representing verbal and non-verbal information (aligns with Dual-Coding Theory)
4. meaningful learning occurs when a learner selects relevant information in each store, organises the information into a coherent representation, and makes connections between corresponding representations in each store (aligns with constructivist views of learning).

Other researchers in studies of media and effects on learning have also separately applied Cognitive Load Theory and Dual-Coding Theory and I now move to discuss both of these theories.

3.2.2.1 Cognitive Load Theory

Cognitive Load Theory was developed by Sweller and throughout the 1980s and 1990s it underwent substantial development and expansion (Paas, 2003). It is an instructional theory generated by the cognitive science field which deals with the mental processes of learning, memory and problem solving (Paas, 2003).

Indeed, the term "cognitive load" is used to refer to the total amount of mental activity imposed on working memory at an instance in time. The major factor that contributes to cognitive load is the number of elements that need to be attended to (Cooper, 1998). Under this theory consideration is given to human cognitive architecture (long-term

memory, short term memory and schema), particularly the role and limitations of working memory (Brunken, Plass & Leunter, 2003; Cooper, 1998).

Three forms of cognitive load have been identified through evolution of this theory, intrinsic, extrinsic and germane, each of which I believe can be applied to understand the potential effects of the Internet environment on learning.

Intrinsic cognitive load is connected with the nature of the material to be learned, that is, its complexity. High intrinsic cognitive load occurs in cases when learners do not yet have sufficient command over appropriate schemata (Brunken, et al., 2003; Bannert, 2002; Cooper, 1998). As intrinsic cognitive load is related to the difficulty of some concepts it cannot necessarily be modified.

Extrinsic cognitive load is related to instructional delivery, that is, the format, presentation, methods and materials through which content is shared. High extrinsic cognitive load occurs when delivery places substantial demands on the learner and interferes with their schema acquisition and automation (Brunken et al., 2003; Cooper, 1998). Hence, high extrinsic cognitive load results from poorly designed instructional materials (Bannert, 2002).

Germane cognitive load reflects the learner's effort to process and comprehend the material (Brunken et al., 2003). Germane (or affective) cognitive load occurs when free working memory capacity is used for deeper construction and automation of schemata (Bannert, 2002).

From an instructional point of view, materials which decrease cognitive load are considered more likely to enhance learning. What interested me most from this perspective was the fact that authors producing web sites do not necessarily take account of cognitive load. Given that anyone can produce web pages, their design does not usually minimise load to assist learning. What fascinated me in this respect was that learners appeared capable (to varying degrees) of accessing and using Internet resources regardless that the Internet has potential for high levels of cognitive load. It made me

consider that learners were perhaps developing specific abilities to cope with and/or adapt as a result of their desire to independently use the Internet.

Others have also seen the potential of applying Cognitive Load Theory to studies of Internet-mediated learning. However, the theory's nature as an instructional design-based theory often sees it applied to facilitate instructional development by determining implications for various illustrations, animations and instructional approaches to web design. I wondered, instead, how it may be possible to apply Cognitive Load Theory to understand the use of the Internet in its authentic state because we cannot control the design of Internet as accessed in everyday life. What I became interested to understand was how individuals were able to cope and succeed in this environment, that is, what learning characteristics were developed and possessed as a result of using the Internet.

I could see the further value of this theory to my developing understanding of Internet-mediated learning, through its potential to enhance my analysis of data. I believe understanding of this theory raised my awareness of Internet design elements which may be evident and affect the learner in some positive or negative way during their engagement with the tool. I consider that this theory can be applied using an exploratory approach to gain insight into the impact of the Internet, individual cognitive load and subsequent effects on learning.

Importantly, I note that my review of Cognitive Load Theory suggested to me that this theory does not appear to acknowledge that what may result in high cognitive load today may be different for tomorrow's learners. I say this because the recommendations this theory makes for instructional design is based on current learners who may have had significantly different levels of exposure to various media forms, compared with younger generations. This consideration was helpful to me to appreciate the importance of trying to understand the 'learner' of a particular generation/environment, before we can apply such theories.

3.2.2.2 Dual-Coding Theory

A second theory which has been incorporated into the Cognitive Theory of Multimedia Learning is that of dual-coding. I came across this theory early in my investigations into

human cognition and learning in media-based environments and quickly appreciated its value in understanding learning in Internet-based environments. Paivio (1991, 1971) developed this theory with its basic principle being the existence of verbal and non-verbal systems in human processing of incoming information.

Although Paivio initially claimed superiority of the image code over the verbal code, subsequent research (such as that conducted by Mayer & Moreno) has suggested human memory is improved when information is coded in both visual and verbal forms (Brunken, et al., 2003; Anderson, 2000; Benjafield, 1997).

Similar to Cognitive Load Theory discussed above, this theory contributed to my understanding of learning in a Internet environment as it drew to my attention the potential of the Internet to increase learning though its presentation of material in various multimedia forms. In the case of Dual Coding Theory I began to wonder if, given the nature of the Internet's design, it was indeed capable of enhancing learning, as suggested by some of the commentary presented in Chapter 2 at section 2.3.1.

Through this analysis of the Cognitive Theory of Multimedia Learning and particularly the two underlying theories of Cognitive Load and Dual-Coding I developed a much broader understanding of the potential impact of the Internet on learners in terms of its design features and delivery mode. Specifically, analysis of this theory raised two questions:

(1) was the cognitive load demand of the Internet so great it made learning difficult? alternatively;
(2) did the multiple nature of presentations mean learners could access their dual-coding capabilities and thus learn more effectively with this medium?

Either way, I did not consider that reviewing Internet learning through such a theory would be sufficient to uncover the types of learning taking place in this environment. I believed that we must start by investigating what is actually going on in the Internet environment to uncover the unique nature of learning in this situation before moving to more focussed analysis and application of existing learning theories. Until we have

some understanding of the 'learning' relevant to this environment how can we evaluate its effectiveness as a learning medium? Indeed, given that the Internet's use is widely informal, I believe the issue is not so much determining whether the Internet is good or bad for learning but what kind of learning is acquired through its use.

3.2.3 Additional Cognitive Learning Theories

In addition to the theories of Cognitive Load and Dual-Coding presented through Mayer & Moreno's Cognitive Theory of Multimedia Learning, two other theories related to human cognition were also encountered in my original review of literature and have been influential for me. These are Cognitive Flexibility Theory and Flow Experience and these are discussed in what follows.

3.2.3.1 Cognitive Flexibility Theory

Spiro & Jehng (1990, p.165) describe cognitive flexibility as one's ability to spontaneously restructure one's knowledge in adaptive response to radically changing situational demands. The theory builds upon Salomon's Symbol Systems work (discussed previously in Chapter 2, section 2.2.2.2), in terms of media and learning interactions.

Similar to the principles of Dual-Coding Theory the principles underpinning Cognitive Flexibility Theory led me to consider that the Internet could possibly be an environment which would facilitate and promote positive learning. I continued to investigate this theory in the early stages of my research development as I was curious to understand other ways in which the design and delivery modes of the Internet might promote or impede learning or, indeed, fundamentally change the learner.

Like the Cognitive Theory of Multimedia Learning, Cognitive Flexibility has been developed to aid in the design of instructional materials (in this case hypertexts). Hypertexts designed under this theory intentionally represent multiple perspectives or interpretations of the content to be taught. Indeed, Cognitive Flexibility Theory focuses on learning in complex and ill-structured domains, specifically, environments that present multiple perspectives, including presentation of various cases with irregularities

across the cases. Cognitive Flexibility Theory is also concerned with the transfer of knowledge and skills after the initial learning situation.

I personally see the value of cognitive flexibility in Internet-mediated learning as its defining principles reflect how the Internet is designed, although the Internet's design is not intentionally created as a result of Cognitive Flexibility Theory. The Internet allows the learner to 'criss-cross the landscape'. This is a metaphor used in Cognitive Flexibility Theory to capture the learner criss-crossing the intellectual landscape of the content domain by looking at it from multiple perspectives or through multiple themes (Jonassen, et al., 1997).

This theory suggests that learners grasp the nature of complex knowledge more readily when presented with multiple representations of the same content in different contexts and the learner is allowed to develop their own 'mental models' of a concept (Graddy, Lee, & Timmons, undated). Given this, Cognitive Flexibility Theory is particularly adaptable to environments such as the Internet which, by the nature of its design, allows for this exposure to complexity and variety (Jonassen, et al., 1997; Mishra, Spiro, et al., 1996).

This theory was relevant to me because it led me to identify the structure of the Internet as one which presented content in its complexity rather than traditional learning environments which often focused upon building complex knowledge in a structured and sequential manner. I began to wonder about the impact of this on learners and again asked myself questions related to ways in which this environment may fundamentally impact upon learners who competently engage with it.

This theory was instrumental in developing my understanding that my research design needed to examine the Internet in an authentic situation. The notion of 'authentic' is discussed in section 4.9 of the methodology chapter. However, as a result of this theory, I believed that allowing participants' non-structured engagement with the Internet would enable exposure to complex, multiple presentations and viewpoints as identified under Cognitive Flexibility Theory.

3.2.3.2 Flow Experience

From a cognitive learning perspective the final theory to be discussed is that of Flow Experience. This theory was also encountered during my early reading on the impact of various technologies on learning. Similar to the Cognitive Theory of Multimedia Learning, elements of this theory made me consider how design features of the Internet might either enhance learning or impede it.

Csikszentmihalyi (1990) describes a learner as experiencing 'optimum flow' when concentration is so intense he/she has no attention left over to think about irrelevant issues. That is, where the individual experiences a sense of discovery, transporting him/her to higher levels of performance.

Several researchers have suggested and shown that the Internet is capable of facilitating an individual's achievement of optimum flow, for example Konradt & Sulz (2001) and Chan and Repman (1999 cited in Coomey & Stephenson, 2001). This premise is based on several features which could be evident in the Internet-mediated environment. These include: the provision of some level of feedback by the Internet; the identification of the user's own goals; the experience of an altered sense of time by some; and, pacing oneself based on current level of skill and ability.

However, principles of Flow Experience also made me (and others such as McLellan, 1996) consider the possibility that experiencing optimum flow could be difficult in an Internet environment. One reason stems from the premise that the Internet may not provide the necessary balance between the user's skill with the tool and completion of the task at hand (as has been seen in studies, such as that of Hess (1999), where the Internet user is not competent with navigation). Also, the user could experience distraction from the extraneous features on web pages - advertising, automated messages and the like.

While I agree with the principles of flow experience, that learning is maximised when learners achieve optimal flow, I began to consider the issues raised in the two preceding paragraphs and questioned the potential of the Internet in the achievement, or not, of

optimal flow. This theory thus impacted upon my understanding of learning in this environment and specifically the ways in which the Internet may deeply engage users but also disrupt learning through its various distractors and technical demands.

Exposure to this theory made me mindful that I would perhaps elicit more useful data if I confined my participants to those who were competent Internet users. Also, I determined that the study should allow the research participants to determine their own learning goal to increase the chance that they would be actively engaged and sufficiently motivated by the task and thus produce relevant and useful data.

3.2.4 Integration of Cognitive Learning Theories

From an information processing perspective and specifically from the cognitive learning theories presented, the following principles have been elicited to guide my understanding of Internet-mediated learning.

1. There are some commonalities in human information processing related to sensory input, attention and memory.

2. Account must be taken that individuals may differ in their specific information processing capabilities because of their personal strengths and weaknesses.

3. Account must also be taken that the design and presentation of material has the potential to impact upon human information processing capabilities. Specific design and presentation issues relevant to an Internet-mediated environment include:

    (a) intrinsic cognitive load (complexity of material to be learned) *(cognitive load)*
    (b) extrinsic cognitive load (level of demand placed on learner by instructional means) *(cognitive load)*
    (c) germane cognitive load (learner's efforts to process and comprehend material) *(cognitive load)*
    (d) use of visual and verbal representations *(dual-coding)*

(e) presentation of multiple perspectives *(cognitive flexibility)*

(f) presentation of concepts in their complexity *(cognitive flexibility)*

(g) interactivity (feedback, learner control) *(flow experience)*

(h) impact of distractors *(flow experience)*

(i) goal-driven engagement *(flow experience)*

Having now explored the cognitive theories which had significant impact upon me in the early stages of this research I now move on to explain where I saw limitations in continuing down this path and my move toward an integrated theoretical framework which incorporates Situated Cognition, Distributed Cognition and Activity Theory.

3.3 Developing an Integrated Theoretical Framework to Understand Internet-Mediated Learning

I have presented above an overview of cognitive learning theories which have previously been applied by others to understanding learning in hypertext, multimedia and/or Internet environments. These three theories have covered four principles of human cognition – cognitive load, dual-coding, cognitive flexibility and flow experience – each of which have impacted upon my understanding of learning in an Internet-mediated environment.

Together, the principles underpinning the cognitive learning theories presented here forced me to carefully consider my research goals. Most importantly I saw difficulty in using theories which have developed an instructional design focus, in trying to understand a tool over which researchers have little control, at least with respect to the informal use of the Internet across the globe. Why continue to develop instructional Internet-based tutorials when we do not know what it is this medium has to offer in terms of learning?

Some principles of the theories presented accord with various claims that the Internet will enhance learning because its design features potentially allow dual-coding, cognitive flexibility and optimum flow. Conversely, other aspects suggest that the Internet could reduce learning potential because of the high cognitive load associated with it and its inability to create optimum flow due to distracters and other breaks in flow. Given this,

I initially thought to investigate whether the Internet assisted or impeded learners in achieving higher-order learning outcomes, such as those listed in Chapter 2 at the end of section 2.3.2.1.

Upon further consideration, however, I began to wonder if we should even try to apply these learning outcomes to Internet-mediated learning. Given the uniqueness of this learning environment perhaps these learning outcomes are not relevant. Why are we trying to fit previous notions of learning into a new medium which is unlike anything previously available in people's day-to-day lives? I considered that what was instead needed at this early stage of the Internet's evolution was a move toward trying to establish what learning is actually taking place in this environment. I felt this to be extremely important because, given the increasingly high rates of informal access to the Internet, this learning will occur regardless of whether educators recognise these skills in their students or not.

It was my initial contact with these cognitive theories that aided in the development of my research goal which was to understand the learning actually taking place rather than trying to understand this learning phenomenon by either applying specific cognitive theories to the environment or examining learning potential in this environment through preconceived notions of what 'good' learning should 'look like'.

This way of thinking naturally impacted upon my research design and details of how these cognitive theories affected my research design are discussed in detail in Chapter 4 – Methodology.

This line of thought also saw me begin to question whether it was only the cognitive processes of the individual which were relevant. Reliance on these theories alone ignored what is known of learning as part of a wider context. While I saw the value of these theories in assisting me to understand how the Internet environment was unique and how its design features may potentially impact upon learners and their learning, in order to achieve my research goal I needed to acknowledge the whole learner, whom I could not remove from the context and society in which their learning was taking place.

I was thus desirous of identifying additional theories which would assist me in understanding the greater complexities of the learning environment, beyond that of the individual learner's cognitive processing and the design features of the Internet. Continued review of literature and discussions with others in the field lead me to subsequently integrate aspects of the theories of Situated Cognition, Distributed Cognition and Activity Theory, each of which is discussed in what follows.

It is extremely important to note at the outset of this discussion that these three theories have developed over time and represent complex understandings of learning. Although I have reviewed each extensively, for the purposes of this thesis, I have chosen to remain focused in my discussion on the principles of each theory which fit with my research design and which have impacted on my personal understandings of learning. Doing this allows me to clearly identify and articulate the elements which have contributed to my integrated theoretical framework in a succinct and readable manner. I have not chosen to design my thesis around critical analysis of one theory and its application to Internet-based learning. Rather, my analysis of the theories presents only what I have extracted from each theory as specifically relevant to my research.

I now commence with discussion of Situated Cognition because it is the first theory I encountered after moving beyond the cognitive-based theories.

3.3.1 Situated Cognition

(a) Overview of Situated Cognition

The situative perspective provides a synthesis between the cognitive and behaviourist perspectives (Greeno, 1998). The difference between a cognitive theory and Situated Cognition, however, lies in the shift from 'individual' to 'community', the belief that the person exists in context (Moore & Rocklin, 1998). It is noted, however, that the situative approach does not deny the importance of individual cognition, but it does shift the primary focus to the interactive processes between the individual and their environment.

Learning from this perspective is viewed as a process of enculturation where, from an early age, people adopt behaviours and belief systems of their social groups and eventually start to act in accordance with their norms (Brown, Collins & Duguid, 1989).

Hence, an important principle of Situated Cognition emerges through the notion of 'communities of practice' whereby learning is said to be tied to one's desire (and the subsequent process) to engage with, and become, an active member of their society. Duncan & Leander (undated), Brown, et al. (1998) and Lave & Wagner (1991) each put forth a view that communities of practice emerge as individuals are given the opportunity to observe and practice in situ the behaviours of the members of the culture. This leads to a gradual move toward acting in accordance with the norms of their culture.

Following from this, it is claimed from a situative perspective that one's increased participation is evidenced through 'legitimate peripheral participation' whereby one masters the knowledge and skills necessary for full participation in the socio-cultural practices of their community (Lave & Wenger, 1991). The peripheral nature of this participation acknowledges there are multiple, more- or less-engaged and inclusive ways of being located in the fields of participation defined by community (Lave & Wenger, 1991).

The idea that learning occurs in situ leads us to another important principle of Situated Cognition, that meaningful learning occurs in context. This enables learners to connect new knowledge to that which is already meaningful (Winn, undated). To this end, engagement in authentic activity is heralded as a fundamental component in any investigation of learning (Brown, et al., 1989, Herrington, Oliver & Reeves, 2000).

As an educator I entered this research with a belief that authentic activities are crucial in promoting relevant learning. I have since discovered the importance of authentic activity from the Situated Cognition perspective which holds that knowledge construction is bound by the context in which activity takes place (Herrington, Oliver & Reeves, 2003). All learning occurs in a situation and it is within this specific context that skills and knowledge are developed, making the situation a fundamental part of what is learned (Greeno, 1998; Hewitt & Scardamalia, 1998). It is claimed that the contextual environment in which knowledge is developed cannot be seen as separate or ancillary to learning and cognition (Brown, et al., 1989). The person is not, however, viewed as 'in' an environment, rather the activities of the person and the environment in which they perform are viewed as parts of a mutually constructed whole (Bredo, 1994).

In addition to valuing the participatory nature of learning bound by context, the tools utilised during engagement in activity are also acknowledged through a situative perspective. The idea of tools accords with the description of cognitive tools presented earlier in Chapter 2 at section 2.2.2. The belief is that interaction between individuals and culturally developed tools is reciprocal. Situated Cognition holds that the structure of cognition is distributed across the social and physical environments and these relationships contribute to and affect not only current but also future activity (Brown et al., 1989). From this perspective tools can only be understood through use, and using them changes the user's view of the world and sees them adopt the belief system of the culture in which they are used (Brown, et al., 1989).

Based on the principles of Situated Cognition as presented above, I developed a view of learning whereby learning occurs as a result of the learner's desire to participate in their community by engaging with tools and in activities that are valued. It is the contexts in which these tools are used and the activities that take place that influence the learning which occurs.

More specifically, I took the following principles from this theory:

(1) learning occurs in context;
(2) learning results from engagement in socially valued authentic activities;
(3) learning results from engagement with socially valued tools;
(4) learning occurs as a result of the individual's participation in communities of practice
(5) by engaging with socially valued tools and activities in a given context, individuals learn the skills and knowledge necessary to participate in their community. What is learned is therefore relevant to the society by which the learning is bound.

I now apply these principles to an Internet-based context and discuss the implication of this.

(b) *Application of Situated Cognition to Internet-mediated learning*

Firstly, I considered that the Internet presents a specific learning context unlike any previously available to us. Hence, the types of learning which occur in this context would be unique to it. Given the recency of wide-spread Internet usage across many communities it is not yet possible to know what 'types' of leaning are taking place. We can make assumptions based on our previous understandings of learning in other contexts but cannot be sure without appropriate empirical study of the unique Internet context.

Secondly, I concurred with the position presented through Situated Cognition and consider participation in authentic activity essential to understanding learning. I have developed a strong belief that when it comes to investigating the Internet we must, as Brown et al., (1989) suggest, discover what ordinary people are doing in the ordinary course of their lives. We are limited in our understanding of this environment if we continue to investigate learning which is removed from authentic types of engagement. Given this, I determined that my research goal would be more readily achieved if I avoided a prescriptive activity and instead asked the research participants to use the Internet in ways reflective of their day-to-day use.

Thirdly, I determined that in many parts of society across much of the developed world the Internet is a tool which is mastered by individuals. This then allows them to participate in certain communities which have evolved as a result of the Internet. Given this, use of the Internet by individuals would promote certain types of socially-valued skills and knowledge. While the types of valued skills and knowledge are presently unknown, the situative approach provides a vehicle through which these may be uncovered.

Fourthly, although much of the literature on Situated Cognition is focused on ideas relevant in adult learning fields (such as cognitive apprenticeship), I found the theory particularly interesting to apply to children using the Internet because of role reversals of expert/novice evident in Internet-based learning situations between adult and child. Interestingly, I have previously observed that children and adolescents can have greater

expertise and control over the Internet and this forced me to consider that we, as adults, may not be able to identify 'learning' in this environment based on our preconceived notions of effective and important learning. This understanding further supported my view that we must examine what the children are actually doing, rather than approaching this with static views of what we think they should be doing in this environment.

Finally, if learning is said to be reflective of the development of skills and knowledge necessary to participate in one's community it is imperative to investigate what skills and knowledge are necessary for active and purposeful engagement with the Internet. We can hypothesise on the likely skills needed to use the Internet based on current understandings of learning with other forms of media, however, we also need to determine what other skills and knowledge are developed through active use of the Internet so that we can better understand the learning characteristics and needs of the future generations of competent Internet-users.

In addition to my extrapolation of relevant principles underpinning the theory of Situated Cognition I took account of others' views on the application of this theory to learning. In what follows I discuss the manner in which other researchers have applied Situated Cognition.

Greeno (1998) presents another contributing factor which helped me to see the value of applying Situated Cognition to Internet-mediated learning. He suggests this theory's usefulness arises because it allows exploration of elaborate and complex learning systems. This, in turn, allows conclusions to be made about the functioning of the system which could subsequently be used to further investigate properties of individual cognition and behaviour within that learning system. Based on this position, I consider the value of Situated Cognition to enable me to firstly consider the wider context of the Internet-based learning situation, before narrowing my focus to examine in more fine-grained detail issues of participants' cognitive behaviours in this context.

Researchers who have relied upon Situated Cognition as a vehicle through which to examine Internet-mediated learning have also been useful to me. One such example is that of Leblanc, et al. (2001) who relied on a situated-cognitive paradigm to investigate a student's online tutorial usage. They contend that this perspective allowed them to

consider action and its meaning as it emerged from the coupling between the individual and his context. Leblanc et al., (2001) believes that this coupling has an intrinsic organisation that cannot be approached by studying only the constituents of the tasks or the objective constraints of the situation in isolation. I find this theory useful because it promotes investigation of the broader picture, which accords with my research goal, and provides a basis for future, more in-depth localised research.

In addition to providing me with a vehicle to further understand learning in a complex environment such as the Internet, Situated Cognition was also fundamental in several of my research design decisions and these are discussed in greater detail throughout Chapter 4 as applicable.

As can be seen from the discussion so far, literature related to the stated cognitive learning theories and Situated Cognition were instrumental in my development of a clearer understanding of the complexity of Internet-mediated learning. However, I still had concerns that not all elements of the situation were adequately captured through the theories discussed to this point. In much of the literature on Situated Cognition another theory was often raised, that of Distributed Cognition. Hence, I was subsequently drawn to this theory and what it could offer me in trying to understand learning in the environment under study.

3.3.2 Distributed Cognition

(a) Overview of Distributed Cognition

Distributed Cognition was developed by Hutchins and his colleagues throughout the mid- to late-1980s (Hutchins, 2000). The theoretical and methodological base of Distributed Cognition derives from the cognitive sciences, cognitive anthropology and the social sciences (Rogers & Scaife, 1997). It evolved from a growing awareness that we must add disciplines that study *society* to the list of sciences which have been applied to the *mind* (Heylighen, Heath, & vanOverwalle, 2004).

Distributed Cognition emphasises the distributed nature of cognitive phenomena across individuals, tools, internal and external representations (such as common language) and the various forms of media found throughout society. In taking this perspective it

dissolves the traditional divisions between the inside/outside boundary of the individual and the culture/cognition distinction that anthropologists and cognitive scientists have historically created (Rogers & Scaife, 1997). It is important to note from the outset, however, that 'distributed' in this sense does not mean 'divided up', instead it refers to cognition being 'spread over' the complex, interacting system of individual, tool, rules and values (Hewitt & Scardamalia, 1998; Lave, 1988).

Like branches of cognitive science, Distributed Cognition seeks to understand the organisation of cognitive systems. Like most of cognitive science, it takes cognitive processes to be those that are involved in memory, decision making, inference, reasoning, and so on. Also following mainstream cognitive science, it characterises cognitive processes in terms of the propagation and transformation of representations. However, what distinguishes Distributed Cognition from other approaches is its commitment to two related theoretical principles: (1) the range of mechanisms participating in the cognitive process; and (2) boundaries of the unit of analysis for cognition (Hutchins, 2000).

When considering the range of mechanisms that may be engaged in cognitive processes we see two classes of Distributed Cognition as defined by Salomon (1993, cited in Hewitt & Scardamalia, 1998):

1. off-loading of cognition (generally through material distributions, such as shopping lists to support shopping or calculator to help with arithmetic).
2. cognitions that are distributed through shared activities (such as joint problem solving activities) (ie. performance-oriented);

The notion of 'off-loading', as raised in the first class of principles identified above, refers to the way in which the environment actively supports cognition by making information available for others. The environment provides various tools which allow for information sharing, communication and coordination (Heylighen, et al, 2004). Off-loading occurs through the use of what are termed cognitive artefacts under Distributed Cognition but which align with the principles of cognitive tools which I have presented throughout this thesis, particularly in Chapter 2 at section 2.2.2. For consistency I will therefore, continue to use the term cognitive tools.

Point two above suggests that, similar to Situated Cognition, Distributed Cognition has a social aspect to it. Here, Distributed Cognition acknowledges the 'division of labour' which exists across communities. Division of labour reinforces the specialisation of individuals, allowing each of them to develop an expertise that the others do not have. This enables the collective to overcome individual cognitive limitations, accumulating a much larger amount of knowledge than any individual might (Heylighen, et al, 2004). We see, therefore, the social aspect to the theory differs from Situated Cognition which focuses upon the role of cognitive apprenticeship (where learners mimic and learn the skills of more competent members of the community), instead of placing emphasis on each developing their own area of expertise.

From this perspective tools are not considered external to the individual; instead they impact upon competent human action by changing the nature and function of activity systems (Barab & Plucker, 2002). Indeed, Barab & Plucker (2002) go so far as to say these system changes, in turn, affect what, how and why one needs to know. This is seen as a continually evolving process whereby tools are developed and subsequently mastered by individuals. This, in turn, leads to them becoming valuable within that community. Subsequently, the skills and knowledge associated with the use of such tools and the tools' continued growth dictates (to some degree) the skills and knowledge others require in order to actively participate in that community.

I thus found this theory built well upon the understandings I had developed through various cognitive learning theories and Situated Cognition. It supported my beliefs that we cannot ignore human processing capabilities nor can we ignore the place of human cognition within the greater social world. Distributed Cognition presented, what I found a logical premise, that human cognition is shared across humans through the tools and activities in which they engage. Distributed Cognition also encouraged me to consider how the cognitive processes evident in learning situations were not as a result of the individual alone, but rather, occurred as a result of interactions with others and the things they valued in their community.

Distributed Cognition is also concerned with the boundaries of the unit of analysis for cognition. This aspect of the theory was particularly useful to me in my attempts to

investigate a complex learning system such as the Internet. Within the distributive cognitive framework one can adopt different units of analysis, to describe a range of cognitive systems (Hutchins, 1995). One can focus on the processes of the individual, on an individual in coordination with a set of tools or, on a group of individuals' interactions with each other and a set of tools. Because my research interest lies in an area about which little is currently known, this approach was particularly useful to me as it gave me the confidence to design a study which would capture a broad overview of the learning system under study with the understanding I could focus my analysis on a particular unit as it became more apparent which would be the most appropriate unit for analysis.

Also important, the theory supports the capturing of human activity 'in the wild'. This, Hutchins (2000) contends, allows at least three interesting kinds of distribution of cognitive process to emerge:

(1) cognitive processes that may be distributed across members of a social group;
(2) cognitive processes that may be distributed in the sense that the operation of the cognitive system involves coordination between internal and external (material and environmental) structure; and/or
(3) cognitive processes that may be distributed through time in such a way that the products of earlier events can transform the nature of later events.

One of the goals of the distributed approach is to rebuild cognitive science from the outside in, beginning with the social and material setting of cognitive activity, so that culture, context, and history can be linked with the core concepts of cognition (Hutchins, 2000). I am particularly drawn to this as I attempt to understand the impact of the Internet, firstly with respect to the individual learner, but later with respect to the implications of changes in the learner and the continued evolution of society.

Specifically, I took the following principles away from Distributed Cognition:

(1) knowledge is distributed through shared activities – a division of labour;
(2) knowledge is distributed through cognitive tools which allow for information sharing, communication and co-ordination;
(3) cognitive tools are not extraneous to the user, rather, they form part of the user;

(4) cognitive tools can change the nature and function of an activity system which, in turn, affects what is known and what one needs to know;
(5) one can adopt different units of analysis to describe a range of cognitive systems;
(6) research should be conducted in naturalistic settings.

I now apply these principles to an Internet-based context and discuss the implications of this.

(b) Application of Distributed Cognition to Internet-mediated learning

Distributed Cognition allowed me to identify the components of the complex learning system of the Internet. As a result of this theory I determined that the Internet-mediated learning system is made of the user/s, the design features of the Internet, and the local and global communities in which it is used and valued. This provided an important building block for developing the integrated theoretical framework which underpins my research design and analysis.

The concept of 'division of labour' in this theory was interesting to me as it encouraged me to consider the role of the Internet in distributing knowledge across users throughout the world. I found this particularly important in terms of the development of children. Here the theory acknowledges that a new functional system inside the child is brought into existence by the interactions of the child with others (typically adults) and with tools. As a consequence of the experience of interactions with others, the child may eventually be able to create the functional system in the absence of others (Hutchins, 2000). As the Internet affords increased opportunities to interact with others and even contribute knowledge, I consider this concept is particularly important in understanding children's Internet-mediated learning.

The value in viewing the Internet as a cognitive tool under the distributive perspective is important especially if we consider the phenomenon of a *global brain*, as suggested by Heylighen, et al (2004). This phrase captures the view that the Internet forms a network of the people on this planet. The Internet is clearly a medium which readily allows information sharing, communication and co-ordination and thus Distributed Cognition

provides a useful vehicle through which to consider the role of this cognitive tool on human learning.

Further consideration of the Internet as a cognitive tool through this perspective highlights the real possibility of the user and computer becoming one during learning episodes. Indeed, as was highlighted in Chapter 2 at section 2.3.1, it has been found that some young children naturally control the mouse without instruction and use it to navigate confidently. This merging of learner and tool is another aspect which can be explored, in part, through the principles of Distributed Cognition.

The Internet can be considered a tool which has the potential to change the nature and function of an activity system which, in turn, affects what is known and what one needs to know. This principle reflects my original desire to investigate this tool whereby I wanted to determine if engagement with the Internet does appear to produce unique learning processes, skills and/or knowledge applicable to this learning context.

As suggested above, the unit of analysis afforded by applying this theoretical perspective is important in firstly, developing understanding of the larger system (in this case the Internet generally) before examining elements in isolation (such as the competent Internet-user's approach to a specific activity). It is noted that Distributed Cognition also enables new types of interpersonal and social processes, facilitated by a tool, to emerge (Barab & Plucker, 2002). I believe this is particularly applicable to uncovering learning phenomena in an environment about which little is known.

Taking the above into account I thus concur with Hutchins (2000) that once having developed understanding of the larger learning system, we are more able to identify elements of cultural practices that subsequently become available for appropriation by individuals. This is the basis of my thesis; that we cannot continue to examine isolated elements making up the Internet-mediated environment, but instead we must find a means of capturing it in its complexity before then moving to isolate and examine intricate components of the learning system.

A final consideration underpinning my use of this theory is an assertion made by Salomon (1993, in Moore & Rocklin, 1998) that adoption of a Distributed Cognition

approach to research enables exploration of the 'individual-plus' and, further that studies should not be controlled in artificial settings. Again, as indicated throughout this thesis, I have been desirous from the outset to capture the complexities of the Internet-mediated learning situation in context and this position is supported by the distributed approach.

As stated earlier both Situated Cognition and Distributed Cognition were fundamental in developing my understanding of learning in a complex environment such as the Internet, but I was concerned that not all components of this system were being captured. I subsequently explored Activity Theory which fitted comfortably with what I had learned through Distributed Cognition and Situated Cognition but which extended some of these understandings further. I now move to explore those parts of Activity Theory relevant to my study.

3.3.3 Activity Theory

(a) Overview of Activity Theory

Modern Activity Theory originates from Soviet cultural-historical psychology. It is an interdisciplinary paradigm of the social sciences which emerged in the early 20th century through the work of Vygotsky and several of his colleagues, most notably, Leont'ev and Luria (Stetsenko & Arievitch, 2004; Barab & Plucker, 2002; Engeström, 1989).

The early interpretations of Activity Theory continued to build and evolve throughout the 20th century. Although it remained related to Vygotsky's theories, over time it has been related to his work for quite different purposes (Davydov & Radzikhovskii, 1985). This has resulted in several different forms of Activity Theory emerging. Although Activity Theory has evolved over time to reflect a range of interpretations and understandings it would not be practical, or indeed relevant, to discuss all its variations here. What I shall do is present in detail those specific elements that appeared particularly pertinent to my study and which have, therefore, been included in my integrated theoretical framework for understanding Internet-mediated learning.

I believe a simple statement of Lim (2002) captures my understanding of one of the modern versions of this theoretical perspective:

> "*Cognition is no longer studied in light of individuals learning in isolation with only their minds to guide them; instead, the emphasis is on individuals learning with a wide variety of tools and people, to help them carry out goal-oriented activity in socio-cultural settings"* (p. 413).

This interpretation aligns with the version of Activity Theory espoused by Engeström (1999, 1993, 1989). There are several concepts underlying his interpretation of Activity Theory, principally, human cognition is said to occur as individuals engage in motivated, goal-directed activity mediated by tools which are historically and culturally developed and valued (Engeström, 1999, 1993, 1989).

Interestingly, although Vygotsky did not specifically indicate in his writings that he considered the mind could be analysed through tool-mediated action, interpretations of his work meant that, over time, Activity Theory eventually developed according to this premise. Building upon the understandings I developed through analysis of Situated Cognition and Distributed Cognition regarding the complex and interwoven relationship between individual, tool, activity and society, Activity Theory was invaluable in broadening my understanding to further consider the historical implications of a tool's development and subsequent effect on human evolution.

Activity Theory proposes that humans (individually or collectively) are motivated by object-oriented goals to engage in activity (Kaptelinin, 1996; Stetsenko & Arievitch, 2004). Similar to the view presented in Situated Cognition these activities serve to ensure individuals remain in contact with their community and its system of social relations (Bertelsen & Bodker, 2000; Engeström, 1999; Blanton et al., 1997).

Under Activity Theory activities are mediated by tools (Kaptelinin, 1996). Tool-mediated activity in this sense refers to the uniting of mind with real-world objects and events (Blanton, et al., 1997). The mediational process motivates the individual to work toward goal-directed objectives which thus influences the nature of external behaviours and the cognitive functioning of individuals (Kaptelinin & Nardi. 1997; Engeström, 1987).

Again, I note that this theory uses the word 'artefacts' to describe what are fundamentally the 'cognitive tools' presented throughout this thesis. There are two distinct types of tool identified to exist under Activity Theory - external (technical) tools used to manipulate physical objects (eg. hammer; calculator) and internal (psychological) tools used by humans to influence others (eg. calendar, multiplication tables) (Bannon, 1997; Lim, 2002).

Competence with these two types of tools is a means of obtaining and/or transmitting knowledge and reflects the social and cultural context in which they are used (Riva, 2001; Bannon, 1997; Blanton, Moorman & Woodrow, 1997). The acquisition of cultural tools is a key aspect of learning; changing how humans interpret, interact with, and transform, their external world (Hedegaard, 2001). Further, commonalities will then exist among members of a society, as these members are shaped by the cognitive tools (both psychological and technical) available to them (Hatano & Wertsch, 2001).

Similar to Distributed Cognition, under Activity Theory mediational tools are said to emerge in response to many forces and, similar to the notion of off-loading in Distributed Cognition, many tools have specifically been designed to increase the efficiency of human psychological and motor processes (Wertsch & Rupert, 1993).

In examination of other principles relevant to my understanding of Internet-mediated learning, I note that the following are tenets of Activity Theory that attract broad agreement from most socioculturalists:

(a) interaction with people and tools plays an important role in learning and the development of mind;
(b) what occurs in the microenvironment in which individual learning is observed, is affected by larger context, both at community and global levels (Saljö, 1997).

Other social perspectives evident in Activity Theory, which I deemed particularly relevant to this study include the belief that:

(a) practices are organised by the culture in which a person lives and produce some significant outcomes;
(b) repeated participation enhances the cognitive skills needed to perform well in these practices, even when participants do not engage in them for that reason;
(c) participation in practice is the key concept linking social and cultural settings with individual cognitive development (Hatano & Wertsch, 2001).

Indeed, an Activity Theory position is that human cognition relevant to competence in daily life is reliant upon continual interaction with other people and cultural tools (Hatano & Wertsch, 2001). Human action is thus shaped and constrained by the mediational means available. Further, human actions are culturally, historically and institutionally situated, rather than resulting from an individual's isolated action or reflection (Wertsch & Rupert, 1993).

As with Distributed Cognition, this theory has been useful to me through its framework, which allows for multiple units of analysis, thus enabling investigation of complex learning systems. Activity is held as the basic unit of analysis (Kaptelinin & Nardi, 1997; Riva, 2001). However, activity does not refer simply to a disembodied action but rather, it refers to action done in order to transform some object and it encompasses the entire activity system (Barab & Plucker, 2002; Engeström, 1999). Given this, Activity Theory allows for studies of different levels of activity to be combined, applying one and the same set of concepts (Bertelsen & Bodker, 2000)

Indeed, under Activity Theory, when trying to interpret a learning system, three basic principles should be observed:

(1) the collective activity system can be taken as the unit of analysis, giving context and meaning to seemingly random individual events;
(2) the activity system and its components can be understood historically;
(3) inner contradictions of the activity system can be analysed as the source of disruption, innovation, change and development of that system including its individual participants (Engeström, 1993).

Based on the components of Activity Theory that I determined were relevant to this study, I specifically took the following principles from this theory:

(1) human cognition occurs as individuals engage in motivated, goal-directed activity;
(2) human activity serves to ensure individuals remain in contact with their community and its system of social relations;
(3) human activity is mediated by tools which are historically and culturally developed and valued;
(4) there exist two types of cognitive tool - external (technical) tools and internal (psychological) tools;
(5) competence with these two types of tools allows one to obtain and/or transmit knowledge and reflects the social and cultural context where they are used;
(6) acquisition of cultural tools is the key aspect of learning, changing how humans interpret, interact with, and transform their external world;
(7) commonalities exist among members of a society because they are shaped by the cognitive tools (both psychological and physical) available to them;
(8) taking activity as the basic unit of analysis allows study of complex learning systems at different levels of the activity.

I now apply these principles to an Internet-based context and discuss the implications of this.

(b) Application of Activity Theory to Internet-Mediated Learning

If we consider that human cognition occurs as individuals engage in motivated, goal-directed activity it becomes important in any research focused upon the Internet that we consider the motives and goals for engagement with that tool. This again saw me lean toward a research situation which promotes naturalistic engagement with the tool being studied. Indeed, I agree with Lim (2002) that investigating phenomena in context enables us to investigate the integration of individual, objective and tool and the greater relationship that is mediated by community, tools and rules. As is apparent in discussions throughout, capturing data in as naturalistic form as possible was essential to achieve my

stated research aim. Also, the application of goal-orientated actions can be related back to the issues associated with Flow Experience (discussed previously at section 3.2.3.2).

Similar to Situated Cognition and Distributed Cognition, Activity Theory emphasises that human activity serves to ensure individuals remain in contact with their community and its system of social relations (identified at points 2 and 3 above). The value that Activity Theory adds to my integrated theoretical framework is, however, its emphasis on the historical implications of human activity through the use of culturally valued tools. I find this particularly useful in considering the evolution of the Internet to become an integral part of some people's daily lives and the future implications for this in terms of learning and development. Similar to my argument regarding the impact of the printing press (section 2.2.2.3), we will not appreciate the impact of the Internet until sufficient time has passed to reflect upon its role in individual cognition and societal evolution.

A further issue I have drawn out of Activity Theory is the notion of two different forms of cognitive tools. This has been important in assisting me when trying to identify the components making up the Internet as a learning system. I see now that the Internet is not merely an external cognitive tool used under a distributive perspective to both share knowledge and off-load cognitive tasks, but it also reflects internal representations which have evolved over time, such as the interpretation of iconic language representations. Individuals must not only master the technicalities of this tool, but other understandings which have evolved and are shared amongst members of the global community through its use.

Understanding that mastery of cognitive tools is necessary in order to obtain and transmit knowledge which reflects the social and cultural contexts is also important. Given the increasingly high use of the Internet globally, this culturally valued tool contributes to what is considered valuable in the distribution of knowledge across individuals and collective groups. We must, therefore, consider the messages transmitted by the Internet in terms of what is currently valued in our society. Activity Theory gives a useful framework for understanding tools as mediators in human action, and how they are shaped with the changing practice of use (Bertelsen & Bodker, 2000).

Following from this, Activity Theory also suggests that the acquisition of cultural tools is a key aspect of learning, thereby changing how humans interpret, interact with and transform their external world. As Engeström & Miettinen (1999) suggest, Activity Theory offers much for the current multidisciplinary interest in cultural practices and practice-bound cognition.

What holds as most important to me in this respect is a belief articulated by Wertsch and Rupert (1993) that instead of approaching the analysis of social processes as if they exist solely in the service of individuals' cognitive functioning, it is essential to take into account the ways in which they reflect and create sociocultural settings. This position is fundamental in understanding the Internet as more than just a tool for learning, but rather, a tool that will impact on cognitive processing and the subsequent development of society through the engagement by individuals and collective groups with the tool.

Given this, I concur with the view of Lim (2002) that the value in applying Activity Theory lies in its acknowledgement that the interactions between human activity and culturally valued cognitive tools can trigger changes in activities, curriculum and interpersonal relationships in the environment and, in turn, are affected by the very changes the technology causes.

A final aspect to be explored is the ability of Activity Theory to take account of an entire activity system by acknowledging different levels of the related activity. We can, therefore, consider contexts such as the Internet environment, as an entire activity system, one that integrates the individual/s, the goals and the tools (physical tools as well as signs and symbols) into a unified whole. I consider the Internet is an activity system which incorporates Engeström's (1993) view of both the object-oriented productive aspect and the person-oriented communicative aspect of human conduct.

Along with my own interpretation and application of Activity Theory to Internet-mediated learning as outlined in the eight points above, it has also been useful to take account of the ways in which others have applied this theory to learning in various technological situations.

Bertelsen & Bodker (2000), for example, comment on the use of Activity Theory in studies of information technology to address the interdisciplinary nature of the field. Activity Theory, they contend, allows researchers to build upon studies into human-computer interactions which are from a cognitive perspective, to include detail from a psychological and social perspective. Similarly, Kaptelinin (1992) suggests the principles of Activity Theory enable one to reveal underlying processes identified in studies of human-computer interactions

Further we see researchers such as Lim (2002) identify the value of this theory to investigate studies of information and communication technologies because it ensures that technologies are not viewed as existing in isolation, instead acknowledging that the technology is interwoven with the other tools, the user and the environment.

Also, Ravenscroft (2001) discusses Isroff & Scanlon's review of Activity Theory in the context of computer-supported collaborative learning whereby Isroff & Scanlon conclude that the Activity Theory framework holds genuine value in shifting attention to social, cultural and historical influences and relationships that are implicated by the introduction of innovative educational technologies.

Others highlight what they purport as limitations of applying Activity Theory to research design. For example, in her collection of papers regarding the application of Activity Theory to human-computer interaction, Nardi (1996) suggests that Activity Theory is a powerful descriptive tool rather than a predictive theory. Also, according to Engeström (1989), Activity Theory does not offer ready-made techniques and procedures for research, rather its conceptual tools must be concretised according to the specific nature of the object under scrutiny. I believe that these views support my decision to employ an integrated theoretical approach. No theories currently in existence were designed to investigate the Internet-mediated learning system and should not be expected to be readily applicable to the design and analysis of such studies.

Again, similar to Situated Cognition and Distributed Cognition, review of Activity Theory has greatly contributed to my understanding and subsequently assisted in building a strong theoretical base in which to ground this study.

To this point I have provided an overview of each of the theories which have contributed to my understanding of Internet-mediated learning. I will now move to integrate these theories and put forward the framework that I have found useful in conducting research in this area.

3.4 The Integrated Theoretical Framework Underpinning this Study

In many respects it is a natural progression to integrate theories of Situated Cognition, Distributed Cognition and Activity Theory as a number of commonalities exist between either two of these theories or, in some cases, across all three. At times, however, although similar concepts may be central, the underlying principles can be somewhat different and account must be taken of this. This section integrates the theories with emphasis on the three major common principles: the use of tools; authentic (goal-driven, tool-mediated) activity; and learning bound by social context.

Several other authors have also identified similarities between the newer theories of Distributed Cognition and Situated Cognition and the older Activity Theory. Engeström & Miettinen (1999), for example, identify, in their introductory chapter, that the new contextual and culturally situated theories of mind and practice are particularly close to Activity Theory.

Moore & Rocklin (1998) have also reported that often the notion of Distributed Cognition is not distinguished from the term Situated Cognition. They contend that much of the work that is labelled Distributed Cognition or Situated Cognition falls under the cognition/individual-plus rubric.

I certainly acknowledge the difficulty I have experienced in reviewing these three theories separately because they are: (a) often discussed together in the literature without sufficient distinctions between them being made; and (b) the terms of each are used interchangeably and often not clearly defined. For example, we see the merging of language between the theories in the work of Barab & Plucker (2002). Here these authors consider theoretical perspectives on knowing and learning that couple individual and environment whereby "... *individual functioning is considered to be distributed*

across and situated in the transaction among subject, available tools, and the community context ..." (Barab & Plucker, 2002, p.166).

My integration of these three theories lies in the focus of each (to varying degrees and for different reasons) on the relationship between the individual (or collective group), tools, activity and society. I believe that the integration of these three theories strengthens understanding of the interwoven cycle which exists between the individual, their use of tools for goal-directed activity, which enables their participation in, and the future development of, society. With respect to this study this integration of theories provides solid grounding for analysis of the individual's experiences during Internet-mediated activity and promotes consideration of the greater social consequences of this activity.

I move now to discuss the issue of tool usage, before moving to explore authentic (goal-driven/tool-mediated) activity and finally learning bound by social context.

3.4.1 The Use of Tools

Activity Theory and Distributed Cognition place particularly strong emphasis on the role of cognitive tools. Situated Cognition also raises this issue when considering the role of tools to facilitate participation in one's community. Activity Theory sees the role of internal (psychological) tools and external (technical) tools as necessary to mediate human activity. Emphasis under Distributed Cognition is on the use of tools to aid in the distribution of knowledge (ie. knowledge stretched across various components, not delivering knowledge) and to off-load cognitive demands.

As noted previously both Distributed Cognition and Activity Theory have suggested two types of tools exist:

Activity Theory	Internal (psychological) tools External (technical) tools
Distributed Cognition	Performance-oriented tools Off-loading tools

I consider that we can integrate these to create a stronger understanding of the types of tools available and how they may impact upon human and social development. This integration is depicted in Figure 3.1 below.

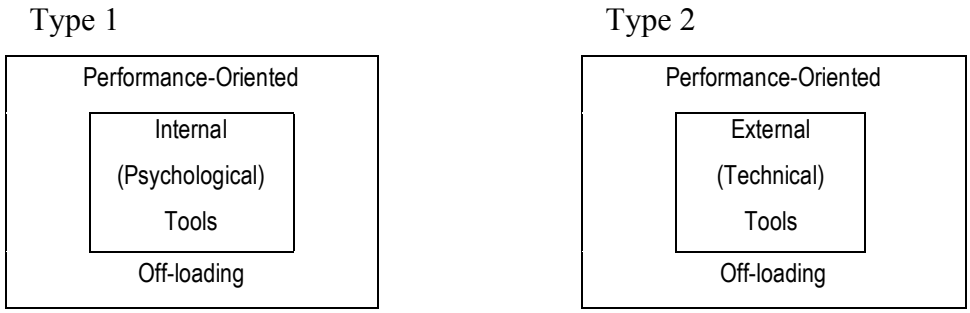


Figure 3.1: Integration of types of cognitive tools

Based on the above, I believe we can investigate the place of an internal tool (Type 1) to enhance cognitive performance or to off-load cognitive tasks. Similarly, we can examine an external tool (Type II) it in light of its performance-orientation or off-loading capabilities.

I view the Internet as a tool that has characteristics of an internal cognitive tool (eg. use of common iconic representations) and an external cognitive tool (eg. hand/mouse interactions) both of which are capable of mediating human activity. The Internet also acts as a cognitive tool as per the Distributed Cognition position, through its ability to off-load cognitive demands (such as factual recall) and distribute knowledge between members of different communities who each hold their own area of expertise.

The integration of these theories has enabled me have greater understanding of the complex role of the Internet as a cognitive tool and the possible implications its use may have for individuals, groups and society as a whole.

In addition to a common focus on cognitive tools the theories are also similar in their underlying position on the value of authentic activity which is goal driven and tool-mediated. I now move to discuss this commonality between the theories.

3.4.2 Authentic (goal driven / tool-mediated) Activity

Activity is articulated as the basic unit of analysis in Activity Theory and this theory identifies activity as the result of tool-mediated action to achieve goals. Situated Cognition also places emphasis on activity, specifically authentic activity, as a primary influence on learning. In both Distribut Cognition and Situated Cognition activity is seen as setting the context for what is learned and how it is learned. Each of these theories clearly acknowledges that activities are socially constructed and bound.

What these theories bring to our understanding of learning is a broad view of the socially evolving nature of human activity. We can then apply this understanding to more context-specific learning before eventually establishing a fine-grained view of specific activity and its impact on the development of future socially valued activity. In terms of Internet-mediated learning this integration of theories has enabled me to consider the potential implications of Internet activity on society generally, before narrowing to focus on the impact of Internet activity on individual learners; their characteristics and skills. I believe that developing this understanding of both the broader social issues and individualised implications of Internet use can lead to greater knowledge of the long-term consequences of Internet-mediated activity.

Importantly, an integration of these theories also supported my recognition of the value of goal-directed, tool-mediated activity as it occurs in context. This understanding was a primary factor in the research design used for this study.

In addition to commonalities related to the use of tools and authentic activity, the relationship between society and human learning is a third primary principle to emerge from an integration of Situated Cognition, Distributed Cognition and Activity Theory and is discussed in what follows.

3.4.3 Learning Bound by Social Context

All three theories acknowledge a move away from examining learning as isolated to the individual and instead to consider the past, current and future social implications of learning. As highlighted in the earlier discussions of each theory, cognitive tools and

human activity are considered to be culturally evolved and reflective of common social practices. Active participation with, and mastery of, tools is, therefore, necessary for active participation in one's community.

As suggested previously in Chapter 2, one of the primary features of the Internet is its ability to bring together local and global communities. We see the merging of social boundaries across cultures as individuals and groups are afforded opportunities to interact with others. Further, in certain social groups, use of the Internet has become common practice and participation in, acceptance by and contribution to such social groups necessitates the mastery of such a valued tool. It is the integration of the social perspective of learning evident in each of the three theories which provides a useful basis for examining the social and cultural implications of Internet-mediated learning.

Additionally, as identified in section 3.4.1 above, taking the view of the Internet as a cognitive tool causes us to consider the distributive nature of social interactions which are enabled by Internet-mediated activity. The social implications of Internet usage are numerous, and the integration of these three theories has promoted consideration of these implications in terms of individual participation, local and global interactions, forms of communication and distributed knowledge.

While I have identified commonalities in the theories of Situated Cognition, Distributed Cognition and Activity Theory it is important to note that although some similarities may exist between these theories, each still offers something unique to my integrated theoretical framework. They each place a difference emphasis on the role of tools, activity and society on learning. The differences in their underlying principles are what has added strength to my understanding of the concepts presented and what has enabled the development of the Internet-Mediated Learning Model which is presented in section 3.6 below.

3.5 Summary of the Integrated Theoretical Framework Underpinning this Research

It is the integration of theories discussed here which has provided me with a solid framework to investigate learning in an Internet-mediated environment. A summary of this integrated theoretical position is presented below.

The specific principles that each theory has bought to my understanding of Internet-mediated learning are already presented so, rather than revisiting each, I will now conclude with an integrated overview of the principles which I believe underpin learning in an Internet environment:

(1) over time the Internet has evolved as a cognitive tool which is reflective of today's society - at both the local and global levels;
(2) access to, and subsequent mastery of, the Internet exposes individuals to the rules, values and beliefs evident in today's global society;
(3) the Internet is a tool which promotes goal-directed activities (motivated by either the user's own goals or the goals imposed by others);
(4) using the Internet allows one to access and contribute to distributed knowledge across societies;
(5) using the Internet develops mastery of the tool – a merging between user and the Internet;
(6) cognitive tools, such as the Internet, have the power to transform individual cognitive processes and learner attitudes and behaviours;
(7) individual actions using the Internet have the power to influence its further development and use – the Internet will continue to grow and evolve to reflect changes in society.

From this I conclude that the learning which occurs when one uses the Internet results from the complex, interwoven relationships between individual, Internet-mediated activity and society.

With respect to research aimed at contributing to our growing understanding of Internet-mediated learning, these three theories contribute as a result of their underlying principles which suggest learning occurs through authentic, context bound activities which is best examined in naturalistic settings. The specific use of these theories on research design and analysis will be discussed in detail in the methodology chapter which follows.

3.6 Using the Integrated Theoretical Framework to Develop the Internet-Mediated Learning Model

Having established the integrated theoretical framework presented above I then moved to develop a useable model to capture important elements of the Internet-mediated learning system. Taking account of the conclusions drawn after integration of the various cognitive learning theories and Situated Cognition, Distributed Cognition and Activity Theory, I present below, in Figure 3.2, my theoretical model for investigating Internet-mediated learning.

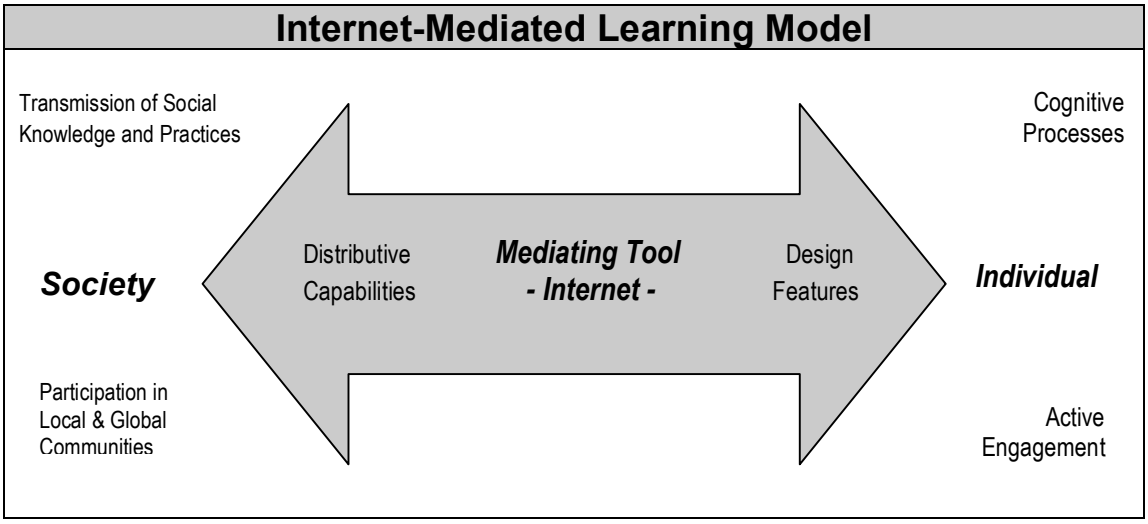


Figure 3.2: The Internet-Mediated Learning Model

This model demonstrates the place of the mediating tool (in this instance the Internet) to impact upon society through its distributive capabilities and to impact upon individual learning due to its unique design features. Importantly, this model reflects the two-way relationship which has been expounded in the integrated theoretical framework; namely, that the individual's engagement with the Internet impacts upon its future development

and its development subsequently impacts upon both the development of the individual and society generally.

Importantly, to evaluate learning through this Internet-mediated learning model we must consider the interwoven relationship between the three elements making up this learning system and these considerations are depicted in Figure 3.3 below:

Society	Mediating-Tool	Individual
Considerations: - the social knowledge and practices which are transmitted via the Internet - access by users to participate in local and global communities	Considerations: - the distributive capabilities of the Internet to off-load tasks and increase individual performance - the design features of the Internet	Considerations: - the cognitive processing capabilities of the learner - the active engagement of the learner in goal-directed activity

Table 3.3: Considerations of the Internet-Mediated Learning Model

As can be seen in Table 3.3 above, considerations of *society* include:

(a) The need to consider how the design of the Internet enables transmission of social knowledge and practices across the global community. This feature of the Internet is unlike any previously available and thus makes it an important consideration when examining the learning taking place during Internet-mediated activity.

(b) The capacity of the Internet to allow individuals to actively participate in their local and global communities. As suggested throughout discussions of Situated Cognition, Distributed Cognition and Activity Theory it is through these forms of participation that individuals become active members of their communities.

Considerations of the *tool-mediated* include:

(a) The belief that the design features of the Internet have an important role to play in learning. The Internet has many unique design features which make it a tool unlike any previously available. I have previously considered how these different design features may impact on learners and their learning. Table 2.1 provides numerous examples of the ways in which the Internet has the potential to impact upon human learning based on its design.

(b) The Internet is a cognitive tool and the distribution of cognition enabled by it can enhance human performance by off-loading certain cognitive tasks. This distribution of cognition also allows the individual to increase their performance by having access to the skills and knowledge of other individuals and groups in society. Both of these elements of distributed cognition should be considered under this model.

Considerations of the *individual* include:

(a) The individual's cognitive processing capabilities (as discussed throughout sections 3.2.1 to 3.3.3). Again, I note that I have not necessarily explored all relevant and useful cognitive theories but instead acknowledge in this Internet-Mediated Learning Model that we cannot ignore that which the individual brings with them in terms of their cognitive abilities.

(b) The individual's active engagement with the tool. Again I draw upon the discussion of cognitive theories presented in this thesis, particularly issues of flow experience and germane cognitive load which considers the learner's efforts to process and comprehend information. Also here I consider the individual's desire to actually engage (or not) in socially desirable activities.

The Internet-Mediated Learning Model presented here thus comprises three areas: society, mediating-tool and individual. I have identified important considerations for each of these areas which, I believe, are necessary to fully understand this complex and unique learning environment. I also believe that we must begin to examine Internet-mediated learning by taking account of each of these interrelated areas, rather than trying

to isolate the components which make up the Internet-mediated learning system. By doing this, I feel we will begin to understand the learning which takes place in this environment and subsequently the impact of it across human and societal development.

3.7 Conclusion

Throughout this chapter I have discussed a broad range of theoretical perspectives which have been instrumental in my understanding of Internet-mediated learning. The cognitive theories presented at the commencement of the chapter are useful when considering many of the issues concerning the potential impact of the Internet which were raised throughout Chapter 2, particularly in section 2.3. These theories were important in my own development as they assisted me in understanding some of the limitations that would exist in my study if I took a solely cognitive approach.

This chapter also explored the three theories from which I presented an integrated theoretical framework as the basis for this study. I believe that without the development of a strong theoretical framework such as that presented in this chapter I would have had limited success in achieving the aim of this study, that is, to uncover the nature of the learning experiences of young, competent Internet users.

It would also have been impossible to achieve the aims of this study if I had not adopted an appropriate methodological approach with supportive research methods. I now move in Chapter 4 to discuss the research design and associated issues.

4. METHODOLOGY

Chapter 2 raised some of the potential areas where the Internet may impact upon learning. That chapter also identified the range of fields interested in Internet-mediated learning and the diverse research methods which have been used in this area. Chapter 3 moved to present an integrated theoretical framework leading to the Internet-Mediated Learning Model, which I suggest is useful for investigations interested in uncovering learning during Internet-mediated activity. Together these two chapters have developed the framework to support my research. Based on this framework my research design emerged and it is now presented here.

Chapter 4 commences with discussion on the qualitative paradigm and the use of case studies within qualitative research. I move to identify the important ethical considerations for this study before exploring issues of research quality and specifically credibility, dependability and transferability. The issue of research usefulness is also raised and discussed. The chapter introduces the participants and defines the case by which the study is bound. Following this, each of the four research methods relied upon are detailed. The chapter concludes with the data analysis procedures which have been utilised.

This chapter draws together the discussions presented throughout Chapters 2 and 3 by placing them within the context of my research design. The chapter presents sufficient information to enable understanding of the findings of this study which are presented in Chapter 5.

4.1 Qualitative Paradigm

As indicated in the literature review, research into Internet-mediated learning is spread across a range of fields and interests and, because of this, no one research approach has dominated. However, the studies which I have found most useful are those conducted under the qualitative paradigm (see, for example, Ross, 1998; Hess, 1999; Bowler et al., (2001); Land & Greene (2000). These qualitative studies have generally demonstrated

diversity in Internet usage and capture some of the complexity of learning in such an environment.

The qualitative approach has been deemed most appropriate for this study because, by its very nature, it allows a researcher and his/her audience to develop an understanding of the meaning or nature of experience. It facilitates substantive exploration into novel learning environments about which little is known (Strauss & Corbin, 1998; Windschitl, 1998). The qualitative approach also enables the researcher to uncover intricate details about phenomena and is such that it allows a comprehensive and descriptive account to emerge (Merriam, 1998; Patton, 1990; Cook & Reichardt, 1979; Best, 1977). Indeed, Eisner (1991) claims that a good qualitative study can help us to understand a situation that would otherwise be enigmatic or confusing.

As identified throughout previous chapters, and particularly when taking account of the Internet-Mediated Learning Model, one of the most important features of this study was to capture Internet-mediated activity in as natural form as possible. The usefulness of the qualitative approach is thus evident because it allows phenomena to be examined in natural settings (Anderson, 1998). Indeed, had I attempted to engage the participants in an experimental environment it would have altered the dynamics of the experience in such a way that the findings would fail to be representative of the actual learning experiences of young Internet users.

Additionally, qualitative research is grounded in a philosophical position which is broadly 'interpretivist'. In a very general sense, it is primarily concerned with how the world is interpreted, understood, experienced or produced, that is, how humans make sense of their environments through the symbols, rituals and tools available to them (Mason, 1996; Berg, 1995). As shall be demonstrated throughout this chapter the research design, methods and analysis taken in this study accord with an interpretivist approach to research which espouses that *"Understanding the meaning of the process or experience constitutes the knowledge to be gained from an inductive, hypothesis- or theory-generating (rather than deductive or testing) mode of inquiry"* (Merriam, 1998, p. 4).

Given this, my philosophical grounding as interpretivist is extremely supportive of my research goal to gain insight into the learning of young, competent Internet-users. This, I consider, provides further support for the appropriateness of the qualitative paradigm.

4.2 The Case Study

The case study is a recognised structural design of qualitative research and it enables empirical inquiry to investigate a contemporary phenomenon within its real-life context (Yin, 2003). This study accords with general case study descriptions as it relies on multiple sources of information to analyse and evaluate a specific phenomenon (Anderson, 1998; Gall, Borg & Gall, 1996; Yin, 1994; Cook & Reichardt, 1979). Case studies are particularly valuable to the qualitative researcher as they allow for a detailed description of the phenomenon being studied, whereby the phenomenon can be explained through identification of themes and patterns emerging from the specified case (Gall, Borg, & Gall, 1996).

This study is classed as a 'collective case study' as it is comprised of one bounded case, which is made up of multiple sub-cases (Creswell, 1998). This design is particularly appropriate as it allows me to capture details of the unique, individual cases and then discern themes common to all. This can be useful in providing a greater understanding of the behaviours being described and thus resulted in a more robust study (Creswell, 1998; Merriam, 1998; Denzin & Lincoln, 1998; Yin, 1994; Patton, 1990; Best, 1977).

The case in this study is bound by the age, location and Internet experience of the participants. The collective case is made up of five children aged between 10 years 9 months and 11 years 11 months at the commencement of this study, who were identified as competent Internet-users. These participants all attended the same Independent K-12 school in the Newcastle region of New South Wales, Australia. Each of these participants is described in detail at section 4.7 below. For the purposes of this study each participant was asked to independently identify an activity they would like to undertake on the Internet. Three children chose to research topics of personal interest, another undertook email and online shopping activities and the fifth looked at online games. These activities are discussed in greater detail in the participant profiles (section 4.7) and again in section 4.8.

In addition to identifying the research methodology, several other considerations are relevant to the preparatory phases of qualitative research. These include ethical considerations and issues of rigour in qualitative research all of which are discussed in what follows.

4.3 Ethical Considerations

There are several important ethical considerations relevant to this particular study and issues related to informed consent of participants, the role of the researcher, participant constraints and participant confidentiality are now presented.

4.3.1 Informed Consent

Access to research participants out of school proved impractical and the study was, therefore, conducted within an Independent K-12 school. This made it necessary to gain the consent and approval of both the school's Headmaster and relevant classroom teacher. In this regard, a written outline of the study was presented to the Headmaster after a meeting had been held to discuss same (see Appendix 'A'). Following this, a short presentation was held during a staff meeting to familarise teaching staff with the project. At this time a summary overview of the research activities was presented (see Appendix 'B'). From this, a willing teacher was identified and the research project was discussed in more detail, particularly the role five of her current students would play in this research.

Five children from a Grade 5 class were identified for selection to participate in the study. Consent of the participating children was, of course, necessary and this was done in the first instance through oral explanation of the purpose of the study and types of activities involved. At this time it was clearly emphasised that no child was obliged to participate. The children indicated their initial agreement and were given a letter outlining the project (see Appendix 'C'). As each child was under 18 years of age it was also necessary to obtain parental consent. To this end, the letter (at Appendix 'C') was sent home which asked both child and parent/guardian to sign and return the approval slip to me if they both consented to the participation. An information sheet outlining the use of video and audio recording was also included (see Appendix 'D').

To truly be considered ethical it is noted that it was not adequate to merely obtain 'consent'; what was required was 'informed consent'. I therefore ensured all consent documents and oral explanations were presented with this in mind. Adequate information was provided to all relevant parties to ensure they each clearly understood the purpose and process of the research and were able to give permission for the collected data to be analysed, compared, used and reproduced (Mason, 1996).

4.3.2 Researcher Role

In qualitative research studies the researcher plays an active role. Given this, it was essential that measures were taken to minimize, as far as possible, the impact I, as researcher, would have. With respect to this study the major issue related to my role as an adult working with children and more specifically, a teacher working with students. It is important to note that I was not, and will at no point in the future be, a teacher of the children who participated in this study. The participants would, however, view me as a teacher-figure and in order to avoid holding a position of power over the participating children it was made clear to them that their role in this research fell outside their ordinary school performance and nothing they did in the research sessions would affect or impact upon their school-related activities or grades. Interactions with the participants suggested they were comfortable with me and in the research environment generally.

4.3.3 Participant Constraints and Confidentiality

It was also necessary to consider the implications of conducting the study during school hours. In an attempt to minimise any negative impact the relevant classroom teacher was asked to choose the most suitable times for the participants to engage in the research activities. The individual participants were withdrawn from class only at times that were mutually agreeable to all parties, including the participants themselves.

All actions and procedures related to confidentiality were carried out in accordance with the related application for ethics approval from the University of Technology, Sydney.

4.4 Rigour in Qualitative Research

In order to present a study that would be valuable in the areas of Internet-mediated learning and educational research generally, it was necessary to take account of issues which impact upon the usefulness and appropriateness of the research for its stated purpose. Issues of research quality in education are particularly important as much research in the field relies on methods which are questioned by those in scientific research fields. This is particularly so because, in qualitative studies, the researcher is responsible for discovering and interpreting the importance of what is observed and drawing plausible connections between what is observed and the conclusions made (Hoepfl, 1997). Criticisms questioning the rigour of qualitative research make it essential for the qualitative researcher to have a thorough understanding of related issues and to demonstrate that appropriate measures have been taken throughout the research process to ensure a rigorous and useful study is presented.

In an attempt to make qualitative research more 'acceptable' to the wider research community, terms associated with the quantitative paradigm, such as reliability and validity, have sometimes been applied to qualitative studies (Clarke, 2004). However, some qualitative researchers have suggested that these traditional quantitative criteria of reliability and validity are not relevant to qualitative research and that attempts to define these concepts in qualitative terms have been inadequate (Golafshani, 2003; Johnson, 1997).

When qualitative researchers are considering issues of validity and reliability, what they are usually referring to is qualitative research that is plausible, credible, trustworthy and, therefore, defensible (Johnson, 1997) or, in similar terms, precise, credible and transferable (Golafshani, 2003).

Lincoln & Guba (1985) agree that the conventional criteria of internal validity, external validity, reliability and objectivity are inappropriate. They contend that in naturalistic studies the need is to establish trustworthiness and to do this they suggest the following four equivalents to the traditional quantitative terms:

Quantitative Term	Qualitative Equivalents
Internal validity	Credibility
External validity	Transferability
Reliability	Dependability
Objectivity	Confirmability

Others have also suggested terms and accompanying definitions to address this issue. Many of these qualitative equivalents are, however, often quantitative notions being applied to a qualitative studies, and so do not necessarily align with the study. Indeed, I concur with Smith & Heshusius' (1985, cited in Hoepfl, 1997) criticism of the 'qualitative equivalents' presented by Lincoln & Guba because the terms are hardly different from the conventional criteria they supposedly replace.

I consider it imperative that qualitative researchers identify their position on the nature of rigorous qualitative studies and the methods and tactics they employ to maximise the quality of their study. In order to present my opinions and methods for ensuring research rigour a shared understanding of certain terms is necessary. Without this the reader is restricted in understanding my position. I have chosen, therefore, to rely on the widely utilised qualitative equivalent words presented by Lincoln & Guba but, in the discussion of these, I present my views on their meaning in the qualitative paradigm.

4.4.1 Confirmability

It is accepted that no piece of research can claim complete objectivity and indeed, it is not necessarily desirable to do so. Heshusius (1995) contends that in an effort to 'control' our research we attempt to separate ourselves by restraining elements of our beliefs and values. Both Heshusius (1995) and Strauss & Corbin (1998) suggest that it is impossible for a researcher to completely remove him/herself from the knowledge and experiences that have formed him/her as a person.

Rather, what we must try to do is acknowledge the research biases that exist (Miles & Huberman, 1994). Heshusius (1995) believes, and I concur, that rather than restraining ourselves, we should instead allow ourselves to become immersed in the phenomena under study. This process enables us to identify and observe our personal reactions and

then dissolve them, rather than trying to manage or restrain them. We should, therefore, make explicit our personal assumptions, values and affective states and identify how they may come into play during the study (Miles & Huberman, 1994). I believe this will establish the confirmability of the study.

Based on the above, I now proceed to declare and discuss my personal assumptions, values and beliefs relevant to this study. Three key beliefs (which are supported by the integrated theoretical framework presented in Chapter 3) dictated the goals of this study and the subsequent research design. Firstly, I hold a strong belief that learning is influenced by the context in which the learner participates. More specifically, I believe that to investigate learning we need to position the learner in a situation which is similar to that which he/she encounters in the ordinary course of his/her life. Secondly, I believe that cognitive tools have a profound impact on the learner and on the learning that takes place while one uses and masters such tools. Thirdly, I undertook this research with a view that the society in which the learner functions greatly influences the learning which occurs and, in turn, the evolving learner has the power to impact upon that society through the learning situations and tools with which he/she engages.

Importantly, I held the view upon entering the study that now was not the time to judge Internet-mediated learning experiences as good or bad. Rather, I believed the goal should be to examine what actually occurs, regardless of whether it fits our preconceived moulds of what and how children should be learning.

In addition to articulating assumptions, values and affective states, other measures have been identified as useful to increase confirmability. Miles & Huberman (1994) suggest that an explicit and sequential description of general methods and procedures need to be provided. Further, subsequent conclusions must be linked explicitly with displayed data. Given this, to increase confirmability of this study:

(a) sections 4.7 to 4.10 below provide detail of my research methods and procedures; and

(b) every attempt has been made in the analysis and discussion of data (Chapters 5 and 6) to demonstrate the connections between conclusions drawn and the empirical data.

4.4.2 Credibility

Review of qualitative research literature indicates that in order to establish rigour one must establish the qualitative equivalent of the quantitative concept of 'validity'. In quantitative terms, validity is concerned with whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure. Of course, as validity is a term derived from quantitative research, the procedures required to establish validity in a qualitative study are markedly different as the qualitative researcher is not attempting to 'measure' the phenomena being studied.

In an attempt to define validity from a qualitative position, the literature refers to descriptive validity, interpretive validity, theoretical validity, internal validity, external validity, evaluative validity, construct validity, generalisability. Also we have analogous terms preferred by some case-study researchers of plausiblity, authenticity, credibility, relevance and those preferred by other interpretive researchers such as, catalytic validity, interrogated validity, transgressive validity, imperial validity, ironic validity, situated validity and voluptuous validity (Gall et al., 1996; Maxwell, 2002; Miles & Huberman, 1994). These terms have some common characteristics defining what is expected from a qualitative researcher in presenting a rigorous qualitative study and the methods to achieve credibility are discussed in what follows.

As indicated previously, the term 'credibility' is a recognised substitute for internal validity. Some, I believe, err with this definition when claiming that it refers to the congruency between the findings and reality. Given there is no one reality which can be presented, what qualitative researchers are instead trying to demonstrate is that their reconstruction and interpretation of the data reflect the original multiple realities (Hoepfl, 1997; Lincoln & Guba, 1985)

Maxwell (2002) suggests that *understanding* is a more fundamental concept for qualitative research than validity. While I believe the discussion provided by Maxwell

(2002) captures what is desirable in qualitative research, the word *understanding* has so many broad meanings I consider it is difficult and perhaps confusing to use in this context. I have chosen, therefore, to use the word credibility but make clear that, to my mind, what is at issue here is the relationship between the phenomenon being studied and the external account given of it by the researcher. This is seen at various levels throughout the entire research process and after consideration of the issues raised, I have condensed these to issues of:

1. utilising measures that are appropriate for the concepts being studied;
2. providing sufficient information to set the context of the study;
3. demonstrating understanding that phenomena should be interpreted (as far as possible) from the position of the participant/s;
4. demonstrating awareness that there are multiple views of reality and truth;
5. reporting an actual account of what is seen or heard with thought to both omission and commission;
6. clearly acknowledging that which is inferred from the data;
7. reaching some consensus in the relevant community on the accuracy of application of terms used to describe and define the research;

The above suggest measures which may increase the credibility of the study. Some overlap with measures that are required to increase rigour in other areas. Given this, I will first discuss the issues of dependability and transferability before I move in section 4.5 to discuss the specific measures I have taken to ensure a rigorous study in the areas of credibility, dependability and transferability.

4.4.3 Dependability

Dependability has evolved from the quantitative concept of reliability. As reliability derives from the quantitative paradigm the meaning cannot readily be applied to qualitative studies. In quantitative circles, reliability is used to refer to the extent to which results are consistent over time and present an accurate representation of the total population being studied (Shenton, 2004; Joppe, 2000 cited in Golafshani (2003); Lincoln & Guba, 1985).

Reliability is not an appropriate measure for a qualitative study because the very nature of qualitative research acknowledges that situations being studied are unique and constantly evolving. The research situation will never be static as the individuals and environments making up a given research context can never be identical in any period after the moment in which the data were captured.

Many interpretive researchers have instead chosen to use term 'dependability' which, as indicated earlier, derives from the work of Lincoln & Guba (1985). Dependability implies that if another researcher took exactly the same methods and approach, with the same participants at that same point in time they would arrive at the same results (Miles & Huberman, 2002; Gall, et al., 1996).

I argue that this would not be possible or indeed desirable. I believe that, given qualitative research relies on the interpretation of phenomena by an individual it is unlikely that another researcher, with their different life experiences, theoretical stances and opinions, would arrive at exactly the same interpretations and conclusions. Also, the fact that the researcher is the instrument in qualitative research makes this unlikely. Given this, I consider it is not necessary that the same results be obtained, but rather the goal is that the same methods can be employed and the similarities and variations which result in the findings are what adds depth to an emerging theory or build upon existing theories.

As Shenton (1994) suggests, what is essential is that sufficient detail is provided so that a future researcher could use the research design as a 'prototype model'. What I believe is needed to achieve dependability, is to demonstrate that appropriate methods have been used to obtain the data that these methods are clearly detailed and that interpretation of the data follows a logical sequence and clearly reflects and represents the data.

Again, we can draw from the literature (regardless of word used) to identify appropriate measures which can be taken to increase the dependability and these are discussed at section 4.5 in the section discussing methods to achieve rigour.

4.4.4 Transferability

In quantitative research the term generalisability is used and in qualitative circles this concept has often been classed external validity. External validity refers to the extent to which the findings of one study can be applied to another situation (Merriam, 1998, p. 39).

External validity is not automatically considered highly relevant to the qualitative researcher. This is because qualitative research is concerned with providing a coherent and illuminating description of a phenomenon, rather than engaging in the statistical sampling which is necessary to generalise across cases (Schofield, 2002).

Transferability has been put forward as a qualitative alternative to external validity. Here the issue is to determine the degree to which the 'sending' and 'receiving' contexts are similar. It is not possible for the initial researcher to determine the level of transferability. Instead, what is required of the researcher is to provide sufficient contextual and situational information which future researchers can rely upon to determine and justify the level of application from a previous study to their own (Shenton, 2004; Lincoln & Guba, 1985).

What is desirable in qualitative research has also been termed comparability or translatability (Goetz & LeCompte, 1985 in Schofield, 2002). In order to increase the potential for comparability it is necessary to provide sufficient detail about the participants, context, setting and analysis. Again, through these more naturalistic forms of generalisation that researchers can then make reasonable judgments on the extent to which findings can be translated (Schofield, 2002).

Hoepfl (1997) refers to Eisner's (1991) claim that what is achieved through the concepts outlined above is a form of 'retrospective generalisation' which allows us to understand our past and possibly our future experiences in new ways. Similarly, Shenton (2004) acknowledges the benefits of the researcher providing such information to, in effect, provide a 'baseline understanding' upon which results from other studies can be compared.

As I suggested above, with respect to dependability, conducting different investigations and obtaining different results may simply reflect multiple realities. The power to emerge from this is in analysis of the reasons behind variations (Shenton, 2004). Indeed, I concur with Shenton (2004) that understanding of a phenomenon is gained gradually, through several studies, rather than one major project conducted in isolation.

Smith and Heshusius (1985, cited in Hoepfl, 1997) claim that naturalistic research can offer only an "interpretation of the interpretation of others". Given this, my desire for the research presented here is that it be scrutinised and be held by those knowledgeable in the field to be viewed as a study which, as far as possible, presents a plausible and defensible 'interpretation of an interpretation'.

4.5 Methods to Achieve Rigour

Being aware of issues of confirmability, credibility, dependability and transferability, I deliberately employed all measures possible to address these concepts and thus increase the rigour of this study. Throughout the literature several methods have been claimed to increase the rigour of a qualitative study. Below I identify the specific measures I have taken to ensure rigour:

(a) I have outlined my position with respect to roles, relationships, beliefs and assumptions relevant to the study (Shenton, 2004; Johnson, 1997; Gall et al., 1996; Lincoln & Guba, 1985);
(b) I have presented in-depth methodological descriptions (Shenton, 2004);
(c) I have provided contextual completeness of the case under study (Gall et al., 1996);
(d) the findings are presented through thick and rich descriptions that are reflective of the participants' experiences (Shenton, 2004; Gall et al., 1996; Lincoln & Guba, 1985);
(e) my audio and video-footage ensure referential adequacy (Lincoln & Guba, 1985);
(f) an audit trail to track the research process is available (Shenton, 2004; Gall et al., 1996; Lincoln & Guba, 1985);

(g) triangulation was achieved through reliance on a number of sources and research methods to gather more useful and relevant data (Johnson, 1997; Gall et al., 1996; Lincoln & Guba, 1985);

(h) I have engaged in peer review and debriefing sessions with fellow students and my doctoral supervisors. I have also engaged in peer review with the academic community by presenting my study through papers and conferences (Shenton, 2004; Johnson, 1997; Lincoln & Guba, 1985).

Throughout the study I have been mindful of Yin's (2003) view that qualitative researchers should conduct research as if someone is always looking over their shoulder. I believe that in thinking along these lines I will have prepared, conducted and presented a credible and dependable study for which the confirmability and transferability can be determined by the reader.

4.6 Usefulness of this Qualitative Study

The researcher may do all possible to increase the rigour of his/her study, however, this is insufficient if the study is not deemed relevant and useful to the interested parties; that is, the researcher, the participants, researchers in the field of study and the research community generally. Miles & Huberman (1994. p. 280) raise potential questions a researcher should consider when determining the usefulness of their research:

(a) Are the findings intellectually and physically accessible to potential users?

(b) Does the study promote a working hypothesis on the part of the reader as guidance for future action?

(c) What is the level of usable knowledge offered?

(d) Do the findings have a catalysing effect leading to specific action?

Eisner (1991, cited in Hoepfl, 1997) uses the term "instrumental utility" to discuss the issue of usefulness claiming it is one of the most important tests of any qualitative study. Given this, throughout the design, collection, analysis and presentation of this study I have been extremely mindful of the four points raised above.

I believe that measures taken to develop and conduct a rigourous study are essential foundations for presenting a useful study. The perceived value and usefulness of this study will emerge through the presentation and interpretation of data and particularly in the discussion chapter of this thesis.

Having now established the research methodology and measures to achieve rigour I move forward to introduce the participants of the study.

4.7 The Research Site and Participants

The research was conducted on the premises of an independent school in the Newcastle region of New South Wales, Australia. This site was primarily chosen because of my association with, and access to, the school. As this study was interested in children's independent Internet usage selection criteria centred on the students, rather than the school context in which they operated. Hence, selection of the school as research site was due to access and convenience reasons. The research site was not a primary issue, instead it provided a rich source for participant selection.

As I identified in Chapter 2 at section 2.5.2, the literature indicated that to gain deeper insight into Internet-mediated learning, participants who are confident in using the Internet should be studied. This was a primary consideration in my selection of participants for this study. The classroom teacher assisted by identifying five students who, to the best of her knowledge, used the Internet regularly. I then confirmed their confidence and competence with a questionnaire that included a practical activity on the Internet (the questionnaire is discussed in further detail below at section 4.9.1).

Three girls and two boys participated in this study. At the commencement of the study all children were in Grade 5. By the conclusion of the study the participants were in Grade 6 and one participant attended a different school in that region.

An overview of each of the participants is provided below.

Elizabeth

At the commencement of this study Elizabeth was 11 years and 5 months of age.

Elizabeth is a popular girl who has a good circle of friends both in and outside of school. She has a very good academic profile and has been regularly awarded for her academic achievements. Elizabeth participates in a range of extra-curricula activities, such as School Parliament and debating.

Elizabeth also enjoys a range of sporting activities including Little Athletics and field hockey. At the time this study commenced Elizabeth was about to play her hockey grand final which suggests a very personal interest in her chosen Internet-mediated activity which was to investigate the history of field hockey.

Elizabeth advised that she uses the Internet 4-6 times per week at home and 1-3 times per week at school. She uses the Internet to email her friends and others, research (for personal interests and school projects), play games, complete quizzes, enter competitions and to access music and instant messenger services.

Elizabeth, with the help of family members as necessary, taught herself to use the Internet prior to Year 4.

For her independent Internet-mediated activity Elizabeth chose to investigate field hockey. Elizabeth was to play in her field hockey grand final in coming weeks and she was interested to find out who invented the game and also when and why they created it.

Emily

At the commencement of this study Emily was 11 years and 11 months of age.

Emily is an only child who also spends a significant portion of her school day alone. She indicated a preference for individual activities such as reading and using computers. Emily performs well academically which is attributed, to some extent, to the amount of time she invests in her work.

Emily also identified a range of craft activities to occupy her leisure time.

Emily uses the Internet daily at home and 1-3 times per week at school. She uses the Internet to email family and friends, research (for personal interests and school projects), play games, complete quizzes, enter competitions, access music, access movies and to access books and stories.

Emily mainly taught herself to use the Internet (prior to Year 4) and is helped by family members when she has problems.

For her independent Internet-mediated activity Emily chose to investigate the first Pharaoh. Emily said she had a magazine subscription for Ancient Egypt but it had not given her information on the first Pharaoh. She particularly wanted to find out when he lived, died and whom he married.

Hannah

At the commencement of this study Hannah was 10 years and 7 months of age.

Hannah is described by teachers as an attentive and hard-working student who performs well academically. She is involved in a range of extra-curricula activities such as debating and Tournament of the Minds.

She has an elder sister with whom she is close and they spend a lot of their leisure time together cooking, playing games and watching television.

Hannah uses the Internet 4-6 times per week at home and 1-3 times per week at school. She uses the Internet to email family and friends, research (for personal interests and school projects), play games, complete quizzes, enter competitions, access music, access movies and to access books and stories.

Hannah also said she taught herself to use the Internet (prior to Year 4), with the help of family when necessary.

For her independent Internet-mediated activity Hannah decided to find out about the Bermuda Triangle. Hannah did not indicate a specific reason for investigating this topic but said she had heard about the Bermuda Triangle and wanted to know where it is located and how the ships and planes went missing.

Nate

At the commencement of this study Nate was 11 years and 3 months of age.

Nate is a capable student when he applies himself but is described by teachers as easily distracted. Nate has an extremely good imagination and regularly makes up stories in an attempt to entertain his peers.

Nate spends the majority of his leisure time riding trail bikes and playing computer games.

Nate uses the Internet occasionally at home and 1-3 times per week at school. He uses the Internet to email friends and others, research for personal interests, play games, complete quizzes, enter competitions, access music, access movies and to access cartoons.

Nate has been independently using the Internet prior to Year 4 and at times relies on friends to help him.

For his independent Internet-mediated activity Nate chose to explore online games because he played them regularly. He indicated that he wanted to know who created them and why, particularly if it was for money. He also suggested that he was interested to know how the creators got their ideas. However, during his independent Internet-mediated activity Nate spend his time playing games, rather then researching their existence.

Yanni

At the commencement of this study Yanni was 10 years and 9 months of age.

Yanni is a very popular student who also has an active social life outside of school. He performs to an average academic standard and is considered by teachers as a co-operative and hardworking student.

Yanni enjoys a range of sporting activities, particularly ice hockey, bike riding and soccer.

Yanni uses the Internet daily at home and 1-3 times per week at school. He uses the Internet to email friends and others, research for personal interests, play games, complete quizzes, enter competitions, access music, access movies, access chatrooms and for online shopping.

Similar to the other participants Yanni claims to have taught himself to use the Internet prior to Year 4 and he receives assistance from friends as necessary.

Yanni was less clear in stating his goals for this independent Internet-mediated activity. He did, however, spend his time trying to access MSN Messenger, visiting his email account, searching the Web for a bike and exploring eBay. Informal discussions with Yanni suggested these are the most common online activities he undertakes at home.

In identifying the case in this study I have commented on each participant's chosen independent Internet-mediated activity. I now move to explain and justify the use of an authentic activity to direct the participants' Internet-mediated experiences.

4.8 Authentic Use of Internet to Stimulate Activity

Authentic activity has been discussed in pedagogical literature over the past decade (see for example, Newmann, Marks & Gamoran, 1996; Cronin, 1993) and, although I first encountered the concept in this literature body, it became apparent to me that the term is aligned with the principles identified through the integrated theoretical framework which

underpins the Internet-Mediated Learning Model. This is particularly so with Situated Cognition (as discussed in detail in section 3.3.1) which defines authentic activity as the ordinary practices of the culture, ordinary people doing ordinary things (Grabe & Sigler, 2001; Brown, et al., 1989).

This necessitates some discussion on what is meant by 'authentic activity' in the context of this study. Obviously the study is limited by the school environment in which the research has taken place. However, Cronin (1993) helps to justify this in his claim that the concept of authentic is relative and exists on a continuum. Given this, although the Internet-mediated activities undertaken by these participants may not be considered by some as truly authentic because they occurred on the premises of a school, we should be mindful that school is the reality of the participants' daily experiences and, as such, activities taking place there are not necessarily divorced from real life. Indeed, that fact that some participants engaged in Internet-mediated activity such as searching for a product on eBay and playing an online game, would suggest the participants were aware they could undertake any activity of their choosing and this study was certainly not related to any school-based project.

My desire to engage the participants in authentic activity further accords with the integrated theoretical framework which contends that learning should be examined in context because it is reflective of social practices and experiences. The importance of authentic activity is prominent in current discussions about educational practice. I believe that many of the principles which are purported to increase student learning in the classroom, are also relevant to uncovering learning in the research situation. I present, therefore, those arguments on the use of authentic activities which I believe added to the quality of my research study.

1. *Authentic activity provides value beyond formal educational institutions* (Newmann et al., 1996)

   Allowing participants to engage in activities reflective of community practices, rather than prescriptive school practices, gave me greater insight into the local

and global aspects of the Internet-mediated environment. Also, it allowed the findings to be more reflective of daily life rather than limited to school life.

2. *Learning is maximised when children engage in activities that reflect real world experiences* (Herrington & Oliver, 2000; Bonk & Cunningham, 1998; Brown et al., 1989)

   Having the participants engage in activities of their own choice, which were reflective of their day-to-day use of the Internet, is believed to have facilitated their focus and active engagement during the research process.

3. *Authentic activity allows students to hone their skills using a particular tool* (Herrington & Oliver, 2000; Bonk & Cunningham, 1998; Brown et al., 1989)

   Having students engage with the Internet in natural manner allowed insight to their use of a culturally valued cognitive tool which has been identified as extremely important under the integrated theoretical framework.

4. *Authentic activity induces the kind of cognitive processes engaged in by experts in a domain* (Brown, et al., 1989)

   By selecting participants who demonstrated some level of competency in using the Internet and by allowing them to engage in activities of their own choosing, it was hoped to maximise cognitive performance and allow them to demonstrate practices reflective of the wider community.

I believe the use of authentic activity was essential to achieving the identified aim of this study. This type of Internet-mediated activity engaged the participants in activities reflective of their use of the tool in everyday life and, therefore, resulted in relevant and useful data to achieve the stated research goals.

Data elicited through the use of authentic activity needed to be captured using appropriate qualitative research methods. I move now to describe and analyse each of the research methods utilised in this study.

4.9 The Research Methods

Four data collection methods were used in this study to capture relevant and sufficient data. Initially I used a questionnaire to assist in selecting participants. During the fieldwork phase of data collection I relied on think-aloud protocols as the primary method of data collection. This method is, like all qualitative methods, is subject to limitations and so I incorporated observations and, later, a follow-up interview to enhance the data.

In order to set the research scene immediately below in Table 4.1 is an overview of the research process. This table is followed by analysis and discussion of each of the four research methods used in this study.

PHASE	GOAL	RESEARCH METHOD	DESCRIPTION
I – August 2003	Identify appropriate participants. Gain basic insight into participants' Internet use and experience.	Questionnaire	(a) Written questions related to type and extent of current Internet-usage. (b) Questions requiring potential participants to complete practical Internet-mediated activities to determine competence.
II – October 2003	Uncover the learning experiences of young, competent Internet users whilst engaged in authentic Internet-mediated activity.	Observations Think-Aloud Protocols	Participants choose and carry out own Internet-mediated activities: (a) Observation of overt behaviours captured on video (b) Observation of screen actions captured on video (c) Search history print-outs to follow chain of events and engaged time (d) Verbal data gaining insight into usually covert cognitive processes captured by audio-tape during independent completion of chosen activity.
Initial data analysis			
III – April 2004	Test emerging theories from initial data analysis. Expand understanding of participants' learning experiences during Internet-mediated activity.	Structured Interview (with practical component)	(a) Verbal question/answer specifically related to emerging themes from data (b) Practical Internet-mediated activities to further explore emerging themes from initial data analysis.
Final data analysis			

Table 4.1: Overview of Research Process

It is important to note that each participant conducted his or her independent Internet-mediated activity alone (with only me observing and listening) and each was seen individually for the follow-up interview. There were no interactions between peers or with others throughout the collection of data.

4.9.1 Questionnaire

The questionnaire (found at Appendix 'E') was designed to elicit relevant information about each participant to ensure they each were sufficiently comfortable using the Internet.

The participants met with me as a group and I explained each question to them as they independently completed the written component. This was done to avoid misunderstanding or misinterpretation of any question. The written component was specifically developed to provide me with a better understanding of the characteristics of each participant in terms of their experience and perceived confidence in using the Internet.

For the purposes of this study I deemed it imperative that participants were relatively confident Internet users. It appeared to me that unless participants were personally comfortable using the Internet and felt confident with its basic features, the findings were necessarily limited to the learner's navigation of the medium. Given this, the second component of the questionnaire was included. This section asked each participant to independently complete several simple Internet-mediated activities.

4.9.1.1 Limitations and Benefits of the Questionnaire

The written questions were useful in gaining some insight into how and why these children use the Internet. The questionnaire was valuable in building a descriptive profile of each participant. It allowed some understanding to develop of each of their experiences with the Internet and, to a lesser degree, their personal preferences, likes and dislikes of the Internet.

The practical component of the questionnaire gave me an opportunity to determine the confidence of each child, establish how each participant approached the tasks and their success in completing it. The questionnaire was a simple, efficient and effective tool and using this tool to assist in selection of participants was a valuable approach.

Additionally, the design of this questionnaire subsequently provided another source of data for analysis. Hence, results from the questionnaire are incorporated, where relevant, with data obtained during formal observations, think-alouds and the follow-up interview.

I did not rely on a questionnaire alone for this study as a questionnaire is unable to determine that which is actually occurring in a given situation. Questionnaires are limited to what the respondents want you to know or what they believe (which may not be the same as what they practice). Also, I believed the nature of the questions presented in a questionnaire would be limited to questions reflecting my knowledge and understanding of Internet-mediated learning at the time of constructing it. It would not allow for the uniqueness of the phenomenon to emerge in its natural context, which is the goal of this study. The questionnaire was, therefore, supported with three other forms of data collection.

4.9.2 Observations

Observations in qualitative research are highly valuable. The practice allows a researcher to investigate real events occurring in real time. In order to achieve my stated research goals, observations were fundamental. Only by watching the participants perform in the Internet-mediated environment could I gain insight into their learning behaviours. In this instance, the term observation is used broadly and resulted in the participants being observed at three levels:

(a) physical behaviours (body movements)
(b) on-screen behaviours (hand/mouse movements)
(c) process behaviours (sequence of actions on the Internet).

Observation types (a) and (b) were captured through video recording. A video camera was set up 2-3 metres behind the participant as he/she worked independently on the Internet. The camera alternated between a wide view of the participant and setting and close-up view of the screen. I was operating the video camera and, therefore, very limited field notes were collected during the process. I did, however, briefly record my comments on incidents that appeared to be of particular importance either during or immediately after each session.

Data related to point (c) above were collected immediately after each participant completed their Internet activities by accessing the *history* available on the computer's hard drive. This is a record of the Internet sites visited and the time of entering and leaving each site.

It should be noted that observations were primarily used to support and enhance the data collected through the think-aloud method. This issue shall be discussed in greater detail in 4.9.3.2 below.

4.9.2.1 Limitations and Benefits of the Observations

Given my desire to capture learning as it occurs in context, observations were essential. Limitations of this method arise, however, and must be acknowledged.

Relying on videotaped observations such as those used in this study raises concern that the events being observed may proceed differently due to the very fact that the event is being observed (Yin 2003). In an attempt to minimise this effect, the purpose of videotaping sessions was discussed in detail with each participant. At this time I assured the participants that the footage was only being recorded for my own viewing to assist me in remembering what they had done. Further, the equipment was set behind the participants and thus out of their immediate view, possibly making it easier to forget about. Also, it was assumed that as the participants were working on an Internet-mediated activity of their own choice (discussed at section 4.8 above) they were sufficiently motivated that their focus moved from consciousness of observation to relative absorption in the Internet-mediated activity being undertaken.

Having only one camera was another limitation and for future studies it would be preferable to have one camera permanently capturing the screen and a second camera set to capture the learner and setting more broadly.

As shall be highlighted in the following section, observations are a very useful tool in qualitative studies, I believe, however, that observations are greatly enhanced when participant-voice is added and hence my reliance on think-aloud protocols which are now discussed.

4.9.3 Think-Aloud Protocols

As my primary method of data collection I devote significant discussion to explaining and describing this research method. This is particularly important to me as I wish to strongly promote it as an appropriate research method to be considered for future research in this area.

Think-aloud data requires the participant to verbalise their thoughts as they complete a given activity. That is, the participant is asked to continuously speak aloud the thoughts in their head as they work. The input from the researcher during this process is generally limited to prompts such as "keep talking" if the participant falls quiet for an extended period of time.

Although the think-aloud process can take several different forms, in this research study think-aloud data refer to talk that was concurrently produced by participants whilst they engaged in their chosen Internet mediated activity. The data were produced continuously throughout each participant's engagement with an activity, rather than only at selected points during the activity or at the conclusion of an activity. I acknowledge, however, that concurrent probing was also sometimes evident during this process, whereby participants were asked "Why?" to clarify a think-aloud statement or "What are you doing?" to promote more in-depth think-aloud protocols.

The think-aloud approach captures what is held in the short-term memory while learners complete a given task. This sequence of thoughts will reflect what occurs cognitively

during completion of an activity making it particularly useful when examining student learning (Ericsson & Simon, 1993).

This approach was deemed appropriate by me because the principles underpinning its use are very supportive of my research aims. Indeed, it is suggested that think-aloud data is most useful when:

(1) the aim is to capture what the subject is actually doing;
(2) the data will provide a useful source of insights during the early phases of investigation of a behaviour;
(3) analysis of the data will commence from a point where the referents are unknown, rather than confirm or contrast known entities (Chi, 1997; Payne 1994).

Given the recency of common access by children to the Internet, I believe that research in this area must be thorough in its approach to allow many facets of the Internet's complexity and uniqueness to emerge. I see the think-aloud method as an essential tool for research into the field of Internet-mediated learning. At present we do not understand the effects of learning in this environment so are not looking to confirm known entities or test specific theories of learning. Rather we need to capture what users are actually doing and gain some insight into their thinking when engaged with the Internet. This is precisely the information think-aloud data is designed to elicit from research participants.

4.9.3.1 Limitations of the Think-Aloud Protocols

There are several limitations associated with the think-aloud method. An important area of consideration is that of 'reactivity'. Reactivity in think-aloud data collection includes the following issues:

(a) the capacity for talking and attending at the same time may be limited (Stratman & Hamp-Lyons 1995, cited in Branch 2000; Wilson 1995);

(b) verbalising and hearing one's own voice during an activity usually undertaken silently may be problematic for some participants (Stratman & Hamp-Lyons 1995, cited in Branch 2000);

(c) asking the participant to think-aloud draws his/her attention to certain elements of that task which has the potential to engage their critical thinking of the task at hand to a greater extent than in the non-research situation (Stratman & Hamp-Lyons 1995, cited in Branch 2000);

(d) the researcher may inadvertently draw the attention of the participant to important issues through any verbal or non-verbal cues (Stratman & Hamp-Lyons 1995, cited in Branch 2000);

(e) participants who are less capable of thinking about their own thinking will, in turn, be less capable of reporting on it, and thus the think-aloud data may underestimate their knowledge and abilities (Wade, 1990);

(f) participants may produce verbatim dictation without further deliberation or reflections (Keys, 2000) or brief, incomplete or procedural think-alouds may be produced (Branch, 2000; Wilson, 1994).

Given the above limitations, theories of best practice in implementing this method have been put forth by many and Payne (1995) provides some useful suggestions:

(a) use a brief warm-up task in which it is particularly easy to think aloud (extensive training is seldom necessary);
(b) ask participants to verbalise all thoughts that occur to him or her during the performance of the task without emphasis on any particular type of information;
(c) the researcher should not be immediately visible to the subject during the task;
(d) non-directive prompts can be given if the subject has not verbalised after a period of time (eg. "keep talking").

My research design and implementation of think-alouds carefully considered the issues of reactivity and I was particularly mindful of the fact that the approach must necessarily have some impact on the participants. I was, therefore, conscious to employ the four points raised above to minimise the potential negative impact this research method could present.

Importantly, as researchers, we must be clear on what the think-aloud can measure and what it cannot (Wilson, 1994). In this regard, it is acknowledged that this method of generating data is, like all methods, limited and as such I have also relied on other methods to enhance the data.

Additionally, it is acknowledged that some tasks are better suited to the use of think-aloud protocols. Particularly, the more the task involves higher-level cognitive processes that take more than a few seconds to perform, the better (Payne, 1995). The use of think-aloud data was essential in my own study to uncover elements of student learning in the Internet-mediated environment. The data would not have emerged, however, if the Internet had not provided an appropriate activity to elicit think-aloud data.

Several factors must be considered to ensure an appropriate activity is chosen to elicit think-aloud data and these issues were taken into account when deciding whether the Internet would provide appropriate activities to facilitate the production of think-aloud data. I claim the following points justify the appropriateness of Internet-mediated activity:

(1) Although certain facets of the Internet are perhaps considered as cognitively demanding, the flexible nature of the Internet allows learners to pace and regulate their own learning to accord with their current level of understanding and development. This flexibility, I believe, makes study of the Internet using think-alouds especially appropriate.

(2) Having participants identify a personally relevant use of the Internet and then engage in activities they feel competent undertaking both directs their learning and reduces problems associated with cognitive demands.

Further, although not necessarily natural to verbalise while using the Internet, I personally found that after several minutes of doing so the participants appeared to move to 'mumbling' (although generally audible) to themselves about the task at hand. This suggested to me each participant was absorbed in the activity and talking aloud appeared to have little impact on his/her performance.

4.9.3.2 Benefits of the Think-Aloud Protocols

Identified above are some of the limitations that are associated with the think-aloud method of data collection. It is my firm belief that the benefits of this method far outweigh these limitations. In order to clearly articulate the benefits of think-aloud data in this study I present below discussion on the following:

(a) advantages of think-aloud data over other forms of verbal data collection; and
(b) the usefulness of think-aloud data to support and enhance observational data.

(a) Advantages of think-aloud data over other forms of verbal data collection

Verbal data can take several forms, such as that which is obtained through concurrent or retrospective probes. Other forms of verbal data also emerge through more naturalistic situations such as peer interactions. We can also rely on interviews and focus groups to elicit verbal data. Presented below I discuss the potential of the think-aloud approach in minimising problems associated with these other methods of verbal data collection.

One of the major advantages in using concurrent think-alouds is that it reduces problems associated with memory failure which may occur when one waits to collect verbal data at the conclusion of an activity (Wade 1990). Whilst the use of video-stimulated recall to obtain retrospective data is becoming more common, it is likely that a participant's ability to remember what they were thinking at a previous point in time, even with stimulus materials, is somewhat limited.

Also, given the use of think-aloud data stems from having a learner engaged in a 'real' activity they produce more reliable results than if asked to report on a hypothetical

situation (Wade 1990). As discussed previously, the key here is the engagement of the learner in an activity which immerses him/her, with the desire to complete the activity. This subsequently provides the researcher with the ongoing thought processes toward that end point. This is in preference to eliciting data by asking an individual how they would approach a task, or go about completing an activity, without actually engaging in the activity, both of which would make accurate verbal data far more difficult to produce.

Other common methods of collecting verbal data include analysis of peer-interactions or student-teacher interactions. These both serve an important and distinct purpose in qualitative research studies. Certainly, the use of peer-interactions and/or student-teacher interactions ensures an abundance of verbal data is produced, but the question arises as to what the verbal data reflect. If a researcher is particularly interested in understanding the cognitive processes engaged by learners in Internet-mediated environments, the conversational interactions which would be intertwined with the verbalisation of thoughts on given tasks can far out-weigh the cognitive component. The think-aloud approach ensures specific focus is directed to the participant's thoughts, which is useful in both minimising distractions from a participant's sequence of thoughts and also in aiding the researcher in obtaining data which are most useful for the stated research goals.

Discussion groups and interviews are also undoubtedly useful means of eliciting relevant and directed verbal data on a given subject. However, one major limitations is a tendency for some participants toward giving what they perceive as desirable responses. It is assumed that during the think-aloud process, when a participant is absorbed in a given activity, the completion of this task will take precedence thus limiting the available cognitive 'space' for the participant to formalise thoughts perceived desirable rather than their immediate thought processes. Also, during interviews and discussion groups issues may arise due to a researcher's inadvertent influence over participants' comments and responses to questions. Although it is common for the researcher to be present during the collection of think-aloud data, it is quite possible that the participant (once demonstrating competence in the ability to talk aloud continuously without prompting) could engage in activities in isolation. This would eliminate the possibility of the researcher influencing

the participant's focus or approach to a given task through gestures, expressions or comments.

(b) Advantages of using think-aloud data to support observational data

As we have become more aware of the importance of understanding learning as it occurs in context and during activities which reflect authentic situations (as promoted by the integrated theoretical framework) it has necessitated the collection and analysis of, what Chi (1997) calls, 'messy' data such things as verbal explanations, observations, and videotaping.

I value the 'messy' data that is produced by methods such as think-aloud protocols. I also concur with Ericsson & Simon (1993, p xiii) that concurrent verbal protocols should provide a *"dramatic increase in the amount of behaviour that can be observed when a subject is performing a task while thinking aloud compared to the same subject working under silent conditions"*.

Observational data are commonly utilised in qualitative research studies and provide an abundance of descriptive data upon which a researcher can rely. One of the problems associated with analysis of observational data is, however, the interpretation of it. One study which examines this issue is that of Williams & Clarke (2002). Although these researchers did not actually use the think-aloud method, what is interesting in their study is the way the data are interpreted when one relies on observations alone compared with another interpretation when the student is asked to provide a voice to the observational data. In this instance, the video observational data appeared to suggest a student's off-task behaviour and limited attendance to the task at hand. However, adding student voice to the footage subsequently demonstrated progressive formulation of mathematical ideas and, importantly, the student subsequently provided evidence of a depth of thinking and higher order level of selective attention than was apparent from the video data in isolation.

The above suggests that we can make our observational data more reliable by adding student voice. This highlights my belief that we often neglect the most useful resource we have available to us when trying to understand student learning, that is, the students

themselves. Hence, my reliance on the think-aloud approach in this study and my argument that it should be considered for use in further investigations in this field.

4.9.4 Structured Interview

After initial analysis of data was completed each participant was interviewed. The specific purpose of these interviews was to explore in more depth the themes that had emerged directly from the think-aloud and observation data.

A structured interview approach was taken because there were specific elements which I wanted to explore. The interview sessions consisted of two distinct phases. The first was a standard question-answer session while the second required participants to answer questions and/or discuss ideas whilst engaged in directed Internet-mediated activity.

The standard question/answer component took between 20 and 30 minutes for each participant. The same questions were asked of each participant in the same order (see Appendix 'F'). This was necessary to ensure that all desired components were covered. This approach was also useful during the analysis procedures because questions were organised under emerging themes, such as, communication activities, exposure to advertising, technical skills and knowledge.

Many of the themes to emerge from the initial data analysis could not realistically be further explored through questioning alone. Indeed, had I limited the interviews to verbal question/answer procedures I believe I would have severely limited the data. I wanted the participants to expand upon issues emerging directly from their initial Internet-usage. This being the case, I needed to use the Internet as a stimulus to promote the necessary discussion. In this regard, I selected Internet-sites for the participants to review and comment upon in a general sense. They were also asked to compare a range of sites on a similar topic (in this case their local area of Newcastle) and discuss their likes, dislikes and the perceived value of each site. Finally, they were each asked to locate specific information to gain further insight into the processes taken (see Appendix 'G').

4.9.4.1 Limitations and Benefits of the Structured Interview

Interviews are particularly useful as they allow the researcher to focus directly on the issue under study. However, they are subject to limitations and these are particularly due to poorly constructed questions, inaccuracies of participants' responses due to recall problems or because participants have been found to provide the interviewer with answers they want to hear (Yin 2003).

For this study the interview data were not the primary data source. Any information obtained through this method contributed to the strengthening of emerging themes arising from think-aloud and observational data. Also, the questions were clearly directed at asking the participants their thoughts on a unique learning environment, about which little is known. Given this, it was made clear to the participants that there were no right or wrong answers instead what I was most interested in was their thoughts as a new generation of learners who are comfortable using the Internet.

The timing of the interview was critical. I would not have been comfortable in relying solely on an interview structure for this study as I believed it would be limited to questions reflecting my then current knowledge of Internet-mediated learning rather than uncovering the actual situation. It would have also prevented the investigation of learning in context which was essential to this study. Indeed, it was the use of an authentic activity (discussed earlier in section 4.8) which was of most value to investigating the phenomenon under study. The interview was, however, extremely useful in following up issues to arise from the initial phase of data collection.

It is important to note that while in the process of determining the most appropriate methodological paradigm for this study and the research methods which would elicit the most relevant and useful data, I was also mindful of the subsequent data analysis which would take place. Below I describe the data analysis process that was employed in this study.

4.10 The Data Analysis Process

The approach taken by qualitative researchers in their analysis of data can vary considerably depending on their research purpose and goals. The method with which I was most comfortable for this study aligns with the data analysis process described in Huberman & Miles (2002) and Miles & Huberman (1994). Miles & Huberman suggest that effective and efficient data analysis relies on a systematic approach being taken through all stages of data collection, storage and retrieval. They reduce the act of analysis down to three interrelated sub-processes:

1. data reduction
2. data display
3. conclusion drawing/verification.

Data reduction takes place when actual field notes (in this case, initially observational records and think-aloud protocols and later interview transcripts) are reduced through the identification of themes and categories. From this, data can be compressed and displayed in a manner conducive to in-depth analysis. Finally, the researcher is in a position to interpret the data, draw conclusions and making meaning of it.

My approach to data analysis accords with the three interrelated principles presented above and for convenience in Table 4.2 below I present an overview of my data analysis process before moving to discuss in more detail the approach I have taken.

Research Method	**Data Analysis Process**
Think-aloud data	1. Audio-tapes transcribed verbatim 2. Think-aloud protocols broken into short phrases/segments (Keys 2000; Payne 1995; Ericsson & Simon 1993) 3. Data reduction - think-aloud segments coded
Observational data	4. Video footage transcribed in observational notes 5. Observational notes integrated with corresponding think-aloud segments 6. Data reduction – observational notes coded

Research Method	Data Analysis Process
Interview data Questionnaire data	7. Constant-comparison of emerging themes between five cases and across think-aloud and observational data 8. Data displayed for ongoing in-depth analysis 9. Interviews conducted and transcribed verbatim 10. Interview data coded and used to test themes emerging from initial data analysis 11. Relevant data from initial questionnaire coded and used to test themes emerging from initial data analysis 12. Data displayed for further in-depth analysis 13. Theory emerges through verification process and conclusions drawn

Table: 4.2: Overview of Data Analysis Process

4.10.1 Interpretive Analysis

Throughout this entire process I took an interpretive approach to data analysis. I believe the interpretive approach accords with the theoretical framework presented, whereby I acknowledged my intention to develop an understanding of learning through interpretation of the participants' actions in context.

Denzin & Lincoln (1998) provide a useful breakdown of six phases which make up the interpretive process:

(a) frame the research question;
(b) deconstruct and critically analyse prior conceptions of the phenomenon;
(c) capture the phenomenon as it is situated in the natural world;
(d) uncover the essential structures of the phenomenon by reducing its element and categories;
(e) construct the phenomena – put the essential parts back together;
(f) contextualise the phenomena or relocate it back in its natural world.

I consider this process can be discerned throughout this study whereby it is demonstrated that I have: (a) defined the research aim; (b) presented analysis of current literature in the field and developed a strong theoretical framework; (c) engaged in field work through

the use of authentic activity; (d) completed data reduction processes; (e) displayed data with relevant conclusions drawn; (f) identified the place of the phenomenon in context.

I believe the development of appropriate themes and categories (point (d) above) is one of the most important processes and my approach accords with that espoused by Strauss & Corbin (1998) whereby I approached the data by asking *"What is going on here?"* (p. 130). Strauss & Corbin (1998) consider this is achieved by identifying *"repeated patterns of happenings, events, or actions/interactions that represent what people do or say, alone or together, in response to the problems and situations in which they find themselves*" (pp. 130-131). The coding 'categories' stand for phenomena and in order to identify these 'categories' I took a thematic approach to analysis.

Thematic analysis has been presented by Miles & Huberman (1994) in a very practical and useful manner whereby they outline the process used to identify categories/themes to emerge from the data:

1. count – look for repetition, recurring events/experiences/topics;
2. note themes, patterns – look for underlying similarities between experiences;
3. make metaphors, analogies or symbols for what is happening;
4. check to see if single variables/events/experiences are really several;
5. connect particular events to general ones;
6. note differences and similarities;
7. note triggering, connecting or mediating variables;
8. note if patterns in the data resemble theories/concepts.

Each of the chosen research methods played an important role in the analysis process. The observational and associated think-aloud data were the primary sources of category derivation. Throughout this initial process of thematic analysis I was aided enormously by the emerging Internet-Mediated Learning Model which was concurrently being developed. The Internet-Mediated Learning Model highlighted the need to focus upon three main elements making up the learning system under study: the individual, the Internet and social and cultural issues. It was through the use of these broad categories that I was able to commence analysis of the data in a structured manner. After attributing

each element of data to one or more of these major categories I was then able to analyse each major category to identify the specific components of learning evident through the participants words and actions whilst engaged in Internet-mediated activity. After a lengthy process to establish initial themes and some descriptive categories emerging from the observation and think-aloud data I was in a position to produce questions and activities for the follow-up interview. After the interviews had been transcribed and the data were integrated into the original categories they were modified accordingly to reflect the more extensive data which had now been obtained. This secondary data collection measure contributed greatly to strengthening what had emerged from the primary data sources. This process enabled in-depth and well-supported themes to be discerned until finally the data was organised in such a way that it was both reflective of the participants' experiences and achieved the stated research aims.

4.11 Conclusion

As identified in Chapter 2 many different research methodologies and methods have underpinned studies of Internet-mediated learning. What I established from my review of these studies was that those of a qualitative nature were more likely to capture the type of data which would be necessary to achieve my goal of developing some understanding of the learning experiences of children during Internet-mediated activity. This chapter has now identified how I have applied the qualitative framework to this study.

The four research methods I utilised have been described and discussed. Significant attention has been paid to the think-aloud method as I consider this to be a very useful and appropriate means of uncovering learning in an Internet-mediated environment.

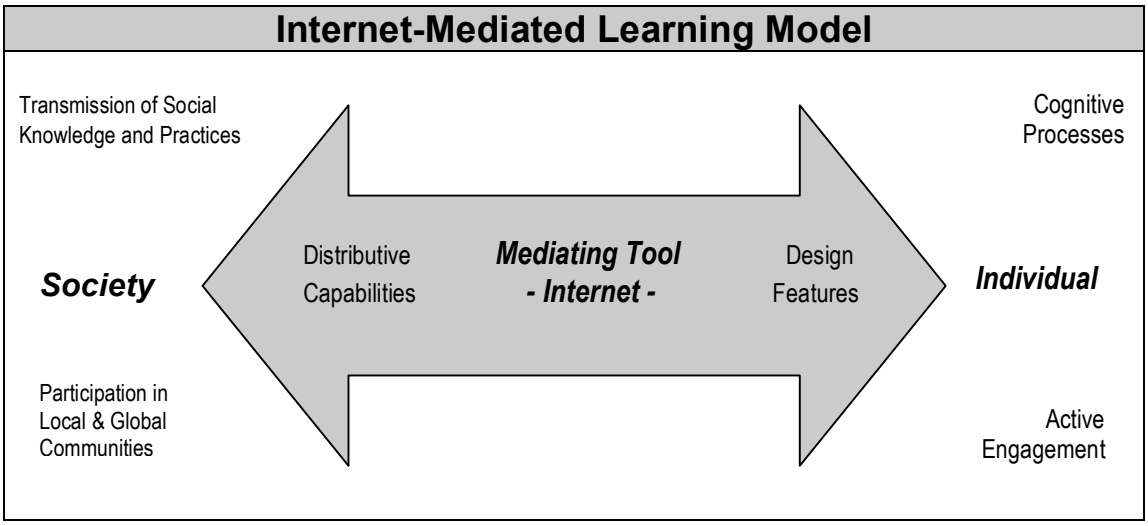
The data analysis process is particularly important under the qualitative paradigm. As can be discerned from section 4.10 above my analysis accorded with the interpretive approach I espoused at the commencement of this chapter. The results of this data analysis are now presented in Chapter 5.

5. DEVELOPING A PROFILE OF THE YOUNG, COMPETENT INTERNET-USER

This chapter presents the findings of the study. Firstly, the Internet-Mediated Learning Model developed in Chapter 3 is briefly revisited to confirm the position I have taken to understanding this complex learning situation. Secondly, I establish the individual learner as my primary unit of analysis and describe the three major categories which have emerged from the data. This is followed by a brief overview of the secondary categories to assist the reader in understanding the structure of the learner profile being presented. I go on to explore each of the categories (with direct reference to the data) and follow with a summary overview of the learner profile which has been presented. The chapter concludes by integrating the Internet-Mediated Learning Model and profile of the young, competent Internet-user to strengthen understanding of Internet-mediated learning experiences.

5.1 Review of the Internet-Mediated Learning Model

As established in Chapter 3 my integrated theoretical framework resulted in the development of the Internet-Mediated Learning Model, as shown below. As indicated previously, I considered it essential to develop an understanding of the interrelated elements making up this learning system in order to uncover the nature of learning in this complex environment. I believe this model achieves its goal.



As shall be discussed in greater detail later in this chapter, development of the Internet-Mediated Learning Model and analysis of the findings occurred simultaneously and so, I did not prejudge the findings in light of the Internet-Mediated Learning Model. However, initial analysis of data saw broad themes emerge under the three principle components of the Internet-Mediated Learning Model: learner, tool and society. It became apparent, however, that such a broad focus of the learning system would not enable an in-depth, yet concise presentation of the findings to emerge. It was therefore necessary to select a primary unit of analysis through which I could view integral components of the learning system. The decision was subsequently made to focus on the individual learner as the primary unit of analysis for this study. The reasons underpinning this decision are presented in section 5.2 below.

5.2 Establishing the Individual as the Primary Unit of Analysis

The goal-driven authentic activity undertaken by the participants underpinned the research design. For the purpose of this study, however, I have not chosen to take 'activity' as the primary unit of analysis as is preferred under some theories. The diversity of Internet-mediated activity which could emerge in a study such as this would make it impractical to draw parallels. Instead, I have taken the participants as the primary unit of analysis.

Placing the participants as the primary unit of analysis did not necessitate a return to a narrow view of learning, examined only through the mind of the individual. Instead, what has emerged as a result of taking the participant as the primary unit of analysis is an understanding of Internet-mediated learning which is comprised of the individual learner, their interactions with the tool and the societal-based influences. As depicted in Figure 5.1 below, these three components have been termed:

- Adaptive Citizen
- Tool-Mediated Citizen
- Participant Citizen

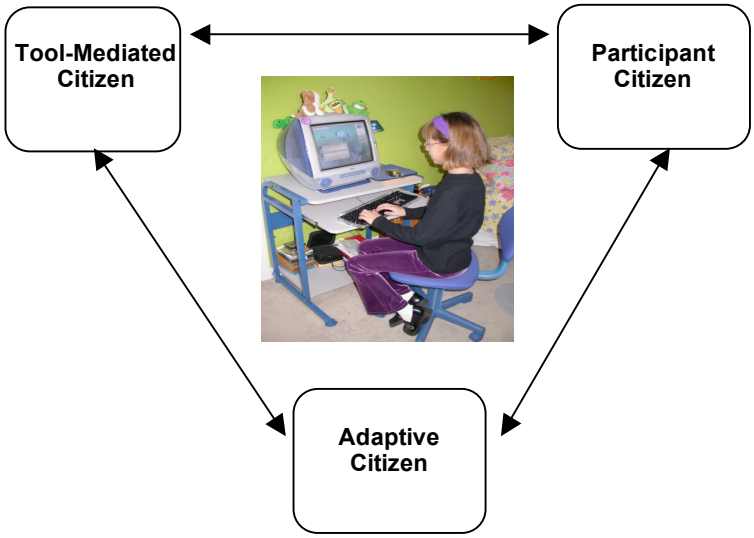


Figure 5.1: The three major categories making up the profile of the young, competent Internet-user

Each of these components is associated with one of the components of the Internet-Mediated Learning Model:

'Participant Citizen' is associated with 'Society'

'Tool-Mediated Citizen' is associated with 'Mediating-Tool'

'Adaptive Citizen' is associated with 'Individual'

The three major categories have defining characteristics that are set in place by the eleven secondary categories which emerged from the data. These eleven secondary categories are depicted in Table 5.1 below:

Participant Citizen	Tool-Mediated Citizen	Adaptive Citizen
Global Citizen	Technician	Efficient Worker
Commercial Citizen	Security Guard	Researcher
Communicative Citizen	Integrator	Director
Abiding Citizen	Design Analyst	

Table 5.1: Overview of the eleven secondary categories making up the profile of the young, competent Internet user

These eleven secondary categories are discussed in what follows to present a thorough and descriptive profile of the young, competent Internet-user as emerged from the data of this study.

5.3 Profile of the Young, Competent Internet-User

The order chosen to present the findings is purposeful. It presents the 'big picture' (issues of society) then moves to the more narrow (issues of the cognitive tool) and concludes with the most localised aspect (issues related to the characteristics of the individual). I thus commence with the category of 'Participant Citizen'.

5.3.1 Participant Citizen

The first major category 'Participant Citizen' refers to participants' experiences and understandings at a local, national and international level. The effects of this are evidenced and discussed at two levels:

1. from the participant's perspective – their understanding of the global nature of today's society;
2. from the societal perspective – the transmission of contemporary social knowledge and structures to participants via the Internet.

Each of these components impacts upon the other. That is, a participant's exposure to society, as a result of their engagement with the Internet, influences what the participant understands about the nature of today's society. Conversely, the participant's understanding of our society's structures subsequently influence their current and future engagement with the Internet at various social levels. Given this, these two elements are discussed together.

In order to explore this category, four secondary categories have been identified under 'Participant Citizen'. These are Global Citizen, Commercial Citizen, Communicative Citizen and Abiding Citizen and discussion of each follows in this order.

5.3.1.1 Global Citizens

The participants' Internet-mediated activity demonstrated significant understanding by them of the global nature of today's society. The data demonstrated the participants: (1) developing an understanding of the world in which they live, and (2) engaging in activities similar to those of other competent Internet-users.

There are several different ways in which the above were evidenced and these are organised under the following descriptive categories:

(a) Awareness of the global nature of online content
(b) Awareness of the impact of global distances on activities
(c) Awareness that language variations exist across cultures
(d) Awareness that Internet access is not available to all people
(e) Awareness that the Internet is used to share information across local and global communities

It is these points (a) to (e) above which capture the essence of the young, competent Internet user as a global citizen.

(a) Awareness of the global nature of online content

The evidence by participants of their awareness of the global nature of online content occurred in various forms.

Elizabeth, for example, appeared particularly cognizant of the fact that the information she accessed on the Internet varied depending on the location from which it originated, and she clearly took this into account when evaluating its usefulness for her stated purpose. In her search for information on the introduction of field hockey to Australia, she notes *"It doesn't say much, it's all about the Great Britain Olympic Squad*" and *"This is about American field hockey I'm going back to the page I was looking at before"* (think-aloud: 16.09.03).

Quickly identifying that she would not be successful in finding relevant information on these international sites Elizabeth took measures to limit her results from the Google search engine results to pages from Australia and described the feature on the Google search engine which allows this *"I'm going back to search on field hockey … two buttons one is the whole web and one is on pages from Australia and I'm going to click on Australia and hopefully that will tell me something from Australia"* (think-aloud: 16.09.03). Also, during the follow-up interview practical activity, when looking for information on snow, she again uses the Australian limiter on the Google search engine stating "*I went on to pages from Australia"* (think-aloud: 16.09.03).

Elizabeth also demonstrated her ability to move from the global to the local once within a web site. She chose to limit her material within an international site *"It says 'go local' and you highlight a country so I am going to click on Australia*" (think-aloud: 16.09.03). At another point, to further focus her search locally she is noted to say *"I'm going to click on New South Wales and hopefully it will give me something"* (think-aloud: 16.09.03).

In a slightly different manner, Nate also demonstrated his awareness that information on web sites can be reflective of a particular culture. In this case, when asked whom he believed created web sites, he stated *"probably just people from America mostly"* (interview: 11.05.04) and when asked why *"'cos it's mostly violent stuff on the Internet"* (interview: 11.05.04). He confirmed through questioning that he thought that most violent material comes from America.

Although making no reference to violence, Elizabeth, like Nate also suggested that American people create most web sites. She considered this made things difficult for Australians because *"there is not as many web sites about Australia particularly not as many good ones on Australia that you can look up. In Google you can go from Australia but if you go from the web they have like the international things"* (interview: 20.04.04). Again, when researching snow during the follow-up interview practical activity she states "*A lot of web sites are from America … that's where most people use the Internet more of the time"* (interview: 20.04.04).

Not only did some participants evidence understanding that online content originated from different countries, they also demonstrated greater understanding of the implications of this, as demonstrated in (b) below.

(b) Awareness of the impact of global distances on activities

Understanding that the world extends beyond their local area was particularly evident when several of the participants considered issues related to global distances.

One such example was Yanni discussing problems associated with online purchases. He was clearly aware of issues related to time and distance when he concluded that if he didn't get his purchase *"in three weeks … longer depending where it is coming from…"* (think-aloud: 19.09.03) he would send an email.

Both Nate and Yanni also raised the issue of postage across global distances:

> *"…sometimes you get suckered in because it might come over from a different country and you need to pay for postage and handling*" (Nate) (interview: 11.05.04).

> *"…but you would have to pay for shipping …. it isn't normally heaps but sometimes it can be more than the actual product"* (Yanni) (interview: 11.05.04).

At another level Elizabeth and Emily suggested, on several different occasions, the Internet provides a means to 'close' global distances:

> *"….for their emails, work people … instead of people from overseas getting them letters 'cos that would take ages they might just send them emails like if they are working with a company overseas…"* (Elizabeth) (interview: 20.04.04).

> *"Friends who live in Australia and American they could email each other, business people who need to contact people fast, that's where text messages come in as well"* (Emily) (interview: 20.04.04).

In addition to an understanding of global distances, understanding of the impact of various languages across the globe and the impact of this on Internet use also arose.

(c) Awareness that language variations exist across cultures

A very simple example is Elizabeth coming across a site "*I think that's a Chinese site, I can't read it*" (think-aloud: 16.09.03) when she encounters a Google search result blurb which contained Chinese script.

Yanni evidences deeper thinking on this issue when asked how important language or words were when searching. He responded *"I don't know, well do they have, I don't know if they have ummm different languages printed out on the computers over there, well they probably do, but someone would have to translate it, that would be a bugger of a job"* (interview: 11.05.04).

Incidental learning is evident when children engage with the Internet. Here, Elizabeth is exposed to Chinese script in its authentic form which she would be unlikely to encounter in her local community. Also, Yanni is forced to consider issues involved in the global community using what is, in effect, a global tool.

(d) Awareness that Internet access is not available to all people

Further evidence of some participants' growing awareness of differences which exist across the globe was apparent during the follow-up interviews when all participants were asked if they thought the Internet was used throughout the world. Evidenced in four of the participants' responses was an emerging awareness that access may not necessarily be available to all:

> *"…they don't have enough money to use it* [the Internet] *….India probably, Malaysia places with, pretty bad (*inaudible*)…"* (Nate) (interview: 11.05.04).

> *"…oh some countries might not have it like, umm, I don't know, Afghanistan or something or some people might have it but not many…'cos, some countries, just the countries can't afford to get it…"* (Yanni) (interview: 11.05.04).

"… probably apart from the countries, like the poor countries that don't have computers and things" (Elizabeth) (interview: 20.04.04).

"…there is some countries that might not have computers or something …. or they might not have anything, like people who are homeless or poor they might not have computers and things like that to use." (Emily) (interview: 20.04.04).

Although not identifying problems associated with some persons having Internet access and others not, I believe this demonstrates that these children are developing some awareness of significant global issues related to Internet access.

Indeed, Elizabeth was noted to consider the need to address this situation *"…like those organisations that are trying to help them* [people in developing countries] *will probably soon think about that"* (interview: 20.04.04).

Whilst acknowledging that not all people may have Internet access the participants did acknowledge that having access does allow for information to be shared across local and global communities and this awareness is demonstrated below.

(e) Awareness that the Internet is used to share information across local and global communities

Elizabeth demonstrates use of the Internet at a local level which extends her interactions from her immediate community to a broader community with common interests. This engagement occurs as a result of her membership to Little Athletics (a children's sporting association in Australia). Elizabeth explains how she uses the Little Athletics' web site on a weekly basis to monitor her own performance. She states *"…when you join up you get a book where you stick all your things in but you can go onto the Internet and just write them into the web site and then when you go it can show you the graph of how you are going"* (interview: 20.04.04). She also uses it as a resource to share her own achievements *"Yeah, you can also see like there's a photo part where you can send photos in of your achievements and you can tell other people how you are going, like if you won first in the State you could send your photo of when you have your medal"* (interview: 20.04.04). This use of the Internet can also provide an inspiring resource as

she follows the achievements of Australian athlete, Lauren Hewitt "*…there is also a part of Lauren Hewitt's diary when she is doing the world championships so that really good"* (interview: 20.04.04).

Similarly, Emily provides an example of the use of the Internet to co-ordinate and share events with the wider community.

> *"… people who own the web site might research it or in the web site they put in what they are doing like charity events of something and then they can, from that they can research what they are doing and they put all the information on the Internet"* (interview: 20.04.04).

Elizabeth also acknowledged that the Internet is used to share and disseminate information between people:

> *"Mostly people that think, that like, like something and they think they should share it with other people and things like that… like say someone likes I don't know, say they like hockey and they think that other people should know more about it, like they would like more people to join in and something they would put a web site up then hopefully people would come and visit it"* (Elizabeth) (interview: 20.04.04).

Emily further highlights the value of the Internet to share information, this time at the global level. Specifically, she notes that the Internet allows people to find information on other countries from various viewpoints:

> *"…'cos if a lot of countries have it* [the Internet] *then you would be getting a lot of information from all the countries, like you can type in something about one country and then from other countries you can have views of what that country is like, so it's different"* (interview: 20.04.04).

> *"… 'cos if you are a Uni student or a child and you have to study a different sort of country or language or something you can type in that language and you could*

get millions of things on it and then you could just, you find out the search and put in all these different countries or people" (interview: 20.04.04).

In contrast, during her independent Internet-mediated activity Elizabeth identifies problems associated with the reverse; waiting for others to present information online. In this case, when she was unable to identify who invented field hockey she concluded it may be because: (a) there wasn't one person who invented it; (b) they don't know who it was; (c) field hockey is quite new in Australia and maybe no-one has wanted to answer those questions before so this information is not yet online. I found these comments particularly interesting as they gave some insight into Elizabeth's understanding of the need for human contribution to create 'the Internet', thus identifying the place of this tool within society.

The five descriptive categories above have, I believe provided insight into the learning of these participants with respect to both their place as global citizens and the role of the Internet in a global community. I now move to the second category under Participant Citizen, being Commercial Citizen.

5.3.1.2 Commercial Citizen

The research process provided evidence that the Internet was a mediating tool with power to influence learners through its commercial nature. This exposure was, at times, solicited by the participants (when they actively sought out information) and, at other times, was completely unsolicited. Through this category I explore the ways in which the Internet-based learning system influences and is influenced by the commercial nature of our global society.

Discussion of the 'Commercial Citizen' is divided into two parts:

(a) Developing understanding of economic values
(b) Consumerism

Consumerism is further broken down and examines issues of:

i. Online advertising
ii. Knowledge of brand names and commercial organisations
iii. Understanding of online shopping activities

(a) Developing understanding of economic values

Activities such as shopping on eBay naturally lend themselves to discussion of economic value. However, what was particularly surprising to me during this study was the voice of participants comparing the economic value of activities they can access through the Internet in contrast to the cost of accessing same via different sources.

Nate, for example, compared the value of accessing computer games on the Internet or using a game console wherein he stated "*Well you can't get Nintendo games and that online .. takes too long to load .. Internet games are usually cheap and easy to play, sometimes they are hard"* (interview: 11.05.04). He appeared to consider the value of Internet-based games in terms of their financial cost, the loading speed and the level of play quality.

Similarly, Yanni's comparison between the use of books and the Internet considers the economic value when asked which he thinks is most efficient *"the Internet, with books you don't need to log on though, and books are probably cheaper"* and why he thinks books are cheaper *"it depends, well with broadband you can be paying $40, $50 a month and with the dial up connection you pay by the hour, but with books when you have bought it you have got it like you don't have to pay to use it"* (interview: 11.05.04).

Yanni also discussed eBay in significant detail and there were numerous instances where it became clear that he had a good understanding of when different approaches to buying and selling were economically viable. For example, when comparing the 'auction' and 'buy-it-now' options he suggests "… *you might get the thing cheaper by auction but the buy-it-now means you can have it straight away"* (think-aloud: 19.09.03).

Yanni also considered the economic value of eBay as a sale tool. At one point he acknowledged the value in selling something you could not use on eBay but at a later stage suggested that *"It costs money to sell on eBay so I would probably just see if a*

friend wants it" (think-aloud: 19.09.03). This suggests, like Nate, Yanni would take a number of factors into consideration when deciding upon the most economically viable option.

However, Yanni clearly recognises that selling goods on the Internet is not the only way to make money from the Internet. He understood that owning a Internet-based tool could also result in income and he mentions the founders of Google and their subsequent wealth on several occasions throughout the follow-up interview - *"… Well there's a lot of places that you can go on and start your own web sites and people make search engines, like Google, the guy that owns that is the youngest billionaire in the world …"* (interview: 11.05.04)

Nate also demonstrated awareness that the Internet can be used to earn money for oneself in his statement at the commencement of his observation period wherein he outlined his session goal as being "*I'm going to do fun and games, find out who made the games, why they made them, how come they made them,* ***did they make them to get money****, or did they make them just for fun, where did they get their ideas from?"* (think-aloud: 19.09.03). Further, during the interview session Nate considered the use of the Internet around the world as financially beneficial for Australia - "… *it helps the economy … well there are some Australian web sites and they get the money from that"* (interview: 11.05.04).

(b) Consumerism

The sub-category 'Consumerism' exists to share evidence that the Internet is both a source for obtaining a desired product, but also exposes users to undesirable or unwanted products or services. This category is explored through both of these angles – the positive and negative aspects of commercial entities on the Internet. There are three components to this category.

i. Online advertising exposure
ii. Knowledge of brand-name and commercial organisations
iii. Understanding of online shopping activities

i. Online advertising exposure

In the initial questionnaire all participants responded to the question "What do you like least about the Internet?" with negative attitudes towards advertisements, for example: "*Silly adds* [sic] *that pop up just as your* [sic] *about to go on your favourite web site"*, "*Tons of ads"*, "*All the adds* [sic] *and stuff"* (questionnaire: 02.09.03).

While Elizabeth, Emily and Nate were not confronted with explicit commercial advertising in the form of pop-up ads during their Internet activities there was evidence of product and service placements on some of the Internet sites they chose to visit. These generally occurred around the extremities of the page and were ignored by the participants. Throughout their initial sessions they did not make comment on any advertising. It is believed that they are used to seeing this type of advertising and have the ability to ignore these extraneous details on the screen, focusing instead on the information they are trying to find. Interestingly, when evaluating web sites during the practical component of the interview Elizabeth attributed the quality of a site to its level of advertising, stating *"I would have a look at that one* [web site] *because it hasn't got any ads on it …"* (interview: 20.04.04).

Hannah appeared to be the most affected by commercial exploits on the Internet. She displayed high levels of frustration during her independent activity when encountering advertisements. She spoke in an increasingly agitated voice along the lines "*No, I don't want a flight to Bermuda"* and *"No, I don't want the vacation package, can't you see that"* (think-aloud: 17.09.03) and often combined these comments with forceful keystrokes/mouse clicks to emphasise her annoyance. Other examples to emerge and briefly break the flow of Hannah's engagement included an offer to purchase videos "*No, I don't want some videos"* (think-aloud: 17.09.03) and later to search her family history *"No, I don't want to know who my ancestors are"* (think-aloud: 17.09.03).

Yanni also noted the advertising which confronted him on the eBay site but in a more neutral tone said *"Basically all over the site there is advertising so at the top here…"* (think-aloud: 19.09.03) before going on to describe what was being advertised in the banners around the site.

When asked during the interview if they took any notice of pop-up ads Elizabeth, Hannah and Nate indicated that they do not even stop to read the ads, instead they immediately shut them down:

> *"It will come up and on ours it says popups.com on the top and before the ads even come up so you just close it." … "Yeah, before you even see it"* (Elizabeth) (interview: 20.04.04).

> What do you do when pop-up ads come up? - *"Shut them down"* (Hannah) (interview: 05.05.04).

> *"Oh yeah, I just cross them off … Right click and then it comes up with a little menu bar and you, which deletes it".* Do you read them? *"No, they are just a waste of time"* (Nate) (interview: 11.05.04).

Yanni and Emily, on the other hand, were more aware that they did take notice of what was being advertised:

> "*Sometimes, it depends really what it is. I will have a quick read through everything and if I find something interesting* (inaudible)*"* (Yanni) (interview: 11.05.04).

> *"Sometimes I read them and, I just read them and then I get rid of them … I look at these ads and if there's nothing good I just get rid of them after I have read them for a while.."* (Emily) (interview: 20.04.04).

The acknowledgement of advertising on the Internet by the participants is interesting at several levels when we consider: (1) the transmission of 'perceived' socially-valued information through the Internet; and, (2) issues of flow experience whereby the participants either maintain attention or are distracted by online advertising. These shall be explored in the discussion chapter which follows.

ii. Knowledge of brand-name and commercial organisations

Yanni was most revealing in identifying the positive and negative aspects to the commerciality of the Internet. While he acknowledged in the questionnaire that he dislikes ads he listed "*buying stuff*" as a favourite Internet-mediated activity. He clearly used his knowledge of commercial brands to assist him in searching for products or services on the Internet – *"I'm going into itech dot com it is a hockey brand*" (think-aloud: 11.05.03) wherein he typed the address www.itech.com directly into the Internet Explorer address bar.

He also recognised that companies used the Internet for inappropriate purposes:

> *"...sometimes they get, like advertising companies can buy details off umm, they do buy them they're not supposed to buy details off people so they can send you advertisements"* (think-aloud: 19.09.94).

When asked if this was a problem he goes on to explain:

> *"… if you bought a bike over the Internet the person that sold you the bike might sell your details to a bike shop and then the bike shop can send you flyers 'cos they know you are interested in bikes"* (interview: 11.05.04).

During his chosen activities, Yanni was noted to have a high number of email messages from commercial entities in his email inbox. After indicating that most of his email messages were junk (before actually opening and reading them) I asked him how he decided which ones were junk, to which he responded "*You look at who they are from and what they are about"* as he scrolled down the inbox list, moving the mouse over relevant emails and reading aloud some of the titles. He continued *"A lot of them like this is from Colombia Star, just like competitions and stuff, there is heaps of them so I normally just delete them"* (think-aloud: 19.09.03). It is also noted during his reading of message titles that he received "*Insurance company trying to get me covered for life or something"* (think-aloud: 19.09.03) which his tone indicates is a strange type of email to receive.

He then explained how these companies get his email account, giving the following example *"I signed into Blue Sky Frog, a mobile site, where you can get free mobile logos and stuff, so they send me emails every week"* (think-aloud: 19.09.93). This episode demonstrates how he uses the commercial sites for his own benefit at times (ie. getting free mobile phone logos) and again uses it to his advantage *"You can get newsletters from Hotmail, I get the technology and the sports ones but I've been getting it for about the last two years ..."* (think-aloud: 19.09.03)

Emily's discussion of various web sites also indicated, whether she was aware of it or not, that she was being regularly exposed to very commercial sites - *"You can go on web sites just for kids and what you do is you could play* ***Nickelodeon*** *you could play this one…"* (interview: 20.04.04). She suggested that she regularly accesses commercial sites such as nickelodeon.com and neopets.com to, amongst other things, enter free competitions.

Elizabeth also uses the Internet to access free resources. When discussing her attempts to build a web site for her father's business she indicates that she used a free online program to do so *"Well on the BigPond Web site you can download it. I downloaded a web site thing ...*" (interview: 20.04.04).

Clearly, the commercial nature of the Internet benefits these three participants. I note, however, they do not acknowledge that the companies may be using free products and services to further promote themselves. The participants did, however, identify some other issues associated with the commercially driven nature of the Internet and these are presented in (iii) below.

iii. Understanding of Online Shopping Activities

Several of the participants indicated that online shopping was one type of Internet-mediated activity they undertook. Interestingly, however, even participants who said they do not shop online had at least some understanding of the workings of this feature:

> "*Well if you go shopping on the internet and if you're in a web site where you can buy things like clothes or toys from the Internet you go into shops and then it tells*

you how much they are and it sends away for it and when they deliver it you have to send the money back, if they deliver it you give them the money…" (Emily) (interview: 20.04.04).

Yeah, it's kind of like a mail order thing, you put it in your cart and you click on shop for it, you pay with cash, credit card or cheques, eftpos" (Nate) (interview: 11.05.04).

It was Yanni's decision to spend time on the eBay site during his independent activity session that lead me to ask some questions related to shopping online during the follow-up interview. Yanni was very knowledgeable about the workings of the eBay site. He could clearly explain the features, for example, when searching for a bike from the Mongoose brand:

"There's a lot of, there's gloves, there's not just, here we go, there's a bike so you've got the picture and what it is so you can click on it and next to that the price and how many bids and then it's got how much time left …" (think-aloud: 19.09.03).

He then goes on to explain what is meant by the term "starter bid" before going on to describe the functions of other icons on the eBay site.

Yanni was also fully aware of the dangers of shopping through eBay "*You can get ripped off"* and *"You don't always get to see your umm like product that you are buying"* (think-aloud: 19.09.03). Again demonstrating his economic savvy he also appreciates that buying online meant savings could be made *"… on the Internet a lot of the time it is a lot cheaper than buying it in a shop"* because "*… some of them are like foreign owned and like they get shipped over and it's different pricing like I went, my friend went over to Canada and got a hockey stick, it's worth $150 here and over there he got it for $30 Australian*" because *"… everyone is interested in hockey over there and they sell a lot more stuff so they can sell it more cheaply*" (think-aloud: 19.09.03).

Emily also identifies other forms of shopping activities which occur:

> *"…like Nickelodeon that's a full channel of shows and all that and what they do is when they find items that they think they can sell and they will sell them on the Internet"* (interview: 20.04.04).

> *"People who want stuff, 'cos it could be things from shows they are selling, they are auctioning or selling, they would cost a lot of money and a lot of people might want prize things from the shows that they love and they'll either bid for it or they'll try to buy it and it'll come up with however many is left or if they have got only one then it will say sold on it, it's like a picture, but it'll say sold* (interview: 20.04.04).

Hannah, who indicated she does not shop online held quite negative views on the feature claiming that "*it wastes money*" because she knows of people *"that used it, once they've shopped on it and they didn't get it and it's been really expensive or something"* (interview: 05.05.04). She considers the problems associated with having to wait for a product you have ordered and, for herself, prefers to go to the shops which are "*about one minute away … if we drive"* (interview: 05.05.04).

The development of Commercial Citizen reflects these young persons' exposure to, and developing understanding of, the economic and commercial issues which have evolved as a direct result of the Internet. Interestingly, all participants were aware of such issues regardless of their level of active participation.

I consider the two descriptive categories making up Commercial Citizen (Developing understanding of economic values and Consumerism) are useful to gain an insight into the learning that relates to the transmission of social practices. The Internet is clearly a cognitive tool with the power to send messages to users that are reflective of local and global practices valued at this point in time. Having now presented data to support the development of the participants as Commercial Citizens I move to demonstrate the learning that is evident when taking the participants as Communicative Citizens.

5.3.1.3 Communicative Citizen

The third category to emerge under Participant Citizen is that which encompasses the communicative nature of the Internet. There are two pertinent areas explored here. The first reflects the participants' understandings that the Internet facilitates communications across the globe and that this impacts on society generally. The second presents the specific uses and experiences of the participants when using the Internet to communicate with others. Again, we see how their understanding of the communicative process affects their actions and similarly their actions influence what they understand of the Internet's impact on global communications. Given this, we cannot isolate these two issues. Instead they are discussed in light of the forms of communication available:

(a) Skill in the use of email
(b) Use of chatroom and messenger services
(c) Understanding of global communicative standards

(a) Skill in the use of email

In response to the initial questionnaire all participants indicated that they used email to communicate with friends and like Elizabeth they acknowledged the usefulness of this function ".. *you can talk to friends if you moved away from them"* (interview: 20.04.04).

Notably the three female participants also indicated that email was used to communicate with family members while neither of the boys included family in their responses. It was also evident that the participants used email to contact others outside their friendship and family circles. Nate, for example, uses email to contact celebrities; Yanni to contact a specific organisation (Breakaway) and Elizabeth stated that she sometimes emails others to find more information on an area of interest.

Yanni spent considerable time, during his independent session, in his Hotmail account. He compared this to another communication system MSN Messenger, stating that you can create a list of contacts through both. Interestingly he chose to email a friend who he acknowledged "*is in other classroom at the moment*" (think-aloud: 19.09.03) and whom he would see soon. The text of the email "*are ya coming ice skating on satday"* raises

issues of evolving language conventions as we see the absence of punctuation and the use of some phonetic spelling.

Another interesting aspect was Yanni's knowledge of the limitations of email contact. He acknowledged this during a discussion of problems associated with online purchases when stating "*...probably people never got their thing, like the people just ran away and delete their email address and stuff ...*" (think-aloud: 19.09.03) . Also evidenced at this point was an awareness of the email/space relationship when Yanni discusses the storing of old email messages. When asked specifically why he keeps so many messages he explains *"You've got heaps of space so if I run out of space I will just start deleting them but you might want to come back to them or something"* (think-aloud: 19.09.03). This prompts him to go into the 'trash' function and check that he can indeed read emails that he has previously trashed.

Hannah, Nate and Emily were also capable of articulating how to go about sending messages. In Emily's words:

> *"... with email you just type in the web site* [to access your chosen Web mail service]*, the address you are sending it to and the reason why, like the reason why you are sending it, if it's just a message to say hello then you type in hello and then you go down and then you start typing your email and then click send and it'll send it off to the person"* (interview: 20.04.04).

(b) Skill in the use of messenger services and chatrooms

In addition to using email as a form of communication several of the participants also indicated they made use of instant messenger services and chatrooms and Hannah identifies these services as a benefit to global communication *"We can talk to people in other countries in these web chats and stuff"* (interview: 05.05.04).

Yanni was again prominent in this area. He explained at length the similarities and differences between email and messenger services. While accessing MSN Messenger he states *"Nobody's on at the moment, 'cos everybody's at school … so I'll go, go to chatrooms"* (think-aloud: 19.09.03). I observe at this point that a small window has

come up with a list of names and when Yanni sees this it quickly tells him no one he has in his address book is online at this point in time.

Elizabeth also makes use of MSN Messenger *"I like to talk to my friends on my MSN sometimes"* (interview: 20.04.04). She explains how it is used and makes comparisons between it and chatrooms:

> *"It's part of hotmail and it's like a little chat thing but it's not like a chatrooom, you get to chose who you are talking to, like it will just be your friends so you can say that you want to talk to a friend, say you had a friend and you wanted to talk to them you could just click on them and you'd only be talking to them"* (interview: 20.04.04).

> *"…and you can have like two or three people that you are talking to and they can all be in different windows so you are all talking together"* (interview: 20.04.04).

We saw in Yanni's email message the use of phonetic language and Elizabeth also raises this issue with respect to messenger services:

> "*If you are on there a lot, like typing in MSN you will probably get faster at typing because you are saying things faster, but when you are typing on MSN you are not really using real words, like if you are saying you you won't write y-o-u you will write u"* (interview: 20.04.04).

However, at a later stage she identifies problems with the use of phonetic spelling in some areas of life and not others:

> "*Yeah, it's not very good if you are doing, like when you go back to school if you start writing like that in your books and things but it's a lot quicker when you are on MSN and sms-ing on the phone but it's yeah, not very good when you go back to school and start writing like that"* (interview: 20.04.04).

One interesting aspect to arise in this study was the change in Yanni's attitude in the seven months between his observational period and the follow-up interview. In the first session he was a huge advocate for the use of email and Messenger functions. However, during the follow-up interview he was noted to have changed his tune somewhat:

> *"I don't use it as much anymore … I just use the phone it is a lot easier … 'cos you've got to log on the Internet and log on to your password, oh your MSN, it probably is cheaper overall to use MSN but it takes a lot longer"* (interview: 11.05.04).

It appears that as this time has passed Yanni has developed a more sophisticated understanding of when different communication genres are appropriate but less concerned for associated costs. Of a similar nature, also evidenced above is Elizabeth's awareness of when specific writing styles are most appropriate.

The use of messaging services certainly appears to encourage users to evaluate the usefulness of the online services for their specific purposes and there is also evidence of new communicative skills being mastered as a direct result of the Internet.

(c) Understanding of global communicative standards

As raised by Elizabeth in section (b) above, the use of phonetic spelling is acceptable in some forms of communication media. Indeed, any of us using email or telephone messaging services today would be familiar with many of the commonplace abbreviations and phonetic spellings used. There are, however, other communicative standards which have emerged as a result of Internet usage in the form of iconic symbols.

The most basic evidence of participants' knowledge of this occurred when, without prompting, they all immediately clicked on the Internet Explorer icon on the computer desktop to commence their independent sessions. Yanni then went on to click on the MSN messenger icon which is also located on the computer desktop to commence his first Internet-mediated activity.

Due to the nature of his chosen activities Yanni was presented with the most opportunities to display his understanding of iconic representations. This was particularly evident when Yanni was on the eBay site at which time he described what all the different icons on the screen were communicating to the buyers and sellers.

In order to navigate around sites the participants also needed to understand how icons were being used to transmit information. Nate, for example, needed to identify the icon which was associated with the specific game he wished to access. Similarly, Elizabeth and Emily relied on toolbars and menus displayed on various sites to navigate into desired areas of a given web site. Navigation is, however, discussed in greater detail at section 5.2.5 when the role of 'Researcher' is presented.

Important to note at this point, there are many icons which are becoming commonplace and many design features on Internet sites with which users are familiar and which they can use with ease. Although these representative icons may vary in colour, shape, size and position on various Internet programs, commonalities exist and knowledge of them is one key to effective use of the tool.

5.3.1.4 Abiding Citizen

The final category under Participant Citizen is explored through Abiding Citizen. This category is defined by its ability to capture the participants' awareness of specific actions and activities which are appropriate for a given situation/circumstance. Many of these understandings have developed because of explicit 'rules' that govern their Internet usage. Generally, this category emerged as a result of the participants either articulating relevant rules or evidencing understanding of them through their actions. However, there are also another group of practices evident that appear to reflect implicit rather than explicit understandings of socially appropriate Internet usage.

(a) Understanding of the rules of usage

The nature of the Internet-mediated activity chosen by each of the participants dictated the level to which this category became relevant. The topics under examination by Elizabeth and Emily were 'safe' topics – links related to field hockey and The Pharaohs,

combined with school censoring programs, meant that no inappropriate material was presented to them. Similarly, as Nate accessed a single game site (for which he typed in the exact web address) he did not expose himself to much Internet-content.

Hannah, on the other hand, experienced three occasions where she was exposed to materials which were either offensive to her and/or would be considered inappropriate for her in the school environment in which she was working. In the first instance the blurb for one of the results of her Google search was found to be related to extraterrestrials. Given that Hannah attends a Christian school this information would not be considered to provide accurate material and Hannah's immediate reaction to this site was "*Extraterrestrial homepage – no way"* (think-aloud: 16.09.03). At a later stage she entered a site which unexpectedly contained pictures of bikini-clad females to which she responded "*What the!!!"* (think-aloud: 16.09.03) and immediately departed from the site. Again, when reviewing sites in the follow-up interview practical activity she notes *"That's obviously not appealing …. the screen saver thing …what is that it is an advertisement you can buy the screen savers …it has got half naked women on there"* (think-aloud: 16.09.03).

Yanni was another participant who, when working in the presence of an adult on school premises, was required to exhibit an understanding of acceptable usage practices. When he was unable to enter the MSN Messenger site, which he uses regularly at home, he ascertained that it needed to be downloaded and said to me "*We're not supposed to download anything"* (think-aloud: 19.09.03). He also decided to check with me if he could undertake certain activities which could be considered questionable in the school context - firstly asking "*Am I allowed to go in my Hotmail at school?"* (think-aloud: 19.09.03) and later "*Umm can I do some, like shopping stuff, like buying off the Internet?"* (think-aloud: 19.09.03). It was clear from these questions that Yanni was aware that the appropriateness of certain Internet activities varied from home to school.

With respect to chatrooms it is noted that the female participants had clear rules set in place by their parents:

> *"... I'm not allowed in chatrooms because you don't know who is in there ...".* (Elizabeth) (interview: 20.04.04)

> *"Well with the rules that my mum and dad have set down … I'm not allowed to use like hotmail and MSN and all that because mum's just worried 'cos she knows what's happened if you get hooked up with someone you don't know'* (Hannah) (interview: 05.05.04).

Emily clearly suggests she wouldn't want to do this anyway:

> *"I never go on there* [chatrooms] *anyway because I don't really care ... all you do is just talk to people you've never heard of, never heard of and you just talk to people and when you can talk to people you know and then you can play games with them on the Internet is better than talking to people you don't know"* (interview: 20.04.04).

A further area where rules are set in place deals with the technical side of Internet use where pre-determined methods for dealing with technical problems (such as when the computer 'freezes') have been established within families. This aspect is further explored in Tool-Mediated Citizen, particularly through the role of Technician.

A broad range of issues have been identified under the first primary category "Participant Citizen". This category, as described by the sub-categories, is useful in identifying the social implications that are evident when children are using the Internet to undertake activities reflective of their day-to-day home and/or school usage. As shall be highlighted in the discussion chapter which follows, the participants' access clearly allows for the transmission of social knowledge and their participation with local and global communities as espoused under the Internet-Mediated Learning Model.

5.3.2 Tool-Mediated Citizen

The second major category to be explored is that of 'Tool-Mediated Citizen'. This category is bound by the exploration of issues that result from the design and structure of the Internet. Tool-Mediated Citizen examines the impact of the features of the Internet

which make it unique in comparison to other tools available in today's society. This analysis occurs at several levels to include mechanical functions as well as tool-mediated activities.

The primary category is made up of four 'roles' which the participants took on as part of their engagement with the Internet – Technician, Security Guard, Design Analyst and Integrator. Each of these is discussed in what follows.

5.3.2.1 Technician

Those of us who have engaged in Internet-mediated activity will not be surprised by the identification of the role of 'technician'. This category encompasses actions, behaviours and understandings of the participants that relate to the 'mechanics' of the tool. During their independent Internet-mediated activities each participant was, on occasion, required to depart from the task at hand and deal with issues related to the computer and its mechanical functions.

While each participant may have experienced different technical demands at different stages of their activities, what was particularly relevant and interesting was the way in which these demands were handled. It must be clarified, however, that this role is not intended to suggest that Internet-users must have thorough technical knowledge, rather what is of interest here is the two distinct issues which emerged:

(a) Demonstrating levels competence (master v. apprentice)
(b) Demonstrating efficient practices

(a) Demonstrating levels of competence (master v. apprentice)

Competence captures the interwoven master v. apprentice nature of this engagement. The participants' understanding of the mechanics of the computer and specific Internet related features varied widely. In some instances a participant might demonstrate considerable knowledge, while at other times, there appeared to be confusion or incomplete knowledge.

Areas of confidence and knowledge (where the participant evidenced some mastery of the tool) are presented in the following examples.

Hannah took responsibility for a technical problem which occurred when it appeared the computer was shutting down – "*Agghhm what have I done now, what have you done now Hannah I thought it had shut down, I thought it had had enough*". (think-aloud: 17.09.03). At this point she had tried to enter a site but it came up with a notice that she was being redirected to another page and a blank message screen appeared in the top left hand corner of the screen. She attempted to remove the blank message screen and was automatically directed to the desired site which presented with a message that the site cannot be found. Comments and body language at this time indicated Hannah was finding the situation frustrating but suddenly seemed to realise that the computer just needed time to complete its functions before she could continue. She dealt with this "… *while you do that I am going to colour in my little thing"* (think-aloud: 17.09.03) and spends a moment colouring in a map which she had drawn earlier into her notebook. Hannah, although frustrated, understood the computer would "catch up" and she could eventually continue with her work.

Yanni was also quick to make sense of an unexpected event. When trying to log into his usual chatroom site Yanni encountered unexpected technical problems "*This doesn't normally happen …"* (think-aloud: 19.09.03) but quickly evaluates the situation and interprets the message displayed on the screen "… *ohh wait, I have to download it"* (think-aloud: 19.09.03). And again, during his email access he was also confronted with a problem when his message failed to be sent. It was only a matter of seconds, however, until he addressed the problem – "*When you click on send, opps, I haven't put his name in, when you click on send it takes about ten seconds to send an email*" (think-aloud: 19.09.03).

Also, apparent was understanding that the participants sometimes had no control over their access to the Internet. Nate, for example, "*I really like this web site, it's got lots of good games but yesterday the server wasn't working so I couldn't get on to it"* (think-aloud: 19.09.03).

Along the same lines, when Emily is prevented access to a particular site she concludes *"It might have been removed and its name has been changed. It's probably temporarily unavailable"* (interview: 20.04.04).

After seeing the participants deal with technical problems during their independent Internet-mediated activities I decided to asked them in the follow-up interview why they thought the computer froze sometimes and what they did when that occurred. Nate and Yanni knew what to do and had their own theories:

> *"I control, alt, delete and restart it …probably just a block in the hard drive, the network or something or a virus."* (Nate) (interview: 11.05.04)

> *"You try pressing control, alt, delete and if that doesn't work sometimes you just have to turn it off, you're not supposed to do that but sometimes that is the only way … yeah it's last resort stuff… I don't know, maybe just too much information is going on at once"* (Yanni) (interview: 11.05.04).

Hannah also indicated she knew what to do if the computer froze *"Just go control, alt, delete and then it comes up with this box and you can end the thing you want"* (interview: 05.05.04). However, she was unable to articulate why this might occur.

Other areas which were briefly raised by participants during the interview and demonstrated knowledge of computer related issues generally or Internet specific issues included:

- Hannah's ability to customize her computer by installing personal preferences;
- Yanni's exposure to a virus on his home computer that slowed it down and eventually required reloading of all programs;
- Elizabeth's attempts to create a web site for her father's business.

In contrast, sometimes participants' comments suggested they are working at an apprentice level and at times call upon the knowledge of a more competent user.

During her independent Internet-mediated activity Emily evidenced an instance of limited understanding of technical features. In this instance, she attempted to enter a site which asked her to choose between "flash version" and "HTML version" wherein she says "*That didn't work so I am just going back to see if secrets and science might help"* (think-aloud : 16.09.03). While this may well have been a very useful site for her stated goal she did not persevere with gaining access.

Nate demonstrated some level of comprehension of computer related terms. This was seen when he was asked about the Internet taking up space wherein he responded: *"Yeah it takes up a fair bit I reckon … yeah 'cos it takes up gigabyte, megabyte and all that"* (interview: 11.05.04). He later demonstrated understanding that these terms refer to *"like memory hard disk stuff, download things"* (interview: 11.05.04).

Reliance on others was also highlighted by some participants which demonstrated a traditional master / apprentice relationship:

While Elizabeth and Emily articulated reasonable theories as to why the computer might freeze while you are on the Internet it is clear they are reliant on others when dealing with this situation:

> *"Well mum doesn't like turning the computer off like without turning it off properly, shutting it down and so she says to leave it for a while 'cos usually when it freezes its because it has been doing too many things, like you've got too many Internet sites open or something so she says to leave it for while and if it's still not working, control alt delete and like, usually if it's frozen it will come up as one of the things is not responding and so you end that one and then it will all usually keep going, otherwise if it is not working mum just shuts it down and then when you turn it back on it will go back through it and check all the files"* (Elizabeth) (interview: 20.04.04).

> *"Mum and I just press control and then alternate and then F4 and that will unfreeze the computer if the computer is willing to do that. …. 'cos you are using too much, it's got to download all the memory that you've just used, you*

might have typed in something really fast and it's got to download all the thing and get it into it, get it into its box and say this is what this person has just put on the computer, we need to stop for a minute and get it through us so that we know what we are doing." (Emily) (interview: 20.04.04).

Emily also suggests a more cautious approach to dealing with pop-up messages *"What I do is I would either call mum and dad and get them to check it out or I just get rid of them or just look at them"* (interview: 20.04.04). However, her actions during the independent activity suggested differently. She did not hesitate to close these and did not consult me (the only adult present) for appropriate action.

(b) Demonstrating efficient practices

In addition to moving between role of master and apprentice whilst engaged in Internet-mediated activity the participants also demonstrated a range of efficient practices throughout their engagement.

Importantly, I make the distinction between 'master' and 'efficient practices' where efficient practice does not necessarily mean the participants had understanding of the technical issue or were taking the most appropriate action as one would expect from a master; rather they were acting to solve a problem in the quickest, most convenient way possible.

The role of technician was most prominent when automated messages appeared on the screen at various times throughout each participant's session. During the start-up stage of logging on to the school computer system a message appeared advising that certain connections had not been made. Not one of the participants hesitated to cancel this message either by clicking on the "OK" button or on the 'x' in the top right hand corner of the message box. It is likely that this message appears each time they log on to the school system so they are familiar with it and respond accordingly. This need to deal with the computer did not impact upon the activities being undertaken at the same time (eg. clicking on the Internet icon on the desktop).

Other forms of automated messages which occurred throughout the sessions were "auto-complete" messages which asked if the user would like to have the computer complete a form-like function being undertaken. In the main, the participants clicked to close such messages without hesitation or comment. On only one occasion did one participant evidence simple verbal acknowledgement by reading the message aloud. Hannah did, however, demonstrate frustration with the regularity of such messages *"Oh not these things again, stupid auto-completes"* (think-aloud: 17.09.03) but also quickly acted to remove the message.

Interestingly, both Nate and Hannah encountered an auto-complete message during the follow-up interview practical activity and demonstrated efficient practices but with insufficient knowledge to back up the decision being made. When the message appeared and I asked Nate what he needed to do he merely said "*no*" (interview: 11.05.04). When I ask him why he said no to it he stated: *"'cos I don't know what it says so I just say no."* (interview: 11.05.04). Similarly, when I specifically asked Hannah, during her independent activity, what the messages were about and what she needed to do, she replied *"I don't know so I just press no"* (think-aloud: 17.09.03). She also didn't hesitate while doing/saying this and immediately returned to talking about the Google search results on the screen in front of her Also later, Hannah encountered another privacy message and when asked what it meant said she didn't know but told me she would deal with it "*I just click don't show this message again and okay"* (think-aloud: 17.09.03).

One of the most common methods of solving a technical problem was to go "back". Elizabeth, for example, when confronted with an unavailable page merely stated "… *alright it says web site cannot be found*" (think-aloud: 16.09.03) and without hesitation clicked the appropriate button to return back to the previous page. Similarly, when Hannah was confronted with an unavailable web site "*Stupid web sites why can't they ever be found…"* (think-aloud: 17.09.03) and returned (using the 'back' button) to Google search results.

Both Hannah and Elizabeth also encounter a privacy message during their Internet-mediated activity. Hannah quickly reads the message aloud and says "*Okay*" (think-

aloud: 17.09.03) while clicking on the 'okay' button on this message and a second which immediately appears which she deals with in a similar manner. Elizabeth also pays little attention to the privacy message and merely states "*I'm going out of that*" (think-aloud: 16.09.03) and does so by clicking on the 'x' without hesitation. Interestingly, I note that they use different approaches to deal with message - achieving the same result.

The descriptive categories presented above demonstrate the learning which was evident when the participants dealt with the technical side of this tool. However, it is not only the role of Technician which was necessary to meet the demands of this unique environment. The participants also demonstrated knowledge and/or skill in dealing with aspects of security related to this tool and this is discussed in what follows.

5.3.2.2 Security Guard

The second role to be examined under the Tool-Mediated Citizen is that of 'Security Guard'. This category is defined through its ability to capture issues related to security and safety that directly result from the design and nature of the Internet as a culturally valued tool.

'Security Guard' explores the use of, and participants' understanding of, sign-ins and passwords.

(a) Use and understanding of signing-in and passwords

From the outset, obtaining access to the Internet required each of the participants to become their own Security Guard. I find this particularly interesting when you consider how few opportunities are presented in children's lives to create and protect their personal space (other than traditional locked diaries). I consider the use of passwords affords children a level of independence and control unlike previous generations.

All participants acknowledged the need to sign-in and have a password to access the school computer system to create their own record of access, such as Elizabeth acknowledging "*I'm going to sign in so I can go into the Internet under my name*" (think-aloud: 16.09.03).

Yanni certainly appreciated the importance of passwords "*Now I am typing in my user name which is Yanni and my password which I am not going to tell you"* (think-aloud: 19.09.03). Both Hannah and Nate indicated that it was not necessarily an automatic process to log on to the system. Hannah stating, "*I've forgotten my own password"* (think-aloud: 17.09.03) and Nate "*I have to remember my password"* (think-aloud: 19.09.03). Both participants did, however, recall it in only a few seconds.

Yanni had opportunity to demonstrate considerable use of logins and passwords due to the nature of his Internet-mediated activity and he demonstrated an understanding that the purpose of signing-in is to create personal space when he attempted to access MSN Messenger "*… you need to make up a password and you need to put your personal details in it"* (think-aloud: 19.09.03). Similarly, during her independent activity, Elizabeth discussed how, when entering details on the Little Athletics site, some parts could be kept private, rather than exhibited for public display, because of her personal login.

When asked later in the interview specifically about the purpose of passwords and sign-ins Elizabeth indicates:

> *"Well a lot of the web sites you go into, if you sign in they will send you newsletters all the time and it's more just, when you sign in you're in, it's only you that can see it, so when you sign into, like for MSN, umm and Hotmail, when you sign in you're reading all your emails and all your information, so if you give someone else your password then they are going to go in and read all your things and maybe change things …. it's just to keep it safe and things"* (interview: 20.04.04).

Similarly, other participants were noted during the follow-up interview to acknowledge the need to sign-in with passwords:

> "*Because in email especially people will just get in and send emails that ummm you don't want to send to people or with umm like if they just logged into your computer*

they could like do anything really that they wanted they could wreck your computer" (Yanni) (interview: 11.05.04).

"So that no one else can get into your files and hack into everything and do things that sort of ruin you being allowed on the Internet or send viruses to you or send people and they can track you so they know that it is you" (Emily) (interview: 20.04.04).

Further, when discussing why certain sites require users to sign-in:

"… so that they know who is logging in 'cos you have a user name and your password 'cos if someone is trying to hack into your username and password they will know, umm, 'cos they won't know your password so they'll type in the wrong thing and it will come up access denied or something and it won't match up so that's sort of how they protect you. … yes 'cos that protects you, your files, yeah, if you're playing games and you've got really high scores so they can't ruin everything and delete your scores and all that" (Emily) (interview: 20.04.04).

Similarly, Nate agreed that passwords and sign-ins were necessary to prevent inappropriate actions by others "'*cos if other people get into your passwords they might frame you and send rude messages to people in your name and whatever*" (interview: 11.05.04).

There was sufficient evidence that the participants appreciated the need to sign-in and maintain confidential passwords. It was clear that these participants had adapted to this environment and were capable of managing their personal interests in an environment where online activities can be of concern. Not only did the participants demonstrate their ability to maintain security in this environment they also demonstrated the ability to integrate a range of senses and skills while working online. Given this, the next area of learning to be addressed is that of Integrator.

5.3.2.3 Integrator

The role of 'Integrator' evolved from data which suggested that the Internet enabled or necessitated the participants to integrate several tasks at once. To some degree this appears quite a broad category as it explores three distinctly different areas:

(a) Integration of Senses

(b) Integration of Online and Offline Activities

(c) Integration of Available Software and Hardware.

However, as shall be explained throughout this section, focus is maintained on 'integration' and this occurs across these three areas to varying degrees and levels dependent upon learner, activity and resources. The purpose of this category is to demonstrate how the Internet encourages users to use several of their senses and/or undertake different activities, simultaneously.

(a) Ability to integrate various human senses

The first level of integration to be explored is the effective integration of the participants' sensory functions. This was evidenced, in one respect, by the speed of scrolling up and down various web pages while simultaneously summarising content, that is, describing pictures and/or reading headings and text. It was clear all participants were maximising exposure to the material on the screen with their efficient hand/eye co-ordination that enabled them to quickly manoeuvre around the Internet. Even when the participants did remain still on a page (ie. not scrolling up and down) they still often moved the mouse all over the page while they examined it.

Also, although it was the nature of the research design which forced the participants to talk aloud while they were engaged in activities I think it is important to note that when they did this they could also continue to participate in their given Internet-mediated activity. Indeed, they were often found to be verbalising something quite different from the task they were actually undertaking. For example, while taking action to ensure that Internet Explorer had loaded and later while waiting for his game to load, Nate continually talked about unrelated topics, for example "*I can't think of any good jokes* …" (think-aloud: 19.09.03).

Similarly, during the follow-up interview practical activity, the participants demonstrated that they were capable of listening to questions posed by me (sometimes unrelated to current web page) and respond verbally while they continued to move around the screen examining the contents of a page.

(b) Ability to integrate online and offline activities

In addition to integrating their sensory functions the participants were also observed to integrate the other tools that were available to them.

Hannah, for example, often moved with ease between using the Internet and writing notes in her notebook. She found a map locating the Bermuda Triangle and copied it into her notebook (observing "*it doesn't look like a triangle, well an quadrilateral but who cares"* (think-aloud: 17.09.03)). Later in the session, while waiting for the computer to complete a function, she returns to this diagram to add further detail. Also, she was observed to switch regularly between the screen and reading her handwritten notes.

Several of the participants also referred to their handwritten notes to enter search criteria. Elizabeth checked her handwritten notes when searching "*Into the little box thing I want to write who created field hockey"* (think-aloud: 16.09.03) and Hannah referred to her notes while she typed 'Bermuda Triangle' into the Google search box. During the follow-up interview practical activity participants also moved between my handout to spell Lithuania and Ethiopia and type these words into the Google search box.

While waiting for search results or pages to load the participants were also observed to make use of their time by integrating other activities. Elizabeth, for example, while waiting for an internal site search to complete, continued to scroll up and down the page she was currently viewing. Similarly, after selecting a site from her Google search results, there was clear evidence that Elizabeth continued to review the search results as she exclaimed "*wait a minute, I'm going back 'cos while it was happening I saw another one that says (reads blurb) so hopefully it will tell me something"* (think-aloud: 16.09.03).

Further evidence of integration of online activities occurred when Emily suggested that she was quite capable of moving between activities *"… if I am searching something and I get bored I just go and type in a new web site and do a game and that distracts me from what I do when I search and when I play games or something I can get distracted and think that's a nice word that's something I need to research and I go and on and research something"* (interview: 20.04.04) . She explained that she minimizes her "research" screen to play the game and then when bored with the game can "*bring back the research… so that way I don't lose what I am up to"* (interview: 20.04.04).

(c) Ability to integrate available hardware and software

Also evident was the integration of available software and hardware. For instance, when asked during independent activities what she was going to do with the information she has found Emily states "*I might print it out, I'm just going to go up and hit print"* (think-aloud: 16.09.03). Similarly, Hannah eventually decides it would be easier to print a page she has found that has considerable information, rather than continue to handwrite it into her notebook.

This led me to explore this issue during the follow-up interview when I asked each participant what software or hardware he or she used when on the Internet. The following responses were obtained.

When Elizabeth was specifically asked if she used Microsoft Word she replied: *"Well if I am doing research I will usually instead of printing off all the pages if I don't need all the information I just copy it into Word and just print off what I need in the end*" (interview: 20.04.04).

Again, in the follow-up interview, Emily confirms that she uses the printer for information obtained from the Internet: *"…sometimes if I find a site that has competitions that you can't enter by email but you can enter by getting a form off the Internet I print off the forms to use them"* (interview: 20.04.04).

Hannah also articulates integration of Microsoft Word and printing functions during online activity *"You put it into Word and then, or you can just print it out straight*

away... just click the print button … sometimes you can print them, some Internet sites you can't but the information one's usually you can print the information out straight away …. there's a little, you can go to the file there's print, you can only do that if you have a printer of course" (interview: 05.05.04).

Yanni also demonstrates awareness and use of the print function to print desired pages from the Internet *"I use printers when I have got* [games] *cheat stuff, I print out the cheats and ummm yeah maybe print out if I wanted to buy something, print out the page where to go and pick it up from"* (interview: 11.05.04).

Interestingly, both Hannah and Emily allude to what is acknowledged as a growing problem with students' Internet-based research – cut-and-paste without reflection:

> "*…sometimes 'cos if you've got something up on the search you can just minimise that and go onto Word and bring the search back up and then paste what you want onto Word and then print it and change it into your own words when you've finished*" (Hannah) (interview: 05.05.04).

> *"You cut some information you have got, well copy it, and then you put it on the Microsoft and then change into your own words"* (Emily) (interview: 20.04.04).

When further questioned as to whether this makes things easier or hard Emily notes, it is "*easy really I just need to change it into your own words"* (interview: 20.04.04).

5.3.2.4 Design Analyst

The final role to be discussed under Tool-Mediated Citizen is Design Analyst. After watching the participants make hasty decisions during their independent activities about whether to stay or leave a web page or site, I was curious to explore further the information provided in the think-aloud data as to what was behind these decisions. Also, given the range of Internet-mediated activities the participants engaged in, I wanted to explore further their understanding of the Internet's purpose and design. The specifics of this category emerged, therefore, primarily as a result of the follow-up interview,

when I introduced specific questioning and the practical component, to achieve this purpose.

Three distinct areas are explored under the category of Design Analyst. The first refers to specific interpretation of web site features - analysis of the layout of specific web pages and web sites, and interpretation of displays and graphical representations.

The second two refer to a broader understanding of the Internet's design in general and examine the different purposes the Internet is designed to serve; as well as the participants' understanding of what skills and knowledge are needed or can be achieved through engagement with the Internet. These three components are entitled:

(a) Skill in analysis of web site layout
(b) Understanding of the uses and limitations of the Internet
(c) Understanding of skills and knowledge required for, or facilitated by Internet use.

(a) Skill in analysis of web site layout

It became apparent during the participants' individual Internet-mediated activities that upon entering a web site they made quick decisions as to whether they should remain on that site. When this was further explored in the follow up interview, it became clear that they had preferences of what was appealing to them and also what would prevent them from remaining and/or using information on a given page.

When reviewing web sites of Newcastle during the follow-up practical activity Elizabeth comments on a page where there is a lot of text without many sub-headings or graphics – "*Yeah, that's a bit of annoying information that's not very separated … It's so confusing like 'cos when you are looking at a web site that's got a lot of information you can read through it and that makes it hard if it's all together … would look at another one first and then if I still couldn't find it I would probably go back to it and have a look if I was having trouble"* (interview: 20.04.04) . Similarly, Hannah also identifies a preference for sites that are 'separated' "*It is easy to read 'cos it's not all, it's got separate links, not all just dnt dnt dnt dnt dnt down the page"* (interview: 05.05.04).

Not unexpectedly, the participants were also drawn to pages with graphics. Emily particularly evidenced this in her initial independent activity when searching for information on the first Pharaoh when she would describe the graphics on a page immediately upon entering a site. Some examples of this are below, with my observational notes in square brackets:

> "*It's got some writing and it's got some hieroglyphs up the top* [she scrolls quickly – top to bottom and back to top of screen before continuing] "*It's got a map of where the actual, oh where he, of where he reigned .. and it's got some quotes that the writer said"* [she has described the map and read the quotes but does not appear to read the text provided. She remains on this page only briefly] (think-aloud/observations: 16.09.03).
>
> Similarly, "*I might go into this which is, which I don't really know much about .. it's got some pictures of …* [describes pictures]. *No more pictures, it's a bit about those two people …"* [describes pictures of two people - again, she does not appear to read the text – merely makes the general statement about the page] "*It's got a bit about these people"* (think-aloud/observations: 16.09.03).
>
> *"It's got a lot of words about Ramses but not as many pictures as the other Ramses ... so that didn't really help* (think-aloud/observations: 16.09.03).
>
> [There were numerous instances during Emily's engagement with the web where upon entering a web page she immediately scrolled up and down the screen before, and then again during, her verbal description of what was contained on that page. In all of Emily's page description/overviews she spoke of the pictures displayed] (observations: 16.09.03).

Emily's interest in visuals was later confirmed in the practical component of the follow-up interview "*umm on this one it would make me stay because it's got pictures and it shows where Newcastle is located…"* (interview: 20.04.04). In contrast when a page did not contain graphics she states "*…it doesn't look like it's going to attract people 'cos it's*

not like the last web site, it doesn't have big pictures on it of landscapes of Newcastle so it might not attract as many people as the other one would…" (interview: 20.04.04).

Elizabeth elaborates further on the importance of visuals "*it's got photos which is good … when you are doing a project, if you're not really understanding, the photos like show them more about it, so yeah 'cos it gives them more information, like if they are having trouble understanding, if you are trying to describe a part about it very well they can look at the photo and then they can tell that it's got a lot of water and a lot of different things…"* (interview: 20.04.04).

Although giving no additional information Hannah is also noted to be drawn to pictures contained on a site. When asked what she sees on a given site of marsupials during the follow-up interview practical activity *"lots of pictures"* (interview: 05.05.04). Later, when reviewing a Newcastle site "*It's good, it's got pictures and stuff*" (interview: 05.05.04).

Similarly, Nate appears quite excited by the pictures contained on some sites visited as part of the follow-up practical activity - "*… ohh, a picture" … "I've clicked on the first picture, cool, back again, now into the second one, ohh"* and *"That's cool"* [What?] *"I like the flag thingy, it's a mad flag"* (interview: 11.05.04).

In addition to web pages where information is separated and adequate visuals are displayed the participants were also noted to acknowledge that common structural features can be found on pages. Elizabeth particularly, acknowledged this on several occasions:

> *"I like this one 'cos you actually see how it is a web site, it's all true. Like those sort of 'how to' web sites, it's got 'what's on' and if you want to 'contact them' and all that sort of thing and it's got about Newcastle and the businesses in Newcastle which is usually good for a project, yeah I would look at this one".* (interview: 20.04.04).

"umm it's got like on most web sites the 'about us' and you can 'contact them' and those sorts of things…" (interview: 20.04.04).

"…the 'gallery' which is probably photos…it's got those 'about us' … 'guestbook' and links and all about it and all these, like the, like buying online… a 'glossary' which is useful if you don't understand it you can look in there, for technical words" (interview: 20.04.04).

The number of links to other sites/pages given on a web page also appears to be another consideration in the evaluation of a web page. On the one hand, Elizabeth was critical of a site which had a lot of links to other pages rather than a great deal of information she could scroll through on one page - "*… but I probably wouldn't look at that one* [web site] *first because you would have to go into a lot of different places to find stuff"* (interview: 20.04.04). On the other hand, Hannah makes a negative evaluation of a page because of the limited number of links it contains "*Can't say it would give you that much information … it doesn't look like it has too many links …"* (interview: 05.05.04).

Hannah also demonstrated awareness that the design of the page does not necessarily indicate its worth when entering a page and stating "*fancy background, who really cares about the background"* (think-aloud: 17.09.03). And, at other times during her independent Internet-mediated activity becomes frustrated at a page design, speaking in annoyed tones *"Can't you use less writing but bigger"* (think-aloud: 17.09.03) and later "*Whoa a bit too light … I couldn't see it"* (think-aloud: 17.09.03).

A final theme to emerge when considering the participants' evaluation of web sites was the level of interactivity. Elizabeth was noted to utilise pages during her initial independent activity that allowed her to interact in some way – such as narrowing her location or asking questions. During the follow-up practical activity she suggested liking pages where "*…it's got questions so you could probably ask about the history and things like that…"* (interview: 20.04.04). In a different way, Nate also suggests that he prefers pages which allow some kind of interaction. When he visited the Silver Institute web site as part of the follow-up interview practical activity he decided that it was boring because "*… it's got nothing to do on it"* (interview: 11.05.04).

(b) Understanding of uses and limitations of the Internet

Of significance were instances where participants demonstrated an awareness of what they could or could not expect from the tool. In some respects the participants were conscious of the tool's limitations but at other times, their high expectations of the tool led to frustration when the tool did not satisfy them.

Responses to the introductory questionnaire which asked what each participant liked most about the Internet indicated a level of understanding of how useful the Internet could be for their individual purposes. Their responses include positive things such as:

> *"You can research almost anything"* (Elizabeth) (questionnaire: 02.09.03)

> *"Quick to find information"* and *"Tons of fun things to do"* (Hannah) (questionnaire: 02.09.03)

Similarly, during the follow-up interview Elizabeth claimed "*It's pretty useful, you can find pretty much anything on there"* (interview: 20.04.04).

Elizabeth, however, later demonstrated an understanding that the Internet does not, as is often claimed, hold answers to everything. In the concluding conversation I had with Elizabeth during her independent session she indicated that finding her desired information was harder than she had expected and relates this to the fact that her topic was possibly not highly researched. I further explored this issue in the follow-up interview at which time she explained:

> *"... if you research dolphins or something that has been researched by other people a lot they know what questions you want to find out and the information is easy to find there, something like field hockey people might not have asked the kind of questions I was interested in finding out so there are not sites that were easy to find the information I was looking for*" (interview: 20.04.04).

Interestingly, Elizabeth made good use of question/answer features on web sites whenever they were available. One example of this behaviour was when she was looking for information on the snow in the follow-up interview practical *"I'm looking through the questions and answers to see if someone has, like, asked the questions"* (interview: 20.04.04).

Hannah on the other hand did not appear to consider why the information she required was not being presented as she had initially expected "*There is nothing good in this"* and *"I hate these websites … they don't give you much information"* (think-aloud: 17.09.03) referring to her Google search results and later in general reference to the sites she has entered "*There's nothing good on these, oh some, well most of these"* (think-aloud: 17.09.03).

A further instance of Hannah of becoming frustrated with the limitations of the tool arose when she was attempting to add information in her notebook from a previous page at which time she claimed "*They don't give you spelling either, I'm looking for words for spelling and can't find them"* (think-aloud: 17.09.03).

In addition to merely providing information, Emily's justification for her research focus demonstrates her understanding that the Internet can be used to complement other sources of information. In her case, the magazine to which she subscribes (about Ancient Egypt), had failed to give her information on the first Pharaoh and she chose her topic as she believed the Internet could provide such information.

From the range of data collected from the initial questionnaire, the chosen Internet-mediated activities and the follow-up interview, it was apparent all of the participants were very knowledgeable about the usefulness of the tool for a broad range of activities:

> *"I like to talk to my friends on my MSN sometimes and for school projects, like if we can't get to the library it is so much easier"* (Elizabeth) (interview: 20.04.04).

"I think it is very useful because if you just want to unwind on the computer and talk and play games you can do that, or if you need assignments to do you can do that as well" (Emily) (interview: 20.04.04).

"Well I log on the Internet most times for games, when I need help with an assignment I just go on the Internet for assignments and games" (Emily) (interview: 20.04.04).

"...you can play games for kids or brain games, sort of like tests, like quizzes" (Emily) (interview: 20.04.04).

"Very useful … 'cos it helps you with your research" (Hannah) (interview: 05.05.04).

"It helps people to research, helps them to get away from reality and it helps them to check up on movies, latest movies and stuff" (Nate) (interview: 11.05.04).

"You can do a lot of stuff on it that you wouldn't be able to do normally like shopping and research, you can still do research but you would have to look up books and you have to get books and that but with the Internet you can type in specific things" (Yanni) (interview: 11.05.04).

"I visit a lot of cheat sites and get cheats for games. ....well like you type in a site I like one which is cheatindex.com and then you type in what game console you want so Playstation or something and then it's got whether it's 'a b c to z' and like you click on the letter that the game starts with and its got a list of all the games that start with that letter and you click on the one that you want and it comes up with cheats for it" (Yanni) (interview: 11.05.04).

This knowledge of the usefulness of the Internet for their own purposes was extended to also acknowledge the usefulness for others for a range of relevant purposes:

"A lot of people, school children, because like the projects and things because its a lot easier than looking through books and a lot quicker and people like for their emails, work people instead of like getting emails instead of people, from overseas getting them letters 'cos that would take ages they might just send them emails like if they are working with a company overseas" (Elizabeth) (interview: 20.04.04).

"…Uni students they use it for online dictionaries, online thesaurus, and web sites to help them study and kids can use it to, they can type in web sites they like and just play on that…" (Emily) (interview: 20.04.04).

"teachers, businessmen, lawyers, barristers any scientists, kids generally … a lot of people to find out about research, play games, email, shopping like buy stuff" (Nate) (interview: 11.05.04).

In addition to identifying uses and limitations of the Internet the participants were also able to identify some of the skills and knowledge which is required and/or facilitated by use of the Internet.

(c) Understanding of skills and knowledge required or facilitated by Internet use

Two main issues arise under this descriptive category. The first relays what the participants identify as the skills necessary to use the Internet and the second presents the learning which the participants identify as taking place when they use the Internet.

After I had initially observed the participants and listened to their think-aloud data, I started to amass ideas of the learning which appeared to be taking place while competent, young Internet users were undertaking goal-directed activity. I thus took advantage in the follow-up interview to actually ask them about the skills and learning they believed could be acquired during Internet-mediated activity.

All participants identified basic skills such as reading and typing and three participants particularly played down the skills required, although they described quite complex forms of thinking:

"You have to know how to work a computer, and you have to know what you are looking for, but really you don't need much skills, just you have to know how to use a computer and how to activate the Internet" (Emily) (interview: 20.04.04).

"You need to be able to know how to type, to use the mouse use your brain to think about what you are doing" and *"you need your hands, that's about it"* (Nate) (interview: 11.05.04).

"You need to be able to type for starters and ummm you need to be able not to get sucked into some person who is trying to suck you into a deal, that's when you get ripped off. Yeah, that's about it really. It's not hard … we grew up using a computer and they didn't have computers, they only got introduced a few years ago" (Yanni) (interview: 11.05.04).

In the follow-up interview all participants were explicitly asked if they thought they learned more on the Internet than what they were specifically looking for. Emily suggests:

"You learn how to research on the Internet from doing this 'cos it teaches you how to just type in whatever you need and find it and yeah and that's how it teaches you" (Emily) (interview: 20.04.04).

And, later:

"Yeah if you are researching a person and you only need to find out when he was born and where he lived you might find more about where they lived you can find more about where they grew up, how they grew up, so you are looking, so you are finding more about the thing than you really need to know but it just helps you in case you have to do another part of it later, so you'll know more" (Emily) (interview: 20.04.04).

Similarly, Hannah is less specific but acknowledges that sometimes *"you are looking at something and then something else catches your eye and you read that and then you learn something else"* (interview: 20.04.04).

And, Yanni:

> *"Yeah, sort of like you might want to do, like get help for a project at school and you would read it and it would tell you a lot more than just like what you want and umm yeah it gives a lot of extra information the Internet does ... 'cos you just might want to know what's the name of say the largest waterfall and it will tell you the name of it, the size of it, the whereabouts of it and second largest waterfall maybe"* (interview: 11.05.04).

When discussing the issues raised above, the participants certainly gave me the impression that the development of skills needed to use the Internet was automatic, not something they had to be taught or, indeed, had previously considered.

Presentation of the data under Tool-Mediated Citizen allowed me to thoroughly explore the issues associated with the tool's structure and design. The category has enabled the participants to demonstrate their use of the tool and their understanding of its features. Through this discussion we can see elements where the tool is used as an off-loading device and others where it is used to increase performance and facilitate the user's participation in greater society. These are issues to be further explored in the discussion chapter which follows.

5.3.3 Adaptive Citizen

Having explored some of the broader social issues of the Internet-based learning system and then narrowed to focus on the tool-design issues, the time comes to examine the individual with more direct focus on their place in this unique learning system. This third primary category has been titled "Adaptive Citizen" to capture the participants' actions and words which demonstrate how they, as individuals, engage with the Internet, that is, how they adapt to this situation in order to work in the environment.

The three specific areas explored under the primary category of "Adaptive Citizen' are Efficient Worker, Researcher and Director.

5.3.4.1 Efficient Worker

The speed with which the participants used the tool and made associated decisions was astounding. This, I believe, is one of the most exciting areas to be revealed in this study. The speed and efficiency with which the participants acted did not occur in isolated situations/activities but across a broad range and across all five participants. It is this speed of actions and decisions that define this particular category. It should be noted that I was not inclined to judge their decision, when acting quickly, as right or wrong, but rather, saw this as a skill which they were developing to deal with this complex tool and the abundance of information which is available to them through it.

The speed and efficiency of student actions and decisions were evidenced across a range of different activities and so are explored under the following two categories:

(a) Efficiently scanning for keywords
(b) Efficiently skimming texts

Both of these are discussed in what follows.

(a) Efficiently scanning for keywords

The participants' scanning of Google search results to find a relevant page was enlightening. The students did this very rapidly and were quite varied in their approach. At some times they were seen accessing one of the first entries and at other times scrolling down several pages before choosing one.

In trying to quickly locate relevant materials from a Google search Elizabeth provided some very useful insights into her approach "*I'm looking for one that's got like little words under the heading … like information maybe the person's name.. or something that seems interesting*" (think-aloud: 16.09.03). Similarly she states "*I'm going here 'cos it says* [reads Google blurb aloud] *so it might have something"* (think-aloud:

16.09.03). To get to this point she has scrolled quickly to the bottom of a Google search results page and then scrolled more slowly back up reading aloud some of the blurbs until she finds this particular entry. Similarly, Emily states *"I'm looking for the first Pharaoh"* (her chosen keywords) (think-aloud: 16.09.03).

Hannah further confirms use of keywords to ensure efficiency when working and when asked about a particular site she is viewing she says "*It's got the headings so if you want the history or something you just go down to history or the climate or something"* (think-aloud: 17.09.03).

It appears that participants are not just scanning for traditional key words but also words which indicate to them the type of site they are entering. Hannah, for example chose a Government Department page to find information on the country of Lithuania and, when asked why, states "*Well I'm trying to find out where it is and usually these type of sites have where Lithuania is and stuff*" (think-aloud: 16.09.03). Elizabeth further elaborates when asked why she has also chosen a particular site for information about snow "'*cos it says some science about it and tells you about it and it's a dot org web site … Because they are an actual organisation that only deals with that and you know they spend a lot of time researching it and they've got the right thing"* (think-aloud: 16.09.03). There is evidence these participants recognise the difference of web content based on its originating source, recognising that official organisations will be a good starting point for information.

(b) Efficiently skimming text

The scrolling speed with which each of the participants moved up and down each page was astounding - particularly Hannah, Elizabeth and Emily whose activities prompted more of this type of action. While this may be expected on pages with limited text it was also observed on pages dense with text as evidenced in video observations of Hannah where my notes state "scrolls quickly to bottom of long page which is dense with text and straight back up and back to Google search". One could assume this is an efficient approach as it provides an overview of a site through the subheadings and graphics which are displayed.

Elizabeth clearly acknowledges how she gets through the information provided *"It depends how quick the Internet is, 'cos sometimes it will take a long time and it depends how much information is on the page like sometimes they have got a lot of writing and you have to read through, like skim read through it all to make sure you haven't missed anything and sometimes they will just have really basic information so it makes it easier."* (interview: 20.04.04)

Observations of the participants whilst engaged in their independent Internet-mediated activity provided numerous examples of their speed in skimming through the text on screen. Specific examples of this by Elizabeth, including my observational notes in square brackets, are below:

> *"It doesn't say much, it's all about the Great Britain Olympic Squad"* [scrolling very quickly to the bottom of a page which is still loading] (Elizabeth) (think-aloud: 16.09.03).

> *"Yes, that looks like ice hockey … I don't want that one, I'm going back*" [pictures only have emerged while remainder of the page is loading] (Elizabeth) (think-aloud: 16.09.03).

> *"I'm looking for a person's name, okay I can't find it, it's more about where it started"* [she scrolls down screen more quickly than one could possible read the words before declaring the information she is looking for is not there] (Elizabeth) (think-aloud: 16.09.03).

> "*I'm going to the next page of the google site … there's nothing there, they're all about school clubs"* [leaves after only a couple of seconds] (Elizabeth) (think-aloud: 16.09.03).

Emily also demonstrated very rapid evaluation after skimming texts:

"*I'm going into one of the sites called Egyptian Kings and in brackets it's got Pharaohs"* [she very quickly moves the mouse over the page and quickly states] "*It's not the right website"* (Emily) (think-aloud/observation: 16.09.03).

"It's got a few pictures and just talks about [reads aloud part of the text on screen] *and it's got a few things about the rise of her power* [reads sub-headings] *and if I go back* [returns to a previous page having reviewed this page for only a matter of seconds] (Emily) (think-aloud/observation: 16.09.03).

"*I'm just going to read some of it* [summarises aloud from screen for approximately 8 seconds] *and that didn't really help"* (think-aloud/observation: 16.09.03).

After observing this behaviour during each participant's individual sessions I used the follow-up practical activity to further explore this issue. Specifically, I identified a range of web sites for participants to look at and explain what each was about. These were not sites the participants were familiar with but I quickly realised it took each of them a very short time to describe each site. Again, I hesitate to comment on the precise accuracy of their comments but note that all were correct in a general sense when identifying the content and purpose of each web site and did this within a minute or two of entering the site, I believe the nature of the interview-based practical activity precluded them from being more specific as I often asked them to move on to the next site when they had given me some indication of what the page was about and at whom it may be directed.

As Efficient Workers the participants clearly demonstrated that they had adapted to deal with both the quantity of information available to them and also the design elements of web pages. I believe the descriptive categories established under Efficient Worker provide useful insight into the participants' learning, particularly how they dealt efficiently with the tool being used. This notion of adaptivity to the environment is also evidenced through Researcher, which is the next category to be explored.

5.3.4.2 Researcher

The category of Researcher is not limited to traditional notions of learners' researching information to find answers for a given project or questions. By this I mean that the role of Researcher when using the Internet required significantly more of the learner than finding a book and identifying the correct chapter/page where relevant information can be found. Indeed, the research process stood out as requiring something quite different of learners compared to research using other tools previously and currently available. This was particularly evident with respect to searching and navigating techniques and was explored further when participants evaluated the use of the Internet over other information tools, such as books.

There are two areas which I believe impacted on the participants' research process:

(a) Searching and navigating for information;
(b) Comparing research tools and preferences.

These two areas are explored in detail below.

(a) Understanding of search and navigation techniques

Searching required the participants to apply a range of understandings: the design of the Internet, design of search engines, the vocabulary required, spelling conventions and, in some instances, the recall of web addresses. Navigation skills were evidenced when the participants: maintained awareness of their place within a given web site; utlised a range of online navigational tools; and interpreted a range of navigational cues to access material. Instances where problems arose also gave the participants the opportunity to demonstrate their ability to adapt to the navigational situation as necessary.

The first issue of note is the use of appropriate search terms. All participants demonstrated this to some degree and it was most interesting to hear some of their logic for using particular search criteria.

For example, during her initial independent session, Elizabeth typed the words 'who created field hockey' into the Google search engine. However, she quickly highlighted and removed the words 'who created'. When asked why, she responded *"I think there was probably too many words in there and it wouldn't understand what I was asking"* (think-aloud: 16.09.03).

Similarly, Hannah chose to limit her original search criteria quickly after entering it. She first types 'Bermuda Triangle' into the Google search engine and then adds 'how' in front of these words and says "*Okay, let's see if this works"* (think-aloud: 17.09.03) but instead of entering the search, choses to delete 'how' and says *"Okay just keep on this"* and when asked why responds "*Because it will probably say something weird like it cannot be found"* (think-aloud: 17.09.03).

The opposite process was also evident where the participants added words to their search criteria to assist in finding relevant information. When trying to identify some of Ethiopia's native animals in the follow-up interview practical activity both Elizabeth and Hannah change their search criteria from 'Ethiopia' to 'Ethiopia animals'. Nate, further limits his search and types in 'Ethiopian native animals' and when asked why says "*So I can see what was native"* (interview: 11.05.04).

Another issue to arise when participants were searching for information was evident when both Emily and Elizabeth were unsuccessful with their search because of spelling errors. After entering her search criteria she is presented by the Google question "Did you mean …" and exclaims "*God I spelled it wrong"* (referring to Bermuda in Bermuda Triangle) (think-aloud: 16.09.04). On this occasion she fixes it manually herself rather than clicking on the Google spelling correction option. Similarly, when trying to spell Ethiopia she becomes aware she has spelled it incorrectly and corrects it manually using my handout.

Emily also had a problem in searching due to misspelling and this was also brought to her attention by the question being asked "Did you mean…" , In contrast to Hannah, however, she clicked on the Google automatically generated spelling correction. Also found to encounter a problem due to lack of spelling knowledge Yanni was quick to

indicate that he couldn't continue his search for a bike because *"... I don't know how to spell mongoose"* (think-aloud: 19.09.03).

Nate, further captures this problem when asked about the importance of language generally during the follow-up interview, wherein he suggested *"umm they are very important 'cos if you get the spelling wrong then it might go into something entirely different"* (interview: 11.05.04).

After observing the way in which the participants searched for information during their initial independent activities I wanted to further explore the participants' understanding of search engines in the follow up interview. I began by asking each participant how he or she thought search engines worked:

> *"Yeah, I usually use Google, that is our homepage at home. Well you type in what you are searching for and it comes up with all the pages that have got anything to do with it. Like it will have, when you make a web page you will type in something about it, like when you see in Google it will have the heading and then a little blurb thing about it like what's in it and so it will search through all the blurbs for the word you have typed in to look for it. Sometimes it doesn't have anything about it it's just that word in one of the websites"* (Elizabeth) (interview: 20.04.04).

She elaborated when asked how important the language is that you use:

> *"Umm well if you type in too much, like the whole question that you have been given, it doesn't usually work because it's looking for all the words. The search engines don't look for words like 'the' and 'and' and things 'cos, and it'll tell you it will say the word 'and' was not searched for because it is such a common word … If you use like really basic, just a few words, like they don't necessarily have to make sense in a sentence but it is just going to look for those words in the thing … It doesn't matter. As long as they have got spaces in between then they are not going to search for them as a sentences they are just going to search for each of the different words"* (interview: 20.04.04).

Both Nate and Emily also provided useful examples of how they believed search engines work:

> *"Well with a search engine all you have to do is pick a word that you want to research or a topic and you type it in and if it's and it'll come up as a couple of pages of what's your thing, and just say you looked up horses, then it will have millions and millions of types of horses but you have to be more specific so if you wanted to look up a particular breed like the Arabian, you just type in Arabian horse and it would bring up profiles on that one. So sometimes you have to be more specific than you do other times when you can just type in one word and it'll bring up all the things you need and you can be specific"* (Emily) (interview: 20.04.04).

> *"Well someone makes them for starters, like I said before, the guy that made Google is very rich … when you type in, say you type in bikes, it will come up with bike websites, like buying bikes, tips on bikes, buying accessories, products"* (Yanni) (interview:11.05.04).

Interestingly, Elizabeth was also able to provide even more insight into the structure of search engine results when asked why a particular web site (CIA World Fact Book) has been at the top of her list for a couple of different searches *"Probably because a lot of people use it and it's used very often and it's a good web site 'cos lots of people like to search on it because you can find everything…"* (interview: 20.04.04). Her understanding of the search engine's structure is further evidenced when she reached the ninth search results page and states "*I think all these sites, I think they are getting a bit off the subject"* and later *"… going to go back to Google … closer to the top and* [inaudible] *they are usually better they usually give you the actual, like as you get further into the search the more they don't have actual information about it, I find…"* (think-aloud: 16.09.03). Similarly, when doing an Internet search within a web site Elizabeth is presented with documents 1-10 of 48 results. She reads aloud some of the first ten results and moves on to the second set of ten and realises "*… I think they are getting a bit off the subject though"* (think-aloud: 16.09.03).

The participants clearly demonstrated understanding of how search engines worked and the findings identified implications of language and spelling when using a search engine. After successful searching and locating information the nature of the Internet environment then required the participants to navigate around the web sites and issues of navigation are now discussed.

Elizabeth, particularly, was noted to take advantage of internal links available in some of the web sites she visited to find the most relevant information. For example she noted "*It's a whole lot of web sites about hockey"* (think-aloud: 16.09.03) and chooses one of the links titled "*History"* (her goal being to establish who created field hockey).

Emily also demonstrated some willingness to explore links within a site to access more of the available information. This was noted when she entered seventeen internal links from one site. However, it should be noted that she spent only seconds on many of these pages.

All students made use of the dropdown menus in the Silver Institute site to navigate around it while trying to determine what the site was about and at whom it was directed. Nate, particularly appeared to enjoy the different navigational features of this well designed page. Students also made use of the dropdown menus on the various web pages on the City of Newcastle, for example, *"events calendar and council news and paying rates and organizations and postcards and stuff and things to do in Newcastle are on this page"* (Emily) (interview: 20.04.04) which helped them decide on the usefulness of each site.

Returning back was the most common navigational action and the participants used two different strategies to do so; namely using the 'back' button on the Internet Explorer toolbar or using the dropdown menu from the Internet Explorer address bar to select the exact address of where they wished to return. At no time did a participant appear to lose sight of where they were within the search process – always managing to return to the Google search results with ease once they felt they had adequately explored a given site.

(b) Ability to compare different tools for different purposes

During the follow-up interview several questions led the participants to compare the Internet with other tools. For example, when considering why she thought people seemed to work so quickly on the Internet Elizabeth compared the use of the Internet with other sources:

> *"Well you usually have to look through, you usually have to borrow a lot of books and it takes a lot more time 'cos you have to borrow the books and then you have to look through the whole book to find it, like the book might be about"* (interview: 20.04.04).

> *"'cos the Internet has a faster way of researching things than books do, because on the Internet you just type in one word or something, or a couple of words and it will just bring up pages on them and then you find what you need, click it, and then you've got all your information whereas if you look in a book you have to go through the whole index, find what you need, turning to that page and then if you need to find something else you've got to go back to the index and might find it's in another complete different book, you have to go to another book, but on the Internet you just type in another word and then you can look for anything"* (interview: 20.04.04).

Emily and Yanni concur that the Internet is their preferred method:

> *"I prefer the Internet than books 'cos it is a faster way to get the information 'cos then you have more time for studying and more leisure time for playing games and going out with friends and all that"* (Emily) (interview: 20.04.04).

> *"Well the Internet, with books you it will have a book on waterfalls and you will have to look through the whole book to find out where the largest waterfall is but with the internet it will go straight to the bit you want"* (Yanni) (interview: 11.05.04).

Emily, also considers the value of other functions associated with Internet usage:

> *"Well with a book it is different than on the internet 'cos with a book it has umm it has an index of what and you can find it, but it's like the internet 'cos the Internet has an index as well that you click on, but with the book you have to find the page and you flick to that page and you've got to read it and you have to, 'cos if you need to photocopy it it just takes longer than on the Internet you can just print it straight away"* (interview: 20.04.04).

Hannah also acknowledged that she uses CD-Roms and books to find information. She acknowledges these forms are different because *"…'cos it's on the computer and you don't have to keep turning the pages like a book."* (interview: 20.04.04). She acknowledges that at some times each of the three tools *"…sometimes it gives you exactly the same thing"* (interview: 20.04.04).

Interestingly, Nate presented a slightly different perspective indicating a preference for books, stating *"…the Internet if it cuts out then you are stuffed and you don't remember it but if it is a book then you can always read it again"*. When further asked which he thought was faster "*easily books, 'cos you're not always allowed on the Internet for 24 hours"* (interview: 11.05.04).

When comparing print and online media both Elizabeth and Emily also raise issues of the simplicity of the Internet:

> *"Yeah … it doesn't challenge you very much to find it like whereas if you had to look through a book you would be challenging yourself say when you get a project you have a certain time it has to be due so you have to try and work out that today I am going to the library and look through all the books I find and then tomorrow I am going to type up, work out, sort all the information I have found and you have to kind of do that, whereas on the Internet you can just find the information and read it and then you can type it into Word straight away, without it you have to* [inaudible] *your time more..."* (Elizabeth) (interview: 20.04.04).

Emily later suggests that the Internet simplifies information, a statement which contrasts with much literature on the nature of the Internet:

> *"Yeah with the Internet yeah I think it is a bit easier because in books they've got really long words and bigger words that you've never heard of before but on the Internet they've got those same words just sort of gone down a bit so you can actually understand what you are reading, 'cos sometimes in books you can't understand 'cos you don't know what these words are and you have to go and get a dictionary and look up the words and say ohh that's what the word means"* (Emily) (interview: 20.04.04).

The role of Researcher was useful in uncovering some of the learning strategies employed by these participants and some of their understandings of locating information using this unique tool. There is also evidence of their growing knowledge of the place of the Internet compared with other available tools. However, the unique Internet environment not only led to the emergence of the role of Researcher, but also the following category of Director which examines more closely the learner skills and behaviours which were apparent.

5.3.4.3 Director

The final area to be examined under the major category of "Adaptive Citizen" is termed "Director". This category encompasses the notion that the individual learner takes control of the experience and oversees progress and achievement of goals.

It could be seen that the use of an authentic activity (as described in Chapter 4, section 4.9) certainly allowed each participant to be the Director of his or her own Internet-mediated activity. I consider this research approach was particularly important in allowing the categories found under Director to emerge.

It should be noted, however, that this is not an evaluation of students' strengths and weaknesses or their level of success or failure. Instead, what characterises this section is an overview of some of the traits which emerged from users' actual engagement with the Internet.

Three broad areas emerged from the data to capture the directed actions of the participants. These were generally not demonstrated in a single situation or by a single participant, rather they occurred across activities and learners to varying degrees throughout their engagement with the Internet. The three areas are Patience and Persistence, Focus and Direction, and Self-regulation and Monitoring.

(a) Patience and Persistence

There were several different ways the participants demonstrated what we would traditionally consider lack of patience and/or persistence.

One very notable area was when the participants scrolled down web pages before all information had loaded. They were generally perceived by me to lack the patience to wait for pages which were slow to present. Elizabeth, for example, chooses not to wait for certain sites to load that she wanted to review "*It's coming, very slowly .. it's taking a while .. I don't like that site, it's not coming"* (think-aloud: 16.09.03) and returned back to her Google search results. Later, a similar episode "*I'm going to have a look at this one, it's called, okay I'm going back out of this it doesn't seem to be working"* (think-aloud: 16.09.03). She had has waited only a couple of seconds before making this decision and again returns back to her Google search results.

Hannah also chooses not to enter a site rather than wait for it to load. She clicks on a site she is interested in from her Google search results which does not immediately load and she responds *"Fine then, you win, I am going out"* (think-aloud: 17.09.03) and she clicks to return to Google. She is clearly frustrated at times by the delays which occur "*Why do these things always take forever?", "Hurry up you stupid computer! It doesn't take that long!"* and *"Yeah, finally ... These computers are slow"* (think-aloud: 17.09.03) and while waiting for the process to be undertaken by the computer she taps her fingers with vigour on the table. Hannah is also noted on several occasions to scroll quickly from the top to the end of a page while it is still loading and choosing to leave the site before it has fully displayed all the information that it contains.

Each participant, at some stage in his or her independent activity commented on the speed with which a web page was being received:

> *"I'm just waiting for this one to load ... and it's there*" (Emily) (think-aloud: 16.09.03).

> "*loading ... still loading"* (Yanni) (think-aloud: 19.09.03).

> *"waiting, always waiting, I wish this would hurry up .. I like the ones down there*" (referring to computers in a different computer lab) (Nate) (think-aloud: 19.09.03).

(b) Level of focus and direction

Although not expecting the participants to experience intense focus (especially given the think-aloud approach somewhat reduces this possibility), it was noted that this was still evident to some degree. It was interesting to observe the ability of the participants to generally remain focused on the task at hand. Where they might have been distracted by extraneous elements, unrelated to their chosen Internet-mediated activity (such as an error message), they were able to acknowledge and manage these distractions - only giving them the level of attention required and continuing fairly unperturbed.

Evidence of specific distractors has been highlighted in previous sections. For example, under 'Consumerism', we saw Hannah, Nate and Yanni experience breaks in focus when encountering online advertising. Under 'Use of Messenger Services' Elizabeth was noted to comment on the distracting nature of messenging services such as MSN which "pop up" when a friend has come online.

When participants did encounter certain distractors, although they appeared to have redirected their focus from the task at hand the particpants did not appear to suffer as a result of this. For example, when Hannah's attention is drawn to a graphic she states "*Oh cool a crashing aeroplane"* (think-aloud: 17.09.03) but easily continued with her task without delay. Similarly, when Emily thought the computer might have been about to freeze she also dealt with the problem and continued without delay.

I was interested to explore further the participants' perceived level of focus when working on the Internet at home. I therefore asked each of them during the follow-up interview if they usually finished what they were doing on the Internet or were asked to log-off and also, whether they were ever surprised at how long they spent on the Internet. The two male participants indicated that they usually finished what they wanted to do and were not surprised at the length of time they spent on the Internet. The female responses were somewhat different.

Elizabeth talked about the five-hour timer her mum has set so the Internet will turn off after that time. She acknowledges that she has not actually sat in front of the screen for five hours but has been logged on for this period of time – getting up and down to other tasks/activities throughout the day. She notes that *" … some things take longer to research than others so if it's really hard and there's not that much out there Mum usually just says oh it's dinner time you can go back on tomorrow and I just save what I have found and then go back on later"* (interview: 20.04.04).

Emily demonstrated surprise that sometimes she feels like *"You're like I've only been on here for 20 minutes, wrong you've been on there for six hours, ohhhh*". She states that *"sometimes 'cos I go on it, I could go on early in the morning and then I find out that it's three in the afternoon and I have been on for ages … I just can't take my eyes off the computer once I have started and then I look at the time and I'm like holy and then mum goes I think you've finished on the Internet and I said yeah you can use it and that's when I go into my room and read a book or something"* (interview: 20.04.04).

Similarly, Hannah's experience *"Usually it feels like I am only on for a couple of minutes and your mum tells you to log off 'cos you've been on there for like hours."* and she notes that she usually has to be asked to log off the web because *"...usually mum or dad want to ring someone*" (interview: 05.05.04).

(c) Goal direction

The research design of this study acknowledged the importance of goal identification to guide the participants' tool-mediated activities. The flexible nature of the research

design meant, however, the participants were not bound by their stated goal and, as occurred with the two male participants, once online they were able to alter the course of the activities. The three female participants did, however, remain focused on their initial stated goal throughout their independent Internet-mediated activity and so gave some insight into young Internet users' focus on goal direction.

Some examples which demonstrate that the participants were monitoring their progress toward their stated activity goal include Elizabeth's declaration of what she has learned *"So I've kind of worked out where it [field hockey] was made, where it was created and there's a whole lot of words on the edge ... I'm going into..."* (think-aloud: 16.09.03) and she continues to try and locate answers to her other research questions. And later, after reading directly from the screen and then summarising content in her own words declares *"I've got number three"* (think-aloud: 17.09.03) referring to her third research question. At one point Elizabeth acknowledges the difficulty she is encountering in finding the information she desires "*I haven't seen anywhere, who created it or why they created it"* (think-aloud: 16.09.03). She then goes on to relay previous learning which answered her first two research questions "*ummm I kind of know when they created field hockey 'cos it says they kind of started it about 4000 years ago in Egypt but in the 19th century the game we play today was created. And where field hockey was created, I know that one, it was in Egypt, where they kind of got the idea about the game we play today was in England"* (think-aloud: 16.09.03).

Not only was Elizabeth able to identify when she had encountered information, she also identified irrelevant information as it arose, such as when she read aloud selected parts of content displayed on the screen and then declared *"Don't need that, I'm going back"* (think-aloud: 16.09.03). Other instances included *"there is nothing there, it is all about school clubs"* (think-aloud: 16.09.03) which was not relevant to her goals and also *"That's a picture of the field, it's not what I am looking for, right I'm going ..."* (think-aloud: 16.09.03). Also, she was noted a number of times to identify when new information was merely repeating what she had already learned.

When Hannah had fallen quiet at one stage I prompted her to keep talking by asking how she thought she was going in finding the information she was after. At this point, she

evidenced monitoring of her progress to date and responded *"Alright, well I have got where it [Bermuda Triangle] is and which ships and planes disappeared, although I can't remember all of them, 'how' that's all I have got to find out 'how'"* (think-aloud: 17.09.03). Later, of her own accord she declares "*Now I am trying to figure out, well I have done where it is located which is here* (pointing to the map she has drawn in her notebook) *I have done part of which and now why"* (think-aloud: 17.09.03). At another stage during the session Hannah demonstrates frustration at her lack of desired findings "*Come on, I need some information I can actually use"* (think-aloud: 17.09.03) at which time she is scrolling up and down a web page she has entered. This is followed by success *"Now I have got something…. Gas Bubble Theory, Traffic… they've got traffic as one… this isn't a bad one"* (think-aloud: 17.09.03).

Interestingly, in order to complete her research goal Hannah was noted to change one of her questions during the process of searching for information. She encountered a site which asked "Want to know more about this mystery - I mean, who, what, when, where and why??? Click below to find out more" . Hannah is observed at this point to change her 'How' question written on her research sheet to 'Why" which is one of the options on this site. She returns her attention to the screen and states *"Okay I know where, I know who, well I don't know"* (think-aloud: 17.09.03) and she clicks on 'why' and lingers on that page for a few moments. She then returns to the list and selects 'when' again remaining briefly and returning back to her Google search results stating "*Okay that was alright"* (think-aloud: 17.09.03).

Similarly, Emily considers making adjustments to her research goal when she states *"I'm looking for the first Pharaoh but if I can't find that I'll go to either 'how long did he live'.."* (voice fades out) (think-aloud: 16.09.03). Later she declares "*I don't think I can find the first Pharaoh I might go into the Son of Ramses II"* (think-aloud: 16.09.03).

These participants were clearly focused on their stated goals throughout their engagement. Allowing the participants to have control over their Internet-mediated activity was beneficial as it allowed them the freedom to make decisions related to their progress and, as seen, change their goals as it became apparent their initial goals might

be unachievable. I do not believe this would have emerged had the participants been looking to answer questions I had set for them.

The participants were noted to conclude their independent Internet-mediated activities when they decided they had achieved their goal. Emily clearly defines the moment she has completed her task at which time she both reads directly from a web page and summarises part of the content providing information on the first Pharaoh ".. *how the first Pharaoh came to be"* (think-aloud: 16.09.03) and concludes she has finished by stating *"That's pretty much all I wanted to research about"* (think-aloud: 16.09.03) and goes on to recall the last section she has reviewed in her own words.

When Hannah appears to be concluding her session I ask if she has all the information she needs and she replies "*I have got 'why', well I have sort of got 'how', more likely, all the theories and that, that come up, and where and which, so I should be alright"* (think-aloud: 17.09.03).

After a lengthy search Elizabeth ultimately came to the conclusion that she would be unable to find the name of an individual person who invented field hockey. As discussed previously, Elizabeth is aware that not everything can be found online. She realises that she must instead interpret the information she has been able to find and acknowledge that perhaps a single person was not responsible or at least not known for creating field hockey. She suggests that perhaps the Egyptian drawings of the game made it look like fun sport so they kept playing it over time.

As stated above, I believe the use of an authentic Internet-mediated learning activity was very valuable in eliciting the data which are found under Adaptive Citizen. Indeed, taking account of the findings presented through this chapter, I consider significant data have emerged as a result of the research design and subsequent analysis, both of which are underpinned by the integrated theoretical framework which resulted in the Internet-Mediated Learning Model.

In order to make concise the extensive findings presented throughout this chapter I now move to provide a summary overview of the profile of the young, competent Internet-user which has emerged.

5.4 Summary of the Profile of the Young, Competent Internet-User

The primary categories and their associated secondary categories were presented at the beginning of this chapter in Figure 5.1 and Table 5.1. These categories have been explored through the data using a range of descriptive categories. A summary overview of the descriptive categories which form the profile of the young, competent Internet-user is now shown in Table 5.2 below.

Profile of the Young, Competent Internet-User

Participant Citizen

Global Citizen
- Awareness of the global nature of online content
- Awareness of the impact of global distances on activities
- Awareness that language variations exist across cultures
- Awareness that Internet access is not available to all people
- Awareness that the Internet is used to share information across local and global communities

Commercial Citizen
- Understanding of economic values
- Consumerism: exposure to online advertising
  knowledge of brand names and commercial organisations
  understanding of online shopping activities

Communicative Citizen
- Skill in the use of email
- Skill in the use of messenger services and chatrooms
- Understanding of global communicative standards

Abiding Citizen
- Understanding of the rules of usage

Tool-Mediated Citizen

Technician
- Demonstrating levels of competence (master v. apprentice)
- Demonstrating efficient practices

Security Guard Use and understanding of signing-in and passwords Integrator Ability to integrate various human senses Ability to integrate different online and offline activities Ability to integrate available hardware and software Design Analyst Skill in analysis of web site layout Understanding of use and limitations of the Internet Understanding of skills and knowledge required or facilitated by Internet use
Adaptive Citizen
Efficient Worker Efficiently scanning for key words Efficiently skimming texts Researcher Understanding of search and navigation techniques Ability to compare different tools for different purposes Director Patience and persistence Focus on direction Self-regulation/Self-Monitoring toward goals

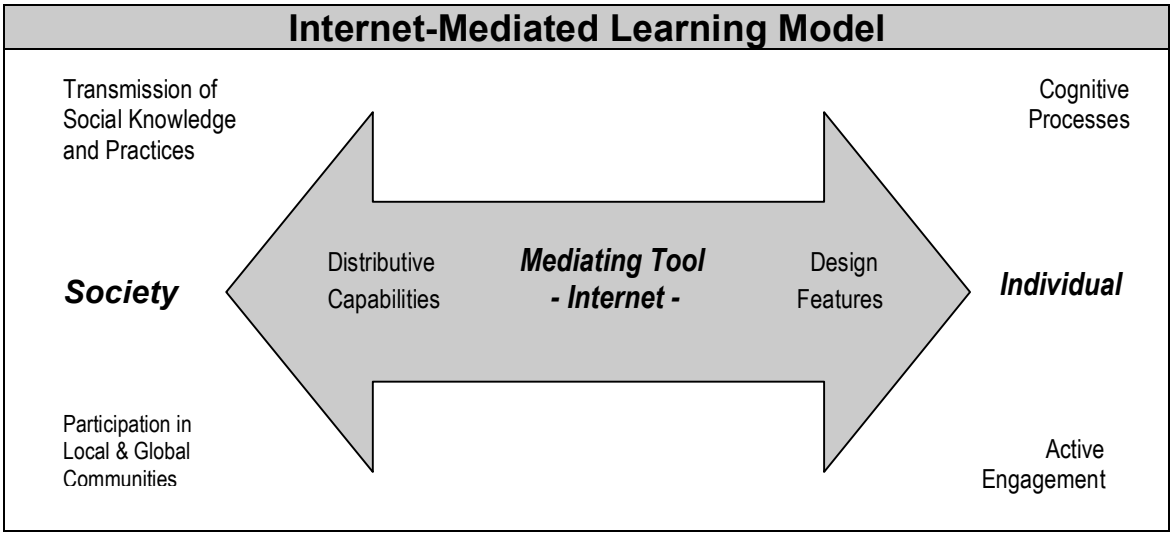
Table 5.2: Overview of the Descriptive Categories which Build the Profile of the Young, Competent Internet-User.

I believe these categories build a useful profile of the young, competent Internet-user. As a result of the different categories which have emerged from the data a clear picture is built of the learning experiences of these young, competent Internet-users. We can see this learning at all levels, from the development of cognitive skills, through to understanding of the tool itself, and also exposure to, and understanding of, broader social issues associated with the Internet usage.

To strengthen understanding of the learning experiences of these young, competent Internet users, I will move in the following section to consider the profile of the young, competent Internet-user with respect to the Internet-Mediated Learning Model.

5.5 Understanding Learning Through the Internet-Mediated Learning Model and the Profile of the Young, Competent Internet-User

As has been stated on numerous occasions throughout this thesis I consider the Internet-mediated learning system is comprised of three interrelated components which are inextricably linked and cannot readily be isolated from the entire system. Taking this approach has allowed me to gain some insight into young, competent Internet-users and subsequently build a profile of their learning experiences. For ease of reference I again include the Internet-Mediated Learning Model proposed in this thesis.



In Table 5.3 below I demonstrate how each of the three major components making up the Internet-Mediated Learning System (society, mediating-tool, individual) were reflected in the findings of the study. You will see that these are not necessarily easily definable categorisations and some overlap exists between each. This, I believe highlights an important principle of the Internet-Mediated Learning Model which suggests that we need to consider the complexity of the learning system rather than examining these components in isolation.

Society

Transmission of social knowledge and practices | **Participation in local and global communities**

A number of the categories which emerged from the data related to learning experiences that enabled transmission of social knowledge and practices and also allowed participation in local and global communities. The most relevant categories in this area included:

- awareness of the global nature of content
- awareness of global distances
- awareness of language variations
- awareness that the Internet is used to share information across communities
- awareness that not all people have Internet access
- understanding of economic values
- issues of consumerism
- understanding of global communication standards
- understanding of online communication services
- understanding of the rules of usage
- understanding of sign-ins and passwords

Mediating-Tool

Design Features | **Distributive Capabilities**

There were a number of learning experiences evident in the data which related to the design features and distributive capabilities of the Internet during the participants' tool-mediated activity. The most relevant categories in this area included:

- analysis of web site layout
- comparison of different tools for different purposes
- efficient practices
- competence (master v. apprentice)
- understanding of the Internet's uses and limitations
- understanding of the skills and knowledge required or facilitated by Internet use
- awareness of the global nature of content
- awareness that the Internet is used to share information across communities

Individual

Cognitive Processing Capabilities | **Active Engagement**

The learning experiences of the participants were evident at the individual level through a number of the descriptive categories. These categories demonstrated elements of the cognitive processing and active engagement of the participants. The most relevant categories in this area included:

- integration of senses and activities
- scanning for keywords and skimming text
- efficient practices
- focus on direction
- self-regulation and self-monitoring toward goals
- search and navigation techniques
- understanding rules of usage

Table 5.3: Integration of the Internet-Mediated Learning Model and the Profile of the Young, Competent Internet-User

While it may seem convenient that the findings of this study support the Internet-Mediated Learning Model the process which has lead to the development of the Model

and the Profile was not as neat and clear-cut as this presentation would imply. For me, as a researcher, it has been a very exciting discovery toward the conclusion of the study that my emerging understandings of Internet-mediated learning were reflected in the learning experiences of the participants, as captured through the research process. It must be emphasised that at the commencement of this study I had not previously encountered the theories which have been integrated to provide a framework for this study. Review of the literature on these three theories was ongoing until the final stages of this thesis and it was only as a result of this ongoing review of literature, combined with the actual findings of the study, that the Internet-Mediated Learning Model emerged in the form it is now found.

While I initially perceived the emerging theoretical framework as essential and most useful in identifying an appropriate research design it subsequently became paramount to understanding the findings which emerged. Conversely, while I believed the building of a profile of the young, competent Internet-user would be useful in understanding learning in this environment it subsequently became obvious that not only was the profile useful in building this understanding, but also the components making up the Internet-Mediated Learning Model were essential to understanding learning in this environment.

It was not the case that I had a predetermined theoretical framework through which to neatly organise the findings, nor did I have a preconceived profile of the young, competent Internet-user. It is only through the combination of these two components of this study that, I believe, a solid understanding of learning in the Internet-mediated learning environment has developed.

5.6 Conclusion

Chapter 5 has presented a profile of the young, competent Internet-user. This profile comprised of three major categories - Participant Citizen, Tool-Mediated Citizen and Adaptive Citizen. Descriptive categories were used to distinguish the different primary and secondary categories. These descriptive categories have provided insight into the learning experiences of these young, competent Internet-users as they engaged in Internet-mediated activity which is reflective of their day-to-day experiences.

In the concluding chapter which follows I will, amongst other things, integrate and explore some of the more interesting findings which have emerged as a result of this study and been presented throughout this chapter.

6. DISCUSSION AND CONCLUSION

The final chapter of this thesis draws together issues raised throughout. Particular emphasis is placed on the insights drawn from the profile of the young, competent Internet-user. In doing this I evaluate the research aim and consider whether the skills and characteristics of young, competent Internet-users as they engage in authentic Internet-mediated activity have emerged. Also discussed in this chapter is the perceived value of the Internet-Mediated Learning Model for understanding learning in this environment.

This chapter also identifies the implications of this study and provides suggestions for future directions in research. As I indicated in Chapter 4, section 4.6, much of the value of qualitative research lies in its 'usefulness'. This chapter is therefore aimed toward presenting my case for the 'usefulness' of this study.

6.1 Review of the Research Aim: Have understandings of the learning experiences of the young, competent Internet-user emerged through this study?

This thesis presented a view of learning as an ongoing interaction between an individual and his/her experiences; where information is processed and knowledge developed. This broad and encompassing understanding of learning enabled me to acknowledge that any types of learning, at any level of sophistication, could emerge from the data. I avoided limiting myself to preconceived notions of learning and instead attempted to allow any and all forms of learning to be acknowledged. From this, a holistic and descriptive account of the learning experiences of these young, competent Internet-users emerged. For example, we saw the participants demonstrate basic factual understanding of the technical features of the Internet but also, social analysis of, for example, some of the uses and limitations of the Internet for different people. At this early stage of investigations into Internet-mediated learning, I consider this broad approach to uncovering 'learning' is extremely useful, especially in providing a foundation for further investigation. It moves away from the 'predictive' and into the 'actual' learning evident in the Internet-mediated learning environment.

More specifically, I now move to examine the profile of the young, competent Internet-user which emerged from this study. I presented findings from the perspective of the individual and this resulted in the development of three primary learner roles: Participant Citizen, Tool-Mediated Citizen and Adaptive Citizen.

Exploration of these three primary roles revealed the various skills, understanding and characteristics which were evident. Importantly, however, as has been highlighted throughout this thesis, the Internet-mediated learning system is comprised of interrelated components which are difficult to isolate. What follows is, therefore, a range of identified learner skills and characteristics which are reflective of this entire learning system: individual, the Internet and society. This discussion is focused on those learning experiences which have been elicited from the profile presented in Chapter 5. These encompass a range of pertinent issues which represent the personal traits of the individual, skills developed by the individual as a result of using the mediating-tool (the Internet) and the social implications of Internet-usage.

There are six categories depicting the learning experiences of young, competent Internet-users evidenced throughout the three citizen types presented in Chapter 5. I consider these six categories demonstrate the achievement of the aim of this thesis. These six categories are:

(a) Evaluative Skills
(b) Efficient Practices
(c) Focus and Direction
(d) Communication Skills
(e) Knowledge of the Internet's Role in Society
(f) Functional Skills

These six categories demonstrate the intertwined relationship between the individual, the Internet and the society in which the Internet is used and valued, which was espoused in the Internet-Mediated Learning Model.

6.1.1 Evaluative Skills

The participants demonstrated the ability to undertake evaluative functions at numerous levels throughout their independent Internet-mediated activity, and later in the follow-up interviews. These evaluative skills were demonstrated through each component of the Internet-Mediated Learning Model – individual, tool and society, as evidenced in what follows.

The participants' evaluative skills included identification of a range of important web page features, such as origin, design, layout and advertising content. The participants were also found to quickly determine the content of a web page and evaluate its relevance and usefulness for their purposes.

The participants also evaluated various Internet activities to determine their usefulness over other available tools (such as, Internet games v. console games, Internet research v. book-based research, email v. telephone or written contact). This ability to compare the value of the Internet with that of other sources has also been found by others. Holloway & Valentine (2003), for example, interviewed teenagers on their Internet usage and when one was asked if he had replaced magazines with the Internet he responded:

> *"Use the both because I like the pictures from magazines to put on my wall 'cos it takes a long time to print the pictures out from computers 'cos they're quite big [trails off]"* (p. 122).

One of the more interesting aspects of this evaluative process was some participants' discussion of the economic viability of certain activities. It was also evident that some participants knew how and when this tool could be used for their own personal gain (eg. obtaining free services such as web design tools and online newsletters).

This is an interesting area for exploration and raises questions of the cognitive skills being developed. The ability to quickly evaluate a situation is useful and it would be helpful to know if this speedy decision-making is transferring into other areas of children's lives. Also the ability to weigh up the advantages and disadvantages of one

service or product over another is an important skill. The ability of the students to act as critical consumers causes me to consider the implications of this transferring into other areas of life. Importantly, we must also consider those children who may not be developing such evaluative ability through lack of skill or lack of exposure to the Internet and ask if this is of concern or consequence.

6.1.2 Efficient Practices

Each participant also demonstrated the ability to work efficiently with this tool. Although not considered 'masters' at all levels they demonstrated the skills necessary to maximise engagement with the tool to avoid or solve problems as they arose. The participants multi-tasked where possible, demonstrating effective use of time and resources. They also used sub-headings and graphics to aid in quick evaluation of content and they very capably skimmed and scanned content.

Traditionally some of the behaviours of the participants may be considered to reflect impatience and/or a lack of persistence. However, as I have stated previously, these characteristics appear to have translated into skills of efficiency.

If we consider that individuals do not just use this tool but also impact upon its future development I consider the development skills of efficient practice to be an extremely important issue. The question is raised about the implications if individuals' cognitive processes are accustomed to working in the manner described above. I consider it is likely to have an affect on the types of Internet sites they choose to visit and later, the types of sites they may choose to create. This, I believe, will impact on individual cognitive development in promoting skills of efficiency. Further, I consider it will be a circular effect where sites which promote and encourage speedy practices will be most frequently accessed and developed and thus present to society a view that quick evaluative processes are valued.

6.1.3 Focus and Direction

Evidence of the participants' abilities to maintain focus and direction were apparent throughout their independent Internet-mediated activities. Particularly strong was their

ability to ignore distractors (like advertising on web sites) with the realisation they generally had little relevance.

Where participants were distracted, either by an extraneous feature on a web site or a technical issue, they were able to quickly return to the task at hand. It appears from the findings of this study that young, competent Internet-users are capable of ignoring distractors when they are sufficiently motivated toward a goal. In contrast, they also recognise the value of the Internet to provide a distraction when they need a break from another activity (eg. accessing a game while having a break from school-related research).

Importantly, the participants were also seen to be capable of monitoring their own progress toward their stated goal. They did not seem overwhelmed by the breadth of information or activities available to them. At all times they appeared to have understanding of their progression toward their personal goal and demonstrated this by acknowledging what they had already accomplished and what was still to be found.

The skills of focus and direction potentially developed through Internet-mediated activity, raise questions for further investigation such as whether these skills transfer to other learning environments or are, indeed, specific to Internet-mediated experiences. It would also be of interest to develop understanding as to whether these skills transfer into a sufficient depth of understanding of the information being accessed. Indeed, what we may be observing is further confirmation of their efficient practices whereby students focus in-depth where necessary and take a surface approach at other times depending upon the ultimate goal facilitated by the Internet-mediated activity. This finding contradicts somewhat anecdotal commentary which suggests that children are merely taking a simple surface approach to their learning as a result of Internet-mediated activity. Instead it causes us to consider the developing skills of children to cope and succeed in this complex environment.

6.1.4 Communication Skills

The Internet has developed new genres of communication. This study saw the participants demonstrate skill in both using and understanding the purpose of different

communication tools available through the Internet. They utilised or spoke of functions related to email, instant messaging services and chatrooms and also provided some insight into their understanding that the Internet generally was used to communicate across community groups and the globe.

The skills required for online communication are numerous. Email communications, for example, firstly require functional skills for access and then, within the program, require the use of language and iconic representations unlike those used in traditional forms of written communication. Similarly, the use of instant messaging services provides another vehicle through which some young persons communicate with their peers and this too has its own set of underlying skills and procedures.

The participants were not formally taught the nuances of these various mediums to ensure appropriate participation. To actively participate using online communication tools young Internet-users need to adapt to each environment and audience as necessary. While formal educational institutes may now incorporate the development of skills related to email communications into the curriculum, it would appear that these teachings could either lag behind or be unnecessary when taking account of some competent Internet users' experiences in daily life.

Importantly, when we consider the place of the Internet to distribute social knowledge it was apparent from the comments of some participants in this study that the Internet was seen as a useful tool to communicate information generally. It was reflected in a belief shared by the participants that web sites are created to allow individuals and companies to share information with others who may be interested. I consider this interesting if we consider that young children already recognise the potential of the Internet as a communicative tool if they desire to interact with the wider global community.

6.1.5 Knowledge of Internet's Role in Society

It became evident that the participants' access to the Internet has enabled them to develop an in-depth understanding of the different uses of the tool for different people in different communities. Interestingly, the Americanisation of the Internet was recognised in this study and this seems to be shared by British teenagers as well, for example: "*I go on*

general chat, or you can do sports, but the sports tend to be all American and they talk about football and it's American football so you've gotta put in soccer" (Holloway & Valentine, 2003, p. 146). This is interesting when we consider the implications of children developing their global identity.

The participants in this study each used the tool for a broad range of purposes and each of these activities have underlying skills associated with them. The participants were also aware of ways in which the Internet could bring local and global communities together through the dissemination of information, and highlighted the problems and benefits associated with this.

The importance of these issues are also recognised in other studies which are beginning to emerge. Holloway & Valentine (2003), for example, devote Chapter 6 to:

> *"…looking at how children can extend the scope of their knowledge by using the WWW to access information from around the globe and explore what this means for the local cultures in which their lives are embedded … move to explore the ways that children use ICT to communicate with both off-line and on-line friends/acquaintances … think about how these connections might be shaping children's sense of place in the world …"*

The integrated theoretical framework which underpins this study emphasised the importance of the use of tools (in this case the Internet) to transmit social knowledge and enable participation in local and global communities. The findings of this study identify the numerous ways in which young, competent Internet users are global citizens. The children in this study are clearly aware of the world around them and the implications of Internet-usage both locally and across the globe.

6.1.6 Functional Skills

Of course the Internet is a tool which requires knowledge of its technical features in order to maximise its potential. The participants demonstrated a range of functional skills related to use of this tool. They understood why the computer may freeze and how

to solve such a problem. They also understood when a technical problem could be ignored or when they needed to seek assistance from someone else.

The participants demonstrated not only use of sign-in features and passwords but also understanding of their underlying purposes. The participants were capable of using search engines and discussing associated issues such as search-engine design. They also understood and identified design features on web sites and were capable of navigating around sites with ease.

The development of these skills shows that from a young age children are becoming confident users of the Internet and this will naturally impact on their continued and more sophisticated use of the tool. This area of the study clearly demonstrated that these participants suffer none of the problems associated with some older learners' early use of the Internet, such as hesitancy and fear.

The stated aim of this research was to identify some of the learning experiences of young, competent Internet-users. Using the findings of this study to build a profile of the young, competent Internet-user has enabled a range of different learning experiences to emerge. Immediately above I have identified six broad areas which I believe capture the most important learning experiences evident in the actions and words of the children taking part in this study. Taking account of the detailed profile of the young, competent Internet-user presented in Chapter 5 and the review of the learning experiences presented immediately above, I believe insights of the skills, understandings and characteristics of young, competent Internet-user have most certainly emerged through this study.

Importantly, I note that from the outset I believed that in order to develop this understanding it was important to have a strong theoretical framework through which the learning system being studied could be understood. As a result an integrated theoretical framework was developed throughout Chapter 3 and resulted in the Internet-Mediated Learning Model. I now move to explore the usefulness of this integrated theoretical framework in understanding the complex Internet-mediated learning system.

6.2 Review of the Integrated Theoretical Framework: How has it contributed to Understanding Internet-Mediated Learning?

The process of establishing the integrated theoretical framework which underpins this research proved invaluable in developing my own understanding of the Internet-mediated learning system. The Internet-Mediated Learning Model which emerged as a result of the integrated theoretical position discussed in Chapter 3 enabled exploration of the interwoven relationships between individual, tool and society.

Specifically, in the earlier discussion of the Internet-Mediated Learning Model, I suggested that the Internet has evolved over time to reflect the rules, values and beliefs evident at various local and global levels. This model is used to illustrate that individuals engage in goal-directed Internet-mediated activity which subsequently enables them to both access and contribute to relevant communities. If we then reconsider the findings of the study, I believe we see reflected in these findings the role of the Internet in facilitating social development and practices. This study demonstrates the place of the Internet in developing young Internet-users' understandings of the world around them. Access to the Internet by these children is clearly facilitating the development of a range of learner skills, behaviours and knowledge. These young Internet-users are in the process of mastering the tool and, over time, it is conceivable that their future actions will be reflected in the continuing evolution of the Internet.

More specifically, I will now consider each of the three primary categories to emerge from the data (Participant Citizen, Tool-Mediated Citizen and Adaptive Citizen) and consider how they, combined with the understandings developed through the integrated theoretical framework, contribute to understanding the learning experiences evident during Internet-mediated activities.

The role of 'Participant Citizen' demonstrated the place of the Internet to reflect and enable the individual to access the communities and greater society in which the Internet is valued. The findings of this study provide evidence that the Internet projects contemporary society through the sites and resources available to users. This enabled the participants to not only access both local and global communities but also develop some

awareness of the cultural issues which exist and are highlighted by the use of the Internet. We see, therefore, the transmission of social knowledge and the user's participation in local or global communities as espoused in the Internet-Mediated Learning Model.

The tool-specific skills displayed by the participants were evident as they worked toward goals during various Internet-mediated activity. The role of 'Tool-Mediated Citizen' provided numerous examples throughout the secondary and descriptive categories of the impact of the tool on its users in terms of its design, layout and technical features. This area evidenced movement between master and apprentice and saw the participants evaluate the tool, and its purpose, as necessary. Again, these findings are more powerful when also taking account of the Internet-Mediated Learning Model which considers the tool's distributive qualities (to enhance the learning and performance of the individual through the tool's off-loading capabilities) and the implications of shared knowledge on individual learning.

Finally, through the role of 'Adaptive Citizen' it was observed that the active participation of each child contributed to his or her employment of different cognitive skills and processes. The integrated theoretical framework suggested that we must take account of the individual's cognitive capabilities and their active participation, to engage (and develop some level of competence) with a tool such as the Internet. The findings related to Adaptive Citizen thus become even more useful in understanding the extensive learning experiences of the individual which were evident during Internet-mediated activity. Here it is also useful to draw upon the cognitive theories raised at the commencement of Chapter 2 and acknowledge the place of such cognitive theories as an important component of the Internet-mediated learning system.

6.3 Review of the Research Design: Was it appropriate to achieve the aims of the study?

6.3.1 Examining Learning in Context

The integrated theoretical framework espoused a belief that learning occurs in context and, as such, we should attempt to research learning in as natural a situation as possible. Given this, I wished to use an authentic activity to facilitate the think-aloud and observational data. As discussed previously in section 4.8, I took the word 'authentic' as

existing across a continuum and, although the research was bound by a school environment, the participants were asked to engage in an Internet-mediated activity of their own choice. As this was an investigatory study, and I was not out to prove or justify any benefits or limitations of Internet use, I found this approach most useful.

Ideally, further research in this area would actually occur during the participants' leisure time, whether at home, during school breaks or even an Internet café for older learners. This would avoid some of the limitations placed on the researcher and on the participants (such as one participant not being able to access his preferred messaging service). However, this type of intrusive research on children raises important ethical issues. Also, we must remember that when children are being watched by adults while they engage in activities which they usually undertake privately, it might result in a change of actions. We must, therefore, maintain focus on what we can actually investigate and the reasonable methods to undertake such investigations.

6.3.2 The Research Methods

The think-aloud method elicited extremely rich and thick data. As discussed at length in Chapter 4, section 4.9.6, this method is not without its limitations. However, I found in this study, as I have found previously, that the data I obtained far outweighed these limitations. I do acknowledge that one participant was limited in her ability to think aloud and did not produce a significant amount of verbal data and another's were of a more conversational nature. However, that which did emerge from each of the five participants was a valuable contribution to gaining an insight into their learning experiences during Internet-mediated activity.

I also found the follow-up interview very useful in exploring issues raised after initial data analysis had been completed. Nevertheless, while the practical component of the follow-up interview provided a wealth of information, I am even more assured now that using this approach in the first instance would have resulted in far fewer insights than I obtained through the use of it as a secondary data collection measure.

Two areas for revision in future studies would include the initial questionnaire and my observation techniques. When constructing the questionnaire I believed I was only

constructing a tool to help select appropriate participants. Now, with hindsight, I see how this tool did provide significant data in itself and so I would include additional elements to this questionnaire to provide a more in-depth understanding of the participants' Internet experience. Also, I would extend the practical component to examine other areas of Internet usage not limited to a Google search activity as I did in this study.

The use of observations was essential to support the think-aloud data. In order to maximise the potential of this research method there are two specific measures which could be undertaken.

Firstly, the use of several video cameras to capture both on-screen actions and a broader picture of each participant and the environment would be useful. This would enable continuous filming of all screen movement and actions as well as providing evidence of a participant's body language and other extraneous behaviours occurring off-screen. This approach would also then free up the researcher to take field notes rather than operating the camera to switch between screen and environment.

Secondly, identification of a more accurate way to record the participants' access to various sites would be useful. The information obtained from the computer's hard drive regarding the history of each participant's access was very limited and did not contain sufficient evidence of the different internal links which may have been accessed. A more in-depth analysis of each participant's movement around the Internet generally and within sites more specifically could enhance understanding about areas such as evaluative skills and efficiency in actions.

Overall, with the addition of the recommendations above, I consider the research methodology and methods applied in this study are extremely valuable as a research design for further investigations into the learning experiences of young, competent Internet users when engaged in authentic Internet-mediated activity.

6.3.3 Data Analysis and Presentation of Findings

As discussed previously toward the conclusion of Chapter 5, the Internet-Mediated Learning Model and building of the profile of young, competent Internet-users occurred simultaneously. That is, I did not develop the model first and then apply the findings to it, nor did I build the profile and then develop a model to explain the profile. Instead, the process was interwoven. As I continued to review the literature on the relevant theories underpinning my theoretical framework I was also in the process of data analysis. Each contributed to my understanding of the learning experiences of young, competent Internet-users and together they provide understanding of the Internet-mediated learning environment.

However, now that the Internet-Mediated Learning Model has been more fully developed I consider it provides a useful starting point to understanding learning in the Internet-mediated environment. I believe the model is sufficiently flexible to enable researchers in this broad field to modify the primary unit of analysis to accord with their own research goals. The model also allows researchers to place their particular interest within the complex and interrelated system which makes up the Internet-mediated learning experience.

Also important in the analysis of data were the two distinct research phases. Entering the second phase of data collection with themes already in existence allowed me to test and thus expand, modify or eliminate categories. I believe this contributes towards the strength of the study.

6.4 Implications of the Study

As a result of this study I believe three important areas have been developed and each of these areas provides some insight which can lead to further action and understanding of the implications of Internet-mediated activity for both individuals and the development of society generally.

Firstly, the study has highlighted that competent, young Internet-users demonstrate a broad range of skills and knowledge as a result of their informal and unstructured Internet-mediated activities.

Secondly, the study has identified and demonstrated a useful research design to illuminate learning experiences present within the Internet-mediated learning system.

Thirdly, the study has presented a strong integrated theoretical framework, leading to the Internet-Mediated Learning Model, which provides a useful vehicle through which research in this field can be conducted and analysed in its complexity.

Consideration must also be given to the fact that the participants of this study have not relied on formal or structured education to develop the skills and knowledge demonstrated whilst they undertook their Internet-mediated activities. This study thus supports claims such as Tapscott (1998, cited in Holloway & Valentine, 2003, p. 73):

> *"Because N-Gen [net generation] children are born with technology, they assimilate it … they soak it up along with everything else. For many kids, using new technology is as natural as breathing."*

I believe that we cannot continue to decide what this generation of children needs to learn from our traditional viewpoints of learning. There is an abundance of literature that claims benefits and/or limitations of online learning experiences. What is missing is empirical evidence of what is actually occurring when ordinary people, particularly children, use the Internet in ordinary ways. I believe this has been captured, to some degree, as result of this study.

Further, I believe an understanding of the learning experiences of children whilst they are engaged in Internet-mediated activity is particularly important given the investment by parents, corporations and governments to purchase or develop of online activities for formal educational experiences. I consider it inappropriate to continue to invest considerable time and money to create online learning experiences which accord with learning outcomes that are not necessarily applicable to the skills and needs of future

generations. I believe this study opens the door to understanding the broad forms of learning that occur when young, competent Internet-users undertake activities reflective of their day-to-day usage of this culturally valued cognitive tool.

I consider the study particularly highlights the importance of recognising the informal learning experiences of children. We need to consider what each child may actually bring with them to Internet-mediated activities undertaken in formal settings. Similarly, we should consider the implications of the skills and knowledge being developed, as a result of children's Internet-mediated activity, on their other learning experiences. Is there a transfer of the skills and behaviours they demonstrate in this environment to other learning situations? If so, we must begin to investigate the implications of this for their cognitive development generally.

It is clear from this study that children, through their exploratory activities and reliance on others for technical aid only as and when necessary, are developing a range of important skills that are directly related to the Internet. I consider it imperative that we understand the skills and knowledge that are being developed through informal and exploratory online activities.

We need to move away from our 'adultist' attitudes toward technologies (Holloway & Valentine, 2003, p. 156) and consider more carefully the views of the future generations on the use and purposes of tools such as the Internet. This is particularly so as we do not yet know what impact the skills and knowledge being developed through media such as the Internet, may have on the long-term development of children and across their lives.

It is my contention that, just as we encourage children to use a pencil to scribble in the early stages of developing writing, so too should we encourage free exploration of the Internet to develop underlying skills, that are necessary to become an active participant in a society where Internet-mediated activity is valued.

6.5 Future Directions for Research

I believe the way forward is to continue to watch and listen to children as they use the Internet in ways reflective of their daily practices. We should investigate the incidental types of learning that are occurring through children's informal and unstructured interactions with the Internet. These types of investigations can occur in a broad sense, such as this study, or become more fine-grained to examine specific Internet features such as email communications or online shopping. The key, however, is to avoid isolating components of this environment. Instead, we must remain mindful of the entire Internet-based learning system and embrace rather than avoid its complexity.

Further investigation into some of the specific learning experiences of children evident in this study, such as speed and efficiency, are needed. At present it would appear that adults' perceptions and children's actions are at odds. As raised previously I initially labelled the participants' behaviours as demonstrating a lack of patience and persistence, but further consideration saw these evolve as evidence of efficiency and adaptation to their environment. These types of understandings are necessary to help 'clear up' some of the conjecture on the value of the Internet to facilitate the types of learning we have traditionally valued. We need to consider the types of learners likely to be prevalent in the future generations and embrace their skills rather than trying to fit them into our traditional moulds of effective learners.

Also important is recognition of the social knowledge which is being developed as children access the Internet. Messages are sent via the activities and interactions enabled by the Internet which project social values and beliefs to the user. I consider it imperative that we learn more about the implications of this on the development of children's understanding of society and the broader social implications if we are to understand the potential of this tool to impact upon current and future generations.

6.6 Conclusion

This study has developed a strong theoretical framework for investigating the new phenomenon of Internet-mediated learning. The integrated theoretical framework is one

which recognises that leaning occurs in complex learning systems where each component impacts upon the other. I put forward a view that we cannot isolate the individual from the tool-mediated activity, the tool-mediated activity from society or the individual from society. I consider that the Internet-Mediated Learning Model which emerged as a result of the integrated theoretical framework provides a vehicle through which this complex system can be understood without removing and isolating its component parts. I believe it is a useful model through which others can continue investigations in the area of Internet-mediated learning.

The literature review highlighted the fact that, while much commentary exists on the potential of the Internet to facilitate or impede learning there is little empirical evidence to indicate what is actually occurring. This study has attempted to close some of the gap between discussion-based and evidence-based understanding of the learning experiences of children when engaged in Internet-mediated activity. Also important, the findings of this study suggest a need to reconsider our traditional views of learning in light of the skills and competencies displayed by young Internet-users.

I entered this study with a goal to find out, as far as possible, the learning experiences of children when using the Internet. I consider that what has resulted from this research is not only some insight into the learning experiences of young, competent Internet-users but also a strong theoretical framework and appropriate research methodology which can provide useful vehicles for further research in the field.

Appendix 'A'

Consent letter to school principal

DOCTORAL RESEARCH PROJECT – KIRSTY ANN YOUNG

As previously discussed, I am currently completing my Doctor of Philosophy at the University of Technology, Sydney. My research aims to identify some of the learning behaviours and learning outcomes of students whilst they are engaged with the World Wide Web (WWW) to complete a research project.

This study will necessitate approximately five to ten students working independently on a project of his/her own design using the WWW. It is anticipated that the participating students will choose a topic of interest for their own research and identify some questions/problems to guide their investigation. Each participant will then present his/her research using a method of his/her own choosing (eg. poster, PowerPoint presentation, oral presentation).

Whilst each student is completing this work on the WWW he/she will be asked to 'think-aloud' about what he/she is doing. This process will be audio-taped so that I can transcribe the data for analysis. Additionally, each student will be video-taped so that I can observe his/her overt behaviours whilst he/she is working on the WWW. The computer screen will also be monitored to record the sequence of student actions. Finally, interviews will take place with each student at the conclusion of the project, at which time they will be asked to review sections of the video recordings to allow me to clarify some of their actions and thought processes.

Also, it is important to note that this research will be published in the form of a doctoral thesis and that journal articles may be published and conference presentations made, using the findings of this research project. At no time, however, will the school be identifiable to others.

You are encouraged to contact either myself or my Supervisor (Dr Sandy Schuck of the University of Technology, Sydney) if you have any concerns about the research or would like to discuss it further. It is also noted that you are free to withdraw the participation of students at your school from this research project at any time you wish and without giving a reason.

If you consent to the above research described above taking place, please sign below as acknowledgement of your consent.

Thank you for your time in previously meeting with me to discuss this project and in considering my request to conduct my doctoral research at your school.

Yours sincerely

Kirsty Young

I, _____, Headmaster of_____, consent to Kirsty Ann Young conducting her doctoral research at this school in the manner described herewith.

_____ Date: _____

Appendix 'B'

Information sheet to teachers of potential participants

DOCTORAL RESEARCH

Kirsty Young

Research Aims:

- Gain an insight into the learning processes of students negotiating the Web to complete an authentic learning activity.
- Ascertain the types of learning outcomes achieved during, and as a result of, engagement with the Web as a culturally developed cognitive tool.

Research Methods:

- Analysis of student behaviour (captured on video) during Web-based experience.
- Analysis of think-aloud data (captured by audio tape) during Web-based experience.
- Follow-up interview with individual students.

Participants Required:

- 10 middle/secondary students with Web competency.
- Participation in authentic learning activity where students are given opportunity to:
    - identify area of personal interest for investigation
    - design own questions to guide Web use
    - engage independently with the Web to complete learning activity.

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kirstyayoung@yahoo.com.au

Appendix 'C'

Consent letter to parents/guardians and participants

I _____ *[parent/guardian's name]* agree for my child to participate in the research project into student learning in a Web-based environment being conducted by Kirsty Ann Young (kirsty.young-1@uts.edu.au Ph: 0249 296653) of the University of Technology, Sydney for the purposes of her Doctor of Philosophy.

I understand the purpose of this study is to gain an insight into how students think, behave and learn when using the World Wide Web and for the purpose of this research my child will be required to:

1. complete a questionnaire about when, how and why *[he/she]* uses the Web;
2. design a research project;
3. be video-taped while conducting research using the World Wide Web;
4. think out aloud (which will be recorded on audio tape) while using the World Wide Web;
5. watch part of the video taken while *[he/she]* was working on the World Wide Web and answer questions about what *[he/she]* was doing and/or thinking.

I am aware that I can contact Kirsty Ann Young or her supervisor Dr Sandy Schuck (sandy.schuck@uts.edu.au, Ph: 02 9514 5218) if I have any concerns about the research. I also understand that my child is free to withdraw *[his/her]* participation from this research project at any time *[he/she]* wishes and without giving a reason and my child's withdrawal will not affect *[his/her]* academic progress in any way. I have discussed this letter with my child and my child is willing to participate in the research.

I agree that the research data from this project may be published in a form that does not identify my child in any way.

_____ _____
Signed by parent/guardian Dated

_____ _____
Signed by child Dated

_____ _____
Witness Dated

NOTE:
This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. I you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer, Ms Susanna Davis (PH: 02 9514 1279), susanna.davis@uts.edu.au) Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Appendix 'D'

Information sheet re: video and audio recording

As indicated in the Consent Letter herewith, the research to be conducted with Kirsty Ann Young for the purposes of her Doctor of Philosophy will require your child to be video- and audio-taped.

Video Recording
Whilst your child is sitting at a school computer a video camera will be present in the room. This video camera will capture the overt movements of your child while he/she is working with the World Wide Web. The recording of your child by video is necessary to more fully understand what is occurring when students are working in a Web-based environment. Video recording allow for ongoing review of the footage to re-examine the experience of your child during his/her Web-based activity.

Audio Recording
Whilst your child is working at the computer he/she will be asked to say aloud the thoughts that are guiding his/her actions. This process is known as 'thinking aloud' and it is a recognised method for gaining some understanding of the thought processes of a learner whilst they complete an activity. In order to accurately capture your child's 'thinking' it is necessary to use an audio tape. Similarly to the video-recording, taping your child will allow for ongoing review of the recording to better understand the experience of your child during his/her Web-based learning experience.

Both of these types of recordings will be viewed/listened to by Miss Young and relevant parts will be transcribed in written form. This is necessary to provide a hard copy of the data which can then be analysed for the purpose of this research study.

The video footage and audio recordings will only be viewed and listened to by Miss Young and her supervisor, Dr Sandy Schuck of the University of Technology, Sydney. The video footage and audio recordings will not be publicly displayed or accessible by others.

At no time will your child's identify be disclosed – not in the final thesis, any published research papers or during any formal presentations which may result from the data collected for this research study.

The video and audio cassettes will be stored in a locked filing cabinet during the course of the research. It is also a requirement of the University that all data sources are kept for a period of five-years after publication of the doctoral thesis and throughout this period the video and audio tapes will be kept in a secure place. The video and audio cassettes will then be destroyed after this five-year period has elapsed.

As with all respects of this study, if you have any concerns regarding the video or audio recording of your child please contact Kirsty Ann Young (kirsty.young-1@uts.edu.au, ph: 0249 296 653) or her supervisor, Dr Sandy Schuck (sandy.schuck@uts.edu.au, ph: 02 9514 5218).

Appendix 'E'

Questionnaire

Name: _____ Male/Female

Age: _____ Date of Birth: _____

Do you use the Internet at school? YES/NO

How often do you use the Internet at school?
? everyday
? 1-3 times per week
? 4.-6 times per week
? once each fortnight
? once each month
? less than once a month

What do you use the Internet for at school?
_____
_____
_____
_____
_____

Do you use the Internet at home? YES/NO

How often do you use the Internet at home?
? everyday
? 1-3 times per week
? 4.-6 times per week
? once each fortnight
? once each month
? less than once a month

What do you use the Internet for at home?
? to email my
? friends
? family
? others _____

? to find information for
? school projects
? things I am interested in

? to play games
? to enter competitions
? to 'talk' in chatrooms
? to listen to music
? to watch movies
? to listen to the radio
? to see books/stories
? other _____
_____
_____

What are some of your favourite Web sites?
_____
_____
_____

Have you ever designed/published your own Web site? YES?NO

Appendix ‘E’ cont.

How did you learn to use the Internet?

? school lessons
? learnt on my own
? taught by a family member
? taught by a friend
? other _____

When did you learn to use the Internet?

? this year (Year 5)
? last year (Year 4
? before Year 4

What do you like about the Internet?

What do you dislike about the Internet?

Give an example of how you found something on the Internet?

INTERNET ACTIVITY

Find information to answer the following questions.

What are the planets in our solar system?

What happened to the dinosaurs?

Appendix 'F'

Follow-up interview questions

Conceptual understanding of the tool

1. Does the Internet take up 'space'?
2. How much stuff is on the Internet?
3. How does it get there?
4. Who uses the Internet?

Technical focus

5. Why do you need passwords/sign-ins?
6. How do you deal with the message boxes that pop-up? Do you read them?
7. What about pop-up ads – do you take notice of what they advertise?
8. What happens when the computer freezes?
9. Do you set personal preferences at school or home?
10. What other software/hardware might you use when using the Internet?

Activity/goal directions

11. Why would you decide to log on to the Internet?
12. What are the main things you do on the Internet?
13. What sites do you visit regularly – why?
14. Do you usually finish what you are doing or get asked to log off?
15. What are some of the 'rules' associated with using the Internet?
16. What kinds of things distract you when you are working on the Internet?
17. Are you ever surprised at how long you've been on the Internet?
18. Everyone seemed to be working really quickly on the Internet - why do you think that is?

Navigating/Evaluating

19. How do search engines work?
20. How important is the language/words you use?
21. Some people said they use the Internet for shopping – tell me about shopping on the Internet?
22. Some people said they use the Internet to communicate with others – tell me about this?
23. What skills do you have to have to use the Internet?
24. Do you think you learn things other than just the information you are looking for when using the Internet?

Miscellaneous

25. How useful is the Internet?
26. Do you find information using other things – can you describe how it is different using the Internet?
27. Who else do you know that uses the Internet? Do you know anyone who doesn't use the Internet?
28. How would you feel if you couldn't use the Internet anymore? Would your life be different?

Appendix 'G'

Follow-up interview – practical activities

1. What are the following sites about? Who would visit them? Why? What would they find out?

   http://floorballamerica.com/usa/
   http://silverinstitute.org/
   www.42explore.com/marsupial.htm

2. Pretend you want to find some information about Newcastle. Look at each of these sites on Newcastle. For each site describe the things that would make you stay on the site or leave the site.

   http://users.hunterlink.net.au/~ddrge/city/ncle.html
   http://www.ncc.nsw.gov.au/index.cfm
   http://goaustralia.about.com/cs/newcastle/
   http://www.iagora.com/itravel/icities/australia/newcastle/ic_index.html
   http://3.1911encyclopedia.org/N/NE/NEWCASTLE_AUSTRALIA_.htm
   http://www.encyclopedia4u.com/n/newcastle-australia.html

3. Can you find out the following things:

   (a) Where is Lithuania?
   (a) Describe some of Ethiopia's native animals?
   (b) Why does it snow in some places and not others?

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