An exploration of children's experiences of interactive multimedia text: a case study

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Abstract

Being ‘literate’ in the twenty-first century now involves more than encoding and decoding typographic text. Understanding of multimodal literacy is still in its infancy although children are widely considered to be experienced in this form of communication. This research project will contribute to the understanding of education professionals in this area by examining the contemporary phenomena of children’s experiences of interactive multimedia text. In particular, it will examine how children interact with these texts and discuss the ways in which pedagogic practice may respond to developments in multimodal forms of communication. The research project encompasses elements of literary theory, the notion of ‘new literacies, narrative construction, human computer interaction (HCI), games technology and multimedia design.

A case study approach has been adopted with a range of data sources providing a richly-textured opportunity for studying the phenomena. A mixed method approach involving a questionnaire, focus group discussions, the analysis of multimedia texts and observations of children’s experiences of these texts was employed. The complex phenomenon of children’s interactions with multimodal texts was recorded using software originally designed for usability testing. This is an original and undocumented method of capturing data for research into new literacies and also constitutes a contribution to knowledge with respect to data collection techniques.

The empirical evidence of children’s experience of interactive multimedia texts indicates that there is a significant difference between children’s experience at school and at home. At home, children use a wide range of multimedia texts through the use of computer games but at school they have a very limited experience. The analysis of data from this research project also suggests that claims regarding the existence of ‘digital natives’ with respect to computer games is not entirely supported. Collectively, children have greater experience of computer games at home yet there are significant variations in between individual children. The analysis of children’s interactions with multimedia texts also suggests that a revised understanding of ‘literacy’ is developed and multimodal-rich literature is provided for use in the school.

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Statement of objectives

This research project will examine children's experiences of interactive multimedia texts. In so doing, it will provide opportunity for children to express their thoughts and ideas regarding the nature of multimedia texts in the school. As children's experience extends beyond the classroom, there will be some examination of the range and variety of texts used at home with a view to analysing the extent to which children might be considered to be 'digital natives'.

In addition to this, children's interactions with two multimedia texts and the process of 'reading' these will be analysed. This will allow concepts of 'new literacies' to be evaluated by examining the complexities associated with the construction of narrative through interaction, interpretation and navigation. Furthermore, the innovative research method employed which uses specialised software to capture children's interactions with multimedia texts will be presented and discussed.

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Glossary of terms

3G	Third Generation
AI	Artificial Intelligence
BECTA	British Educational Computing and Technology Agency
BERA	British Educational Research Association
BETT	British Education and Training Technology
BBC	British Broadcasting Company
DS	(as in Nintendo DS) Dual Screen
ICT	Information and Communications Technology
DfES	Department for Education and Skills
DCSF	Department for Children, Schools and Families
DVD	Digital Video Disk
GPRS	General Packet Radio Service
HCI	Human Computer Interaction
ITT	Initial Teacher Training
MIT	Massachusetts Institute of Technology
MMORPG	Massively Multiplayer Online Role Playing Games
MMS	Multimedia Messaging Service
MP3	Moving Picture Experts' Group audio layer III
MSW LOGO	Microsoft Windows LOGO
NC	National Curriculum
ONS	Office for National Statistics
PNS	Primary National Strategy
RPG	Role Playing Game
SMS	Short Message Service
UKLA	United Kingdom Literacy Association
WWW	World Wide Web

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Chapter 1: Introduction

1.1 Introduction

My interest in multimedia texts began in the early 1990's when the first multimedia computers and the compact disk, read-only memory (CD ROM) were introduced into primary schools. Amongst the many CD ROM titles available for use in the primary classroom were the 'Living Books' series which were created by Brøderbund. At that time, the potential for multimedia texts seemed immense, with opportunities for enhancements in both teaching and learning. Now, almost twenty years later, the advancements in multimedia texts appear to be situated almost entirely in the home entertainment market with digital games technologies offering an extensive range of devices which provide access to titles for all ages. Within the school there appear to be limited opportunities for children to 'read' interactive multimedia texts. In order for children to integrate into a media-rich society it is necessary to provide them with relevant opportunities to examine, understand and be critical of all forms of text. As such, this is highly pertinent to the primary school teacher and therefore Initial Teacher Training. If this is to be accomplished, there will need to be some consideration of the nature of multimedia texts in addition to children's experiences of such texts and, in particular, the ways in which children interact with them.

The rapid developments in information and communication technologies (ICT) has prompted debates surrounding the existence of 'digital natives' (Prensky, 2001b, 2006:28) claiming that the experiences of children within school do not correspond to their experiences out of school. Immersion in media-rich environments has also provoked discussion regarding 'new literacies' (Lankshear & Knobel 2003) or 'multiliteracies' (Cope & Kalantzis (2000). The theories associated with the emergence of 'digital natives' and 'new literacies' present challenges to current pedagogic practice and concepts of literacy within the primary school. As a teacher educator, I have researched my professional practice by critically analysing these debates to ensure students undertaking Initial Teacher Training (ITT) to become primary school teachers are provided with appropriate experiences on a taught programme.

There is an increasing literature base on post-typographic forms of literacies (Cope & Kalantzis 2000, Unsworth 2001, Snyder 2002, Lankshear & Knobel 2003, Kress 2003) but this is in its infancy. Further research on new literacies is necessary to develop a more critical understanding of the way in which multimodal texts are interpreted and the relevance this has to the primary school curriculum. This research project aims to address the areas introduced above by providing opportunity to explore the nature of children's experience with regard to multimedia texts and therefore raises the following overarching question;

- What are children's experiences of interactive multimedia texts?

It is recognised that children will gain experience of multimedia texts in a variety of contexts, most notably the home and the school. In order to ascertain their experiences of multimedia it would be appropriate to gain a more complete understanding of these and gather data on both school and home. This forms a subsidiary question which can be expressed as follows and will be explored concurrently with the first.

- How do children's experiences of multimedia texts between school and home compare?

Comparison between children's home and school experiences of multimedia text will form a basis for posing the following question with the caveat that the main focus is upon the school;

- To what extent can children be considered to be 'digital natives'?

This is an important ingredient to this research project as the apparent differences between children's experiences of multimedia text and the nature of their learning experience in the primary school have prompted this inquiry.

Although exploration of the questions listed above will provide necessary background information regarding children's experiences it will be necessary to examine the phenomena itself to better understand the process of interaction with multimedia texts in school. This can be expressed as the following question;

- How do children interact with multimedia texts?

It will be important to examine the nature of children's interactions with software designed for the home and for the school. This presents the opportunity to engage in argument surrounding the educational potential of video games, especially in a learning environment. The observations of children's interactions with the multimedia titles will also provide allow the claims regarding children as digital natives to be examined. Consideration will be given to the software design and the issues which these might raise with regard to children's experiences of multimedia within the primary school context.

- How do children interact with a multimedia text designed for the school context?

- How do children interact with a multimedia text designed for the home context?

A more specific examination of children's interactions with each of the texts will focus on the notion of new literacies and may be expressed as the following question;

- How do children's interactions with multimedia texts relate to the notion of new literacies?

The process of analysing interactions of children with multimedia text presents a complex challenge. In order to closely examine all of the actions, responses and conversations involved in the process of interacting with a text it will be necessary to capture all possible elements from mouse click to facial expression. Observation and field notes alone will be insufficient and although the use of one or more digital video cameras would generate a moving image record, there are other difficulties with synchronicity between the cameras and the ease at which each subtle action and associated responses can be identified and viewed simultaneously. The research project makes use of an original and innovative method of analysing the layers of meaning evident in the multifaceted and intricate processes associated with 'reading' multimedia texts. The design of the video capture software (MediaCam AV) and the way in which it has been employed in the research project to support and enhance the analysis of video data is examined in chapter three.

It is anticipated that not all interactions with multimedia text may be relevant to discussions related to new literacies. After the initial examination of observational data, it

will be necessary to focus attention more directly upon instances where understanding of new literacies may be explored and developed.

The primary purpose of ICT within the primary school context, as outlined within the National Curriculum documentation is to develop pupil's ICT capability.

> 'As a general requirement, teachers should provide pupils with opportunities to apply and develop their ICT capability in all subjects (except physical education and the non-core foundation subjects at Key Stage 1). For each subject, these translate into specific, statutory requirements to use ICT in subject teaching.'
>
> (DFEE 2000).

This is designed to provide the necessary foundation for an individual's integration into society. It presumes that the well-being of society is dependent upon economic growth and prosperity which require the workforce to learn twenty-first century skills (DfES 2003). Arguably, the ICTs which emerged in the late twentieth century provide the infrastructure for a globalised economy (Castells 2000:101) and the Government maintain that it is the ability to understand and engage with ICTs which will allow the nation to compete globally (Blair 1997:Foreword). As a result, schools have received substantial funding to equip classrooms with computers, networked systems, interactive whiteboards and broadband connectivity. In the recent review of the curriculum by Rose, greater emphasis has been given to ICT within the primary curriculum acknowledging that the pace of change has been faster than originally anticipated when the National Curriculum was introduced in 1988 (Rose 2009).

There appears to be a greater digital divergence between the two contexts. Proponents of the 'digital native' debate would argue that whereas ICTs have changed the way we live, the school, by comparison, has not embraced the use of ICT (Prensky 2001a: 66-67). Despite the existence and popularity of digital video games in the out-of-school context and a growing interest in their educational value, there is little evidence that these have found a place within the primary school curriculum. As forms of multimodal text, digital video games would also provide children with opportunity to develop their ability to 'read' post-typographic forms of literature.

Although Prensky's argument has received great interest, there is a need for more research in order to examine critically the claims made. There is an assumption that all children are adept in the use of ICT because they have all been born into an ICT-rich culture, yet there is little in the way of empirically-based research which would support or contradict this assumption. Similarly, video games are beginning to gain credibility as educational resources for the classroom (BECTA 2002, McFarlane, Sparrowhawk & Heald 2002, Squire 2007) although there is still much uncertainty and disagreement when examining the computer game as text and the construction of narrative through the player's interaction with the game.

This chapter begins to explore the ways in which ICTs have affected our lives and critically examines the concept of children as 'digital natives'. It will introduce the arguments surrounding the emergence of new literacies and discuss the current status of multimedia texts within the school. Dominant concepts on the potential of computer games for learning will be identified and critically appraised. The key issues arising from these themes will be highlighted and form the basis for the literature review in the following chapter.

1.2 The growth of technology

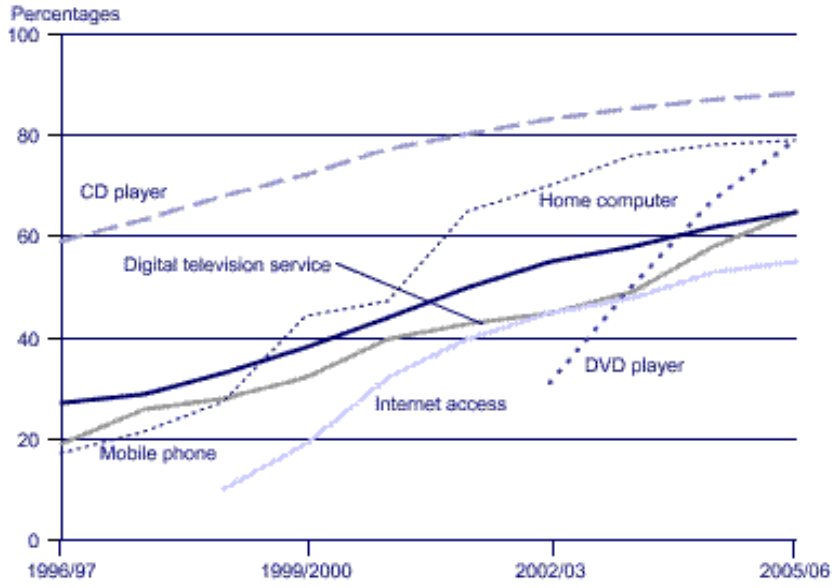
During the last quarter of the twentieth century and in the years since, the emergence of, and developments in, microelectronics and digital technology have been unprecedented. Technological development been extremely rapid, global in nature and ubiquitous with world-wide connectivity and mobility of use, resulting in what Castells describes as a 'pervasiveness throughout the whole realm of human activity' (2000:5). Children as well as adults may now communicate in a variety of ways and select from a range of media formats in order to express and transfer their ideas.

The statistics presented by Shepherd (see figure 1) indicate that over 50 percent of homes have access to the home computer and the Internet. Since 1998 the increase in access to computer technology within the home has continued to rise rapidly. According to Livingstone & Bober (2005:2), approximately 75% of 9-18 year olds have gained access to the Internet at home, 36% of which have more than one computer. More recently, the Office for National Statistics (ONS) stated, 'sixty-three per cent of all UK households had

a broadband connection in 2009, up from 56 per cent in 2008. Of those households with Internet access, 90 per cent had a broadband connection in 2009, an increase from 69 per cent in 2006.' (2009). These statistics are supported by a recent survey undertaken by the Oxford Internet Institute who reported that 'In 2009, 70% of British people said they used the Internet and only 5% of Internet users did not have household access' (Dutton, Helsper and Gerber, 2009:8).

There is a mounting array of devices which fall within the description of digital technology, for example, hand-held devices such as mobile phones, personal digital assistants, game consoles, portable games systems, digital television, DVDs, MP3 players and digital-capture devices such as cameras. In some instances a convergence of technologies is resulting in devices which possess a multitude of functionalities. One example is the smart phone which can provide the user with Internet access, office software, audio in addition to still and moving image capture, video conferencing opportunities, multimedia messaging and telephone capabilities.

Figure 1: Households with selected ICT (Shepherd 2007:2)



A wide range of connectivity options including wireless, GPRS, 3G and Bluetooth, offer opportunities for communication with other individuals in many formats. The report by Shepherd estimates that between April 2003 and April 2006, access to the Internet via the

mobile phone has increased by twenty percent and two-thirds of adults in Great Britain were sending text messages with just over one quarter sending images from their mobile phone (Shepherd 2007:4). Shepherd continued to add that a relationship existed between mobile phone ownership and the age of the individual: those under the age of 25 were most likely to possess a mobile phone in order to contact friends and family via text whilst individuals aged 55 and above mainly possessed a mobile phone for emergency purposes. Although this data may be an indication of the growing volume and complexity of technology available to individuals across the United Kingdom, it does need to be treated with caution. Access to technology does not automatically mean that those who have it are able to, need to, or feel motivated to use it. For example, it is entirely possible that only a small number of people use the full range of a smart phone's functionality. Similarly, a household may contain a home computer but access to the Internet does not necessarily translate to high or sophisticated usage. The convergence of technologies can result in some blurring of boundaries between the different types of equipment listed. For example, digital television and DVDs may be viewed on a computer and Internet access may be gained through a digital television connection. This could result in one device registering on more than one set of data and giving the appearance of more varied use of technology for each household than in reality.

The data were drawn from approximately 6,500 households randomly selected from across the nation. This will give some insight into each household's access to various types of ICT but it will be subject to the limitations of large-scale data-gathering exercises, where opportunities for more detailed responses offering explanations and perspectives are limited. Consequently, it should not be assumed that all children have access to the technologies listed by those who have completed the questionnaires or that use is made of all the technologies to which they have access. In one sense, children may be represented as digitally aware and immersed in technologically-rich home environments which in turn may generate experienced if not expert users of ICT (Prensky 2001ab, 2006, Veen & Vrakking 2006). Alternatively, the statistics may be misleading because children's access may not be universal. Further examination of children's access to, and use of, ICT at home and school is the focus of the following chapter.

1.3 Children as 'digital natives'

Over the last thirty years, the variety of ICTs has increased. At the same time, arguments have been developing regarding the ability of the teacher to meet the needs of the learner. For example, Prensky (2001a, 2001b, 2006) has, pointed out that children have been exposed to, and immersed in, digital technology since birth and has argued that there exists an increasing divide between those who have grown up with technology and those who have not, due to their age. The former, Prensky refers to as 'digital natives' and the latter the 'digital immigrant' (2001b, 2006:28). These terms are significant as they have been used with greater frequency since their introduction by Prensky. However, there is, as yet, no indication that this perspective has been widely accepted. Consequently, children's experiences of ICT deserve further examination in the light of the 'digital native' debate to analyse and evaluate the claims made.

Prensky argues that the difference between student and teacher poses 'the single biggest problem facing education today' (2006:29) with the teachers effectively speaking a language which is unintelligible to the students of the digital age. A growing number of researchers have presented similar arguments to Prensky's, albeit with alternative terminologies to describe the 'digital native' (2001b, 2006:28). For example Veen refers to such students as 'Homo zappiens' and argues that they are a direct result of the changes experienced in society which are created by technological developments (Veen & Vrakking 2006:5). Just as Prensky questions the suitability of the education provision within the school environment, Veen & Vrakking highlight the necessity to reconsider the educational experiences offered to children of the digital age. The 'Homo zappien' has grown up using a variety of technological devices and is able to communicate and process information in a manner which is distinct and entirely different from generations before. The speed of technological change and the continued integration of ICT devices within the home may add some weight to Veen & Vrakking's arguments. It is possible that children arrive at school with greater levels of technological experience than in the past. However, experience does not automatically generate expertise. Veen & Vrakking develop their argument further and maintain that the 'Homo zappien' demands content which is media-rich, interactive, immediate in its feedback and student-centric rather than teacher-reliant.

Similarly Tapscott, who introduced the term 'Net Generation', claims that 'children are more comfortable, knowledgeable, and literate than their parents about an innovation central to their society' (1998; 1-2). Second nature to the student of the digital age is ' multitasking, always-on communication, and a participatory rather than consumerist engagement with multimedia ' (Hartman, Moskal, & Dziuban, 2005:63). It is possible that the speed of technological development has given rise to a generation which is comfortable to experiment with the various gadgets, interfaces and digital machinery associated with ICT, whereas generations before are more cautious and perhaps less inclined to do the same. Nevertheless, the question arises as to whether these oft-cited differences exist in reality and whether children may be considered to be 'digital natives'.

If children have different experiences, expectations and ways of working as a result of their engagement with digital technologies it follows that teachers and their methods of teaching may need to adapt. Barnes et al. claim that the change in digital technology is 'forcing educational institutions to deal with a new population of learners' (2007:1). Other researchers suggest that students of the 'Net Generation' demand a wider range of communication formats to avoid boredom (Oblinger & Hagner 2005) and need interactive environments and independent, self-directed learning opportunities (Glenn 2000). In all instances, but particularly in the arguments presented by Prensky, a polarised perspective is presented with the out-of-date 'digital immigrant' to one side and the new, contemporary 'digital native' to the other. Prensky states that 'if Digital Immigrant educators really want to reach Digital Natives – ie all their students – they [educators] will have to change' (Prensky 2001b:6). As digital technologies become commonplace in every aspect of our lives, the argument for the continued integration of ICT within the school context appears to have little opposition. Bayne & Ross provide a useful summary of the way the 'digital native' and 'digital immigrant' are described within popular and academic literature.

As summarised by Bayne and Ross (2007) perceptions of digital generational divide suggest that the student is, amongst other qualities, forward-looking, youthful, fast-paced and process-oriented whilst the teacher is slow, backward-looking, product-oriented, old and perhaps obsolete. Logically it would seem inappropriate to view the generation of the

teacher and the generation of the learner to be opposites. This false duality would assume that there are no variations between the two polar opposites. Children, as individuals, will have varying experiences and interests in the use of ICT and this could result in differing abilities. The existence of ICT does not automatically result in children becoming experts in its use any more than the existence of the written word automatically generates authors. The argument presented here is that there is no strong, polarised divide and there are individuals born within the age of digital technology who are not inclined or able to engage with computers and the associated gadgetry of the digital age. Similarly, there are individuals who invest heavily in both time and money to access and develop expertise in the various devices and software despite being within the digital 'immigrant' generation. This research project does not assume that children possess expertise in the use of ICT. Children's experiences of multimedia text will be elicited through questioning them and observing the way they interact with multimedia titles. It is important to undertake this research project in order to challenge preconceptions regarding children's ability in the use of ICT.

Native	immigrant
student	Teacher
fast	slow
young	old
future	past or 'legacy'
multi-tasking	logical, serial thinking
image	text
playful	serious
looking forward	looking backward
digital	analogue
action	knowledge
constant connection	isolation
	Bayne & Ross 2007:2

There is another problematic element of the digital native/digital immigrant debate. The view that all digital technologies are desirable and worthwhile is by no means certain. A digital format may not always offers a new, improved or more appropriate means of working. Sometimes a non-digital approach can be more effective and desirable or merely offer an alternative route to the same end. For example, the replacement of paper-based

books by electronic versions has not yet occurred or is slow to do so. The potential to carry hundreds of novels in one small handheld device may be attractive for some individuals but reading from a brightly-lit screen has its limitations. Perhaps the existence of a new generation of 'digital native' is yet to be established. Researchers such as Owen (2004), Bayne & Ross (2007) have questioned the concept of the 'digital native', 'net generation' or 'Homo zappien'. Owen points out that although the term 'digital native' is useful as a means of encouraging debate, it does not stand up to inspection largely because children's use of technology is inflated by Prensky and other critics who suggest the young are the new technologically-adept generation. The notion that age alone determines the ability or inclination of an individual towards the use of ICT is questionable but he suggests that it is 'adult professionals who make more use of ICT than anyone else' and that a teenager's use of the mobile phone is merely a natural extension to the use of the pre-digital telephone with SMS text being a cheaper alternative to voice calls. Yet Owen's perspective is equally subject to criticism as his views are less empirically-driven. Quite simply, not enough is known about children's experiences of ICT to ascertain whether Prensky's views can be substantiated beyond the anecdotal. In part, the aim of this research project is to gather appropriate data in order to engage with the 'digital native' debate and examine whether there is any substance to the claims made by Prensky. Empirical data will be gathered in a field of enquiry where theoretical constructs might be illuminated by case studies which represent the use of ICT in the primary classroom.

Livingstone & Bober's research reports that the use of the Internet is not universally adopted by those who would fall within the 'net generation' category. Factors such as age, gender and socio-economic status affect the use of the Internet and create a 'new divide' (Livingston & Bober, 2004: 395). This perspective appears to be supported by Shepherd & Bryson's interpretation of surveys (2007). They suggest that the average weekly salary, the level of education, the nature of work undertaken within each household and gender all affect the likelihood of Internet use. This study appears to support the argument presented by Owen (2004) that male graduates, working in a profession earning high average weekly salaries by comparison to other households, are more likely to have access to, and make use of, the Internet. Shepherd & Bryson (2007) suggest that households with dependent children are also more likely to have access to the Internet and, at present, Internet usage

declines with the increasing age of the individuals within a household. The increased likelihood that households with dependent children will have access to the Internet may be due to the computer and WWW access being viewed as a necessary resource for their learning. This point is developed in Chapter Two when home-school computer access and use are discussed. Such perspectives are critical for this research project as they may inform interpretations made of the collected data associated with children's experiences of multimedia texts in the school. There are clearly a great number of influential factors and variables which affect children's experiences of multimedia text and the analysis of any data collected would need to take these into consideration. Kennedy et al. emphasised that students may become proficient in the use of technology for social, leisure and entertainment purposes, but such skills may be context-specific and not necessarily relate or translate to the wider context of technological applications and activities which include study, learning and research (2006:4). Skills, however, are one element of the child's experience and other aspects such as attitudes, perceptions and preferences should also be considered. It is necessary to examine the child as a 'whole' and acknowledge that they will experience multimedia texts in more than one setting and that experience itself may result in more than proficiency.

It is therefore important to gain some understanding of children's use of multimedia beyond the school to ascertain the range and depth of their experience. This would correspond directly with the first research question and its associated subsidiary questions identified earlier in this chapter. Examination of children's experiences of multimedia would then naturally lead to questions regarding the way in which children interact and interpret such texts. This connects with current debates regarding the existence of 'new literacies' which are introduced in the following section and discussed in more depth within Chapter Two.

1.4 New literacies

Lankshear & Knobel (2003) provide a brief history of 'literacy' and highlight its recent appearance within educational practice.

> 'It is hard to credit that just two or three decades ago the term 'literacy hardly featured in formal educational

> discourse. Instead, there was a long-established field of 'reading' This was mainly grounded in psychology and associated with time-honoured methods of instruction for teaching new entrants into school how to decode printed text and, secondarily, how to encode text.'
>
> (2003:3)

The process of reading and writing cannot be separated from the various non-print elements and processes such as talk, actions, context and the various tools associated with the act (Lankshear & Knobel 2003). Literacy, in this sense is open to wide interpretation and would be subject to continuing redefinition according to the socio-cultural context (Marsh & Thompson 2001:268). The introduction of an additional variable, such as ICT, offers more contexts, tools and elements to the already complex practice of literacy. As both ICT and literacy are developing and changing continuously it is difficult, if not impossible, to provide a singular and concise definition which encapsulates the complexities of literacy. It is also important to note that literacy is not always subject to the influences of ICT and that literacy may also be active in influencing new forms of ICT (Andrews 2004).

The changes brought about by ICT have transformed the textual environment and generated methods of communication which challenge well-established perspectives of literacy (Unsworth 2001:7). These perspectives focus upon language in a singular and stable form bound by rules (Cope & Kalantzis 2000:5) such as grammar, semantics and sound-symbol relationships. The existence of ICTs allows complex combinations of images, signs, words, sounds and symbols: 'language now comprises a wider range of semiotic systems that cut across reading, writing, viewing and speaking' (Snyder 2002:3).

From the summary of the research on 'talking books' in the following section it can be seen that research on the design and use of multimedia texts for use school is centred upon the development of reading skills involving the decoding of words, and sentences. This may be described as the traditional, or perhaps more accurately the dominant perspective of literacy. In comparison to typographic texts, the process of 'reading' a multimedia text has been given little attention.

Debates surrounding 'new literacies' (Lankshear & Knobel 2003:24) or 'multiliteracies' (Cope & Kalantzis 2000:5, Unsworth, 2001:7-20) are seeking to make sense of the growing complexities associated with ICT-enhanced methods of communication. Developing theories which provide adequate explanation for the construction, transmission and interpretation of multimodal texts are dominated by the conventional mode of language-based theories (Kress 2000:153). The challenge, therefore, is to examine new forms of communication to gain an understanding of how meaning is conveyed. This is of critical significance to the research project and will therefore be discussed in greater depth within the following chapter.

1.5 Multimedia stories within the school context

The term 'multimedia' may be viewed as highly contested and perspectivist. Media is the plural of medium and the addition of 'multi' as a prefix to media seems unnecessary and confusing. In its simplest form it is the combination of two or more media formats, where a media may be identified as a range of elements such as image, words, sound, animation and movies. Mayer defines multimedia as 'the presentation of material using both words and pictures' (2001:2) whereas Heppell suggests that multimedia 'describes the possibility that a computer might at last be able to deliver all the elements that we take for granted in the rest of our everyday lives: speech, text, graphics, video, music, sounds, data' (1994a:152). The former definition extends to the spoken word in addition to moving and still image but the computer is not perceived as a necessary ingredient. Heppell is much more specific and has associated the term directly with the existence of a computer. He continues to argue that real life experience is multimedia and we do not describe it as such but the multimedia computer is deemed worthy of this special terminology (Heppell 1994b).

By Mayer's definition, multimedia in the format of newspapers, cinema, printed text and perhaps even theatre performances has existed before the advent of microelectronics and digital technologies, but the term has been used more widely as computers have become increasingly prevalent within our everyday environments. For example, the emergence of games technologies such as the Playstation, Xbox, handheld consoles and home computer systems offer multimedia authoring capability. It is argued here that in the contemporary

world, multimedia has become almost synonymous with digital technology and the previous existence of non-digital formats has largely been forgotten or overlooked. Perhaps, as Heppell suggests, the multimedia computer provides the means to using and combining media in ways which previous forms cannot and therefore warrants the term multimedia (1994b).

The unique features of digital multimedia, as opposed to other formats, involve the convergence of multiple elements within various constructs such as web pages or video games. The ability to link multimedia elements together through the use of hyperlinks, or more accurately, hypermedia result in what may be described as interactivity between the reader and the multimedia resource (Fahy 2005:5). This distinction is particularly valuable as it highlights the interactivity connection between the design of the text and human action. This relationship between reader and multimedia text will be examined in greater depth within the next section. The participatory nature of such texts can be conceived in many ways which challenge the conventions of narrative structure and the role of the reader.

Hypertext and hypermedia may increase the information capabilities of text by introducing linkages between content resulting in a web of information. Books may possess non-digital versions of hypertext through the placement of cross-referencing systems but in such instances, retracing the journey or moving quickly from one point to another may be difficult and time-consuming. Digital hypertext often allows the reader to move forwards and backwards between the links and effectively traces the journey taken by the reader. With the advent of multimedia, this capability is extended to incorporate the various forms of digital media now available. These themes are particularly relevant to this research project as they provide the means of constructing new, media-rich forms of literature which challenge existing structures and the dominant concepts associated with literacy. These themes will therefore be subject to further discussion in the following chapter and will be examined more closely when children's interactions with multimedia texts are analysed in relation to the notion of new literacies.

The speed of processing and the capacity for stored data has increased the performance and potential of multimedia design resulting in more complex and detailed rendering of

the graphical interface, alongside faster and increasingly sophisticated feedback during interaction. Used within the context of gaming software, players are able to design cities, fight battles both historical and fictional, move within three-dimensional environments and interact with other games players from around the world.

At the same time games technology began to develop, multimedia technology began to filter into the educational context and in the early 1990's multimedia computers arrived in schools. The Compact disk read-only memory (CD ROM) enabled a multimedia software market to proliferate and CD ROMs designed for educational activity became available. These offered interactive multimedia resources for classroom use and amongst the various titles were CD ROM stories sometimes referred to as 'talking books'. It is evident from examining research literature on 'talking books' that traditional literacy remains an important element in the design of multimedia text and the education of the child, yet it is also necessary to gain understanding in the literacy involving post-typographic texts and the way children interact with such literature.

The early examples of talking book software were designed for both home and school market and offered a product which was both educational and entertaining. This genre generally contained animation with spoken text providing narrative. Some elements of interactivity triggered the sound, animation or navigational links. In many instances, they mimic paper-based books by operating in a linear manner with 'pages,' including a contents and cover 'page'.

By using the mouse, it is possible to activate the interactive hyperlinks which, in turn, allow the narration of words, sentences and paragraphs. This means that the story may be read and re-read by triggering the relevant pre-recorded sound files of the narrator. The reader therefore possesses some control over the interactive content and can choose to hear or see the various multimedia elements upon the click of the mouse button. As the hyperlinks are usually hidden, their activation relies heavily upon the natural curiosity of the child and to some extent, prior knowledge of graphical interfaces. Apart from reading the story, the child has no goal, or set of goals, to complete as would be the case in a game and makes no decisions regarding the events portrayed on each screen, such as character actions and interactions. Talking books such as these cannot be classified as digital games.

Interactive features are located through the child's exploration of the screen and made visible when the mouse's screen pointer turns to a hand indicating that something can be activated. The range and depth of exploration can be limited and is sometimes questionable. Burrell & Trushell (1997:3) examined the first screen of '*The Tortoise and the Hare'* created by Brøderbund in 1992 and identified 17 of the 24 interactive elements as being incidental rather than supplemental to the story. The interactive features, however entertaining and motivational, appeared to encourage children to interact with the technology rather than the story itself. One further element of interactivity lies in the context of the software's use. When children are placed in pairs and work together at the computer it is possible that conversation between them would provide opportunity to explore and develop their individual and shared understanding of the story, characters, setting and the various incidental sub-plots which exist through the interactive elements.

According to Gee, multimodal texts are those which mix words and images with the latter often communicating something different to the words (2003:210). This has been a fundamental design feature of the contemporary picture book with complex, multilayered texts arising from sophisticated interplay between the typographic text and the image as a visual text. As pointed out by Gee, 'modes and multimodality go far beyond images and words to include sound, music, movement, bodily sensations and smells' (2003:14). The talking book does not make use of the full range described by Gee. However, the construction of an electronic multimedia text does go beyond the combined effects of the static word and image.

For children the ability to hear a story read to them supports their developing understanding of word-sound relationship, with the purpose and meaning of words being made more apparent (Higgins & Cocks 1999). Where images on the pages of a paper-based book are static, the images on a talking book may be animated and activated on the click of a mouse. Children may become more involved with a story represented in multimedia format and gain increasing familiarity and understanding of the written text (Matthew 1997). Other researchers have highlighted the way in which the entertaining content has supported the teaching of elements, such as word recognition and phonemic awareness (Medwell 1996, Matthew 1997, Lewin 2000). The supportive design facilities

provide independent access to words, an enjoyable experience for non-readers and a positive attitude towards traditional reading materials, particularly in relation to boys and reluctant readers, (Adam & Wild 1997). Matthew (1997) and Lewin (2000) reported on the way in which talking books allowed children to develop their understanding of the link between speech and written text.

Additional studies such as the Talking Books Project of 1995-6 which were documented by Medwell (1998) reported on the significant gains in both accuracy in, and understanding of, reading with an increase in some children's attitude and confidence; in particular, the boys involved in the study appeared to show the most significant gains in word accuracy. Studies conducted by Miller, Blackstock & Miller (1994) suggest that the potential for reading comprehension can be significantly improved through the use of electronic texts. Despite these positive reports there appears to be little development in interactive multimedia texts within the primary school context. By comparison, video games have advanced in their diversity and complexity and have become commonplace within the home environment. Although this may suggest that children are able to select from a wide range of video games at home it is possible that popularity alone does result in children gaining access to such software. Similarly, it is not possible to ascertain the nature of children's experience within the school without gathering relevant data.

1.6 Computer games and learning

During the course of this research, the terms 'computer game', 'video game' or 'digital game' will be used to identify games played on console, personal computer or any alternative electronic device unless referring to the work of other researchers and theorists where one term has been used in preference to another. Essentially, video games refer to those played on gaming consoles that allow progress to be saved at specific intervals, for example on successful completion of a level. Computer games are played on a personal computer and they allow progress to be stored at any point. With the convergence of technologies, the distinction between the 'video' and the 'computer' game has become blurred and the term 'digital game' may be used to embrace all games regardless of the device through which they are accessed.

Digital games alongside other forms of media such as television have, according to Buckingham (2003), become a major cultural form. The BBC announced that 'People in the UK now spend more on computer games than on renting videos or going to the cinema' (2002). Newman (2004:3) reported that the 1999 sales figures for video games in the United Kingdom exceeded those for videos. Buckingham (2003:5) has argued that interaction with media such as computer/video games, television, cinema, magazines, advertising, and the Internet constitute the majority of children's time. As such, Buckingham suggests that media shapes our view of reality and refers to arguments which claim that it has taken the place of 'the family, the church and the school as the major socialising influence in contemporary society.' As early as 1984, Turkle argued that the playing of computer games has the potential to alter children's self-identity, world views and mental processes; an argument which has since been reiterated by Heppell (1994a). Claims such as those referred to by Buckingham (2003) and presented by Turkle (1984) and Heppell (1994a) need to be treated with some caution. Buckingham's perspective encompasses all media and he rightfully indicates that to suggest these are all-powerful would be inappropriate. Influential as the media may be, it is arguable whether it occupies such a status in the lives of all children. Certainly, it is more pervasive and omnipresent than media formats of the past and, perhaps more importantly, it invites and requires participation and interaction in ways which are distinct from broadcasting and publishing (Negroponte 1995, Jenkins, 2008). Whilst watching a film or the television requires an audience, new media such as the digital game can only exist with the participation and action of the player. Interaction appears to be one of the defining features of multimedia text used by the children, whether at home or at school, and will be examined in greater depth in this chapter.

The popularity of computer games has prompted interest in their use within education. For example, in the DFES publication *Harnessing Technology: Transforming Learning and Children's Services*, The then Secretary of State for Education, Ruth Kelly stated that:

> '[I]maginative use of ICT should help engage more learners in the excitement of learning. Borrowing ideas from the world of interactive games, we can motivate even reluctant learners to practice complex skills and achieve much more than they

> would through traditional means. New technologies can attract new kinds of learners into lifelong learning.'
>
> (2005:Foreword)

Yet, computer games within the educational context existed prior to the vast home entertainment business. Simulations were first used to train, educate and test ideas in a safe and relatively economic environment, for example, flight simulators have been, and still are, used for the training of pilots. Simulations have therefore found their origin in a non-gaming context and, according to Joyce, Calhoun & Hopkins, are in fact 'an application of the principles of cybernetics, a branch of psychology' (2002:137). A further distinction between simulations and other computer games is the lack of any explicit goals within the former. Nevertheless, as with computer games in general, the player may develop personal targets and therefore generate implicit goal-oriented activity regardless of the game structure.

Critical evaluations surrounding the success of the computer game in motivating individuals and engaging attention have pointed towards the rich and attractive visual interface known as 'eye-candy' (Prensky 2006:86) which 'sucks the player in' (Poole 2000:191); the fun factor which is 'part of the natural learning process in human development' (Bisson & Luckner 1996:112); the interactivity (Prensky 2001a:157) and immersive nature of the experience (McMahan 2003:68). McMahan makes a careful distinction between the diegetic level (immersed in the game's narrative) and the non-diegetic level (the love of the game and its strategy). This is a helpful distinction as there are instances within a game when the narrative may not progress or unfold and yet the player/reader is still interacting with the tasks and challenges presented. When observing children interacting with multimedia texts it may be possible to differentiate between the two interactions and examine the dynamics between game-play and narrative. Although the diegetic and non-diegetic levels refer to different aspects of the computer game, the process of immersion due to narrative and strategy may be viewed in the same way; as a participatory activity which can be enhanced by a strong visual representation but is not dependent upon the existence of a graphical interface. Some readers of typographic text

may have no need for images and sound and will, instead, visualise elements of a story such as the characters, setting, events and action for themselves (Ryan 2001:120).

The term ‘interaction’ and variances in its form such as interactive and interactivity have been used in this chapter. When referring to computers and ICT in general, ‘interaction’ is often present in the discourse. The concept of interactivity is, however, difficult to define as it may be applied to multiple contexts, used in a variety of ways and describe a wide range of circumstances. As such, it may be regarded as a ‘fragmented, inconsistent and rather messy notion’ (Rose 1999:48). In the context of this research project, interactivity involves the relationship between the player and the game or the reader and the text. The ability to influence and affect events portrayed within the game give the impression that the player is instrumental to the outcomes, regardless of the limitations which exist due to the parameters of the programming. The notion of ‘narrative’ presents another element of interactivity which allows the player or reader to connect with the game as a text. This, in turn, has the ability to trigger emotional responses in the reader and a sense of involvement in the development of the plot.

As pointed out by Prensky (2001a), the reading of word and image with mouse clicks used to activate hot spots or advance the screens is the simplest form of interaction; a model adopted by talking books, for example, Brøderbund’s Living Book series (2001:126). Mouse clicks therefore represent interaction between child and screen at its simplest and involve what may be described as ‘generalised, repetitive and non-adaptive feedback’ (Sims 2000:45). Even so, the act of selecting a specific point on a screen would be instigated for a reason whether the actions are random, exploratory or purposeful. For example, when exploring the graphical images represented on a screen a child may click the mouse when the cursor is placed over various locations. This action may be an act of natural curiosity in order to discover any hyperlinks with the motivational reward of feedback, Random mouse clicks may reflect a lack of interest, understanding or perhaps a sense of frustration as the child clicks on areas of the screen without any sense of purpose. The mouse click itself may be regarded as a low level interaction; however, in the context of other activity it may be indicative of the child’s experiences and perceptions of the text.

Furthermore, the ability to be in command of the speed at which the narrative unfolds, to return to earlier sections or replay specific events, offers the reader a certain amount of control over the software and therefore time to engage with, and comprehend, what they are experiencing by way of narrative or game-oriented task. Data gathered for this research will therefore be analysed to identify where mouse clicks have occurred. This type of interaction alone would constitute a rather repetitive and basic level of activity but the click of the mouse is a very necessary action which activates features and content. This, in turn, facilitates understanding of the relationships between reader and text which may be considered to be more complex in their nature. It is therefore important to record the time, location and outcome of each mouse click in order to provide the greatest possible detail surrounding the activity of the reader in relation to the text.

The design of the games environment provides opportunity to learn as the game is played. The player becomes increasingly expert and adept whilst the demands placed upon them become more challenging; a process described by Prensky as 'Learning by Doing' and requires active participation in order to interact effectively with the game design (2001a:158). This is coupled with the opportunity to make mistakes and learn through a trial and error approach, the player either discovers, or is guided, through a series of challenges to avoid excessive frustration (2001a:158-160). In order to examine whether children actively participate and in what manner it will be necessary to capture not only the mouse-clicks and cursor movement but also the child's reactions to the outcome of actions including any discussions with another child.

Computer games may demand not only a cognitive level of engagement but also a physical, emotional and, in some instances, a social investment from the player. They may also demand a substantial time commitment with some games requiring in excess of 100 real-time hours to complete. Prensky refers to the term 'hard fun' which he attributes to researchers at the Massachusetts Institute of Technology (MIT) Media Lab (2001a:108). Rather than perceive fun as amusement or a trivialised act of indulgence, Prensky labours the point that fun can also be a product of things we work hard for and value. Kafai also highlights the emotional rewards and the individual commitment involved in successfully completing a challenge when describing hard fun as,

> '..the kind of motivation that combines the pleasure of accomplishing something with the intense concentration involved in achieving it. Hard fun is intense concentration coupled with passion'
>
> (1995:290)

This is an important distinction when describing experiences gained from computer games. If, as Prensky suggests, fun is interpreted as a frivolous action then the association of computer games with what may be viewed as serious activity is unlikely to occur. Learning, education and schooling as serious pursuits would therefore have little in common with the perceived frivolity of computer games despite the fact that learning and fun are not discrete components This logic seems to be supported by findings from the BECTA survey '*Curriculum Software Initiative: Computer Games in Education Project'* (2002). Responses from teachers highlighted their reluctance to consider the use of gaming consoles in the classroom due to their association with fun generated through and depicted by marketing campaigns. As part of this research project, the question has been raised as to how children interact with multimedia texts designed for the home and the school. It is important to examine the fun element in both designs and how this relates to learning. Of particular interest will be the views of children regarding the use of video games in the school context. Research undertaken by BECTA (2002), McFarlane, Sparrowhawk & Heald (2002) and Squire (2007) have all reported positive results and valuable learning experiences with a heightened sense of pupil engagement. However, generalised findings from these studies also indicated that 'measuring' learning from computer games is problematic as the perceived enhancements tended to relate to the process rather than the product of learning. Furthermore, computer games often contained irrelevant and distracting content which were surplus or unnecessary to the lesson concerned.

The transfer of video games from home/entertainment to school/education is not straightforward yet if children are experiencing more sophisticated and challenging multimedia texts at home it is necessary to examine the possible implications for the primary school context. There are a number of challenges and obstacles which raise further questions regarding the design and development of computer games as well as the

formal learning context. When examining 'practical barriers to the educational use of video games' Egenfeldt-Nielsen refers to the 'short lessons, physical space, variations in game competence among students, installation, costs, and teacher preparation time' hindering the use of games (2006:5). Certainly, the organisation of a school day may involve a number of discrete lessons and these are often devoted to specific subject focus. Game play may involve a substantial time commitment for both student and teacher. The limitation of time due to timetabling of subject, room and effectively the learning resources may serve to impede or prevent a suitable level of engagement with the game. This, in turn, may result in little or no advantage to learning. Such constraints may be reduced by considering the nature of the taught curriculum and the organisation of resources. Alternatively, or perhaps additionally, the game design may require further consideration in the light of the classroom limitations. For example, shorter, more focussed tasks could be developed which still adhere in some way to the principles outlined by Prensky (2001a) and Gee (2003). Unnecessary content created for pursuits that are more 'leisurely' could be reduced and focussed towards the necessary curriculum.

Teachers involved in both the BECTA (2002) and McFarlane et al's projects (2002) discontinued the use of computer games after the close of the project despite the recognition that children gained valuable learning experiences. This conclusion suggests that the various challenges outlined here perhaps outweighed the advantages and, at present, the use of computer games within the classroom environment is unlikely to occur unless the game design or the educational context, or perhaps both, evolve. The apparent tension between school and the use of games technology has, in part, provided the impetus for this project.

1.7 Conclusion

Educational discourse surrounding the introduction and development of ICTs in the classroom often suggests that it is necessary to examine and reconsider existing practice with a view to altering and reconfiguring ways of working. For example, challenges to concepts such as literacy have been presented where it is claimed that the process of communication is being altered through new means of composing, editing, transmitting, publishing and receiving.

Foremost in such debates are claims that those born since the late 1970's/early 1980's will be characterised as 'digital natives' as they possess different skills, knowledge and understanding having grown up with, and been immersed in, the culture of digital technologies from birth (Prensky 2001b:1). Further to this argument are voices which maintain that the school is technologically adrift and does not offer children a comparable experience to that which they gain at home.

To examine these themes in greater depth, the following chapter will critically analyse the literature base associated with children's experience of ICT at school and the current debates and theories regarding the nature of literacy with particular focus upon multimedia texts.

Chapter 2: Literature Review

2.1 Introduction

This review of literature will explore the four dominant themes which are integral to the research questions identified in Chapter One. These are children's experiences of ICT in the school and the home, new literacies in the primary school, the computer game as text and linearity in a digital environment. Although the research project focuses upon children's experiences of multimedia text within the primary school, the scope of the literature review includes themes which are relevant to the context of the research questions. Furthermore, in order to engage with debates surrounding the existence of 'digital natives', it is necessary to examine empirical research which may add substance to Prensky's argument (2001b, 2006).

Section 2.3 critically examines theoretical perspectives associated with the existence of new literacies partly influenced by changes in the practice of communication due to the use of ICTs. In the first instance, it is necessary to consider the nature of literacy and the way in which our understanding may be redefined in the light of media texts and multimodal forms of communication. Specifically, this research project will focus upon multimedia texts which contain stories. Section 2.4 and 2.5 will review the literature associated with multimedia stories such as computer games and will identify and discuss their distinguishing characteristics which set them apart from print-based versions. Key terms will be defined and particular attention will be placed upon the construction and the structure of narrative and the interactivity between reader and text.

2.2 The home and school perspective

It is appropriate to highlight the possible connections which exist between curriculum construction, cultural values and the use of the computer within the school context. The child occupies two main social settings during their formative years, namely the home and the school. Research such as that conducted by Mumtaz (2001) highlights the dissatisfaction of children and their lack of excitement when engaged mainly in word-processing activities at school. It could be argued that the use of the word processor within the school context signifies the privileged status of the written word within our culture

whereas the computer game is, perhaps, valued as a form of entertainment and therefore relevant to individual, leisurely pursuits outside the school context. The question arises as to whether games technologies are able to offer enhancements and advantages to the learning process and therefore increase the range and variety of ICT-related experiences available to children and teachers within the school context.

Since 1997, research studies have drawn attention to the apparent disparity in computer provision and use between home and school. Hollingsworth & Eastman (1997) completed a survey of 706 seventh and eighth grade students in a large Midwestern middle school to discover that even 'the most technologically literate schools are behind the culture curve.' (p50). Mumtaz (2001) examined the provision and experiences of children's use of computers within the home and the school. In total 322 children drawn from years three and five were involved in the study. The results suggested that the perceived gap between the two environments was growing. Mumtaz reported that children found the school use of computers 'tame' with word processing being the most frequently used application (2001:354). Children interviewed by Kerawalla & Crook (2002) highlighted the rigidity of the school curriculum as a significant factor in restricting opportunities to explore ideas and complete pieces of work at the computer. These findings were echoed in work completed by Downes (1999a) where children identified the freedom to choose the activity and less time restrictions as important factors in their enjoyment and engagement.

The apparent dominance of the word processor in the classroom context was reported by Underwood, Billingham & Underwood (1994), Drenoyianni & Selwood (1998) and Buckingham (1999). Whereas word processing appears to be the most popular use of the computer at school, gaming technology was consistently listed in research studies such as those completed by Kirkman (1993), Downes (1996, 1999b, 2002), Sutherland, Facer, Furlong & Furlong (2000) and Mumtaz (2001) as being the most popular use of the computer within the home environment.

In 1993, Giacquinta, Bauer & Levin suggested that children's use of the home computer occurs within a 'social envelope' (p 132) with children determining their own use of the computer, despite the influences of parents and governmental discourse. Parents may

purchase computers for the home because they view access to this resource as beneficial to their children education (Nixon 1998). Facer et al. reported that,

> 'While many of the children in our case studies were encouraged to use the computer to support schoolwork (as evidenced in the purchase of additional educational software packages and CD-rom encyclopaedias), a small number of parents were also encouraging their children specifically to develop their ICT skills and accordingly encouraging them to use the computer for tasks that they identified as aiding this process. This was manifested in tasks such as emailing family members, using the computer as a productive tool to make birthday cards or encouraging the children to use the web by pointing out websites that they may be interested in.'
>
> (2001:207)

This, they theorised, could be 'an attempt to acquire 'cultural capital' (Bourdieu, 1984)' by 'storing up expertise which is valued primarily in its relation to its future relevance' (Facer et al 2001:207). Nevertheless, children are active in determining their own purpose and use of the computer and amongst the many factors influencing their use of the computer are wider communities of practice, accessed via media such as the television, older siblings, their peer group and the Internet. If the engagement with computer games is a most persuasive cultural influence via the many social connections generated from the home context, children will actively seek opportunities to learn what digital games are and how they may be played. Furthermore, should parents be less skilled in the use of new technologies the children, as 'digital natives' (Prensky 2001a, 2001b), may be better placed to determine their own use of the computer despite any parental intention.

The integration and use of new technology within schools is extremely problematic and various suggestions have been offered which attempt to rationalise why this may be the case. As Prensky's 'digital immigrants,' teachers have been viewed as sceptics or technophobes. Alternatively, Kimbell has pointed to the anxieties of teachers due to league tables, inspections and performance management which effectively reduce their confidence to innovate and take risks (2000: 206-208). Within any school, the adoption of new technologies demands a significant level of risk-taking from teachers and

headteachers alike, with demands of time for the development of expertise and understanding.

A review of research, conducted by BECTA (2003), identified two overlapping categories of barriers which affected teachers' use of ICT; these consisted of 'external barriers' and 'internal barriers'. Lack of time, access to resources and effective training in addition to technical problems comprised the external barriers whereas insufficient confidence, resistance to change, negative attitudes and lack of perceived benefits all formed the external barriers. Internal barriers may be the most influential in the adoption of new technology (John & Wheeler 2008, Ertmer 1999) and arise through complex interactions with external barriers. For example, insufficient confidence may arise from, and be influenced by, lack of time and appropriate training (John 2005). Pupil expertise and confidence may exacerbate this by diminishing the teacher's confidence further and effectively reducing the likelihood of ICT use in the classroom (Dawes 2001). The traditional image of the teacher as the more knowledgeable adult is challenged. Whereas the home context may provide some opportunities for children to participate in their own areas of interest which challenge existing capabilities in the use of ICT, for example the playing of computer games, the school does not allow for anything similar. This could result in children using software which, although marketed as supporting the National Curriculum, require little expertise in ICT. These programs are simple to use and do not intimidate the teacher in terms of the knowledge required to operate the software.

The computer as a 'teaching machine' with drill and skill programs designed within a behaviourist model of learning is one such example. The computer as 'teacher' requires the class teacher to do little except organise the use of the software by selecting the children and perhaps launching the program. The software designer as the 'hidden teacher' controls the interactions of the child with the technology and therefore creates learning environments in the way they feel children learn or ought to learn. This software may also be described as 'closed' with the software acting as a tutor and the child limited in their opportunities for thought, and discussion (Fisher 1992). The design can be constructed on partially understood or inappropriate pedagogy with little intervention, technical expertise or organisation required. 'Closed' software may be equally attractive to the busy teacher

and the technophile, yet it assumes limited or no flexibility and does not make use of the power and potential ICT has to offer. In contrast to ‘closed’ software, ‘open’ software requires the content to be created by the children themselves and is viewed as a way of supporting meaningful learning (Squires & Preece, 1999).

The distinction between ‘closed’ and ‘open’ may be conceptually helpful but it places all software on a continuum between two polarities and may be misleading. For example, if children are not creating content, it does not automatically mean that the activity they are undertaking is limiting their thought or their discussion. A book does not require children to construct content yet, in the process of reading, children may need to think about, reflect upon and be prompted to discuss what they have read. The ‘open-closed’ scheme assumes that software which demands greater activity from the individual is also more challenging. The cognitive demands placed upon an individual are not entirely correlated to the open or closed nature of the software.

Papert argued that the potential obstacle to the innovative use of computers for educational purposes was cultural. At this point, he emphasised the wider societal cultures such as the technical-scientific and the humanistic as, at the time of writing, few if any classrooms possessed computers (1980). He continued this argument in a later publication after computer technology had made considerable developments and focussed some attention upon the culture of the school. Here, he describes the weekly visit to the computer room under the jurisdiction of one specialist teacher.

> ‘Thus, little by little the subversive features of the computer were eroded away: Instead of cutting across and so challenging the very idea of subject boundaries, the computer now defined a new subject; instead of changing the emphasis from impersonal curriculum to excited live exploration by students, the computer was now used to reinforce School’s ways. What had started as a subversive instrument of change was neutralised by the system and converted into an instrument of consolidation.’
>
> (Papert 1993b: 39).

Papert’s views regarding the school’s use of computers are often critical and he proposes what may be described as a utopia of techno-centric education. He views teaching and

learning within the school as being reminiscent of a nineteenth century transmission-based approach with the pupil a passive learner and the teacher an expert source of knowledge but this is not necessarily the case. Classrooms which do not possess a computer, or access to any form of ICT in general, can be innovative, interactive and involve children in an active process of learning. There is a sense of polarisation in Papert's philosophy which echoes that of Prensky's (2001ab). Papert's vision attributes a positive set of characteristics to the computer and a negative set to the school system and the teacher. The perspective taken in this research project is that there is much to be gained from the judicious integration of ICT into the school context. It is acknowledged that not all ICT-related developments in the wider context of an individual's life may be positive or desirable and it would therefore be inappropriate to include all ICT.

Papert's use of the term 'subversive' to describe the computer suggests that the practice of schools needs to be overthrown or undermined by the computer (Papert 1993b: 39). This would assume that the school is an inappropriate institution which perhaps oppresses the pupils and the computer is the means of liberation. This perspective appears to be heavily biased against schools and the education professional. There may be limitations and challenges associated with the formal schooling of children and the computer may offer new and exciting ways of teaching and learning but it would be inappropriate to suggest that the computer is the sole solution to such a complex problem. Just because computers offer alternative methods of teaching and learning it does not follow that these offer any advantages over existing practice. The formal educational system is subject to many direct and indirect forces, some of which have been mentioned earlier. There is a need to examine pedagogy in the light of new technologies but this should be informed by research undertaken in the field rather than from theoretical perspectives regardless of how persuasive they are.

By acknowledging that new technologies do not exist in isolation but are placed within a complex social and cultural system it follows that children's experiences and perceptions of multimedia text also need to be considered in context. Clearly, the home environment will have been subjected to a different set of factors to those of the formal, schooled context and this may affect not only the design of the software but also the way children

perceive and interact with such resources. Each circumstance surrounding the design and development of the texts may therefore reflect the social and cultural context for which each were created.

Although culture may be viewed as providing 'the very grounds for human communication and interaction' (Swartz 1997:1), or the result of human activity; encompassing knowledge, ideas and objects (Grenfell et al 1998:10), there is no consensus on the definition of such a complex term. As Jenkins points out, ''the very definition of what can legitimately be called culture – with a capital 'C' is one of the sharpest bones of contention' (1992:128).

Bourdieu presented the concept of capital as extending beyond that of economic to include a wider system of exchanges such as cultural and social capital (Bourdieu 1986:243, Grenfell 2008:102). As a sociological concept, 'cultural capital' extends to all goods, both symbolic and material, which are considered to be desirable and valuable within a specific social space. Cultural knowledge accumulated over time can also be viewed as cultural capital which would, in turn, impart power and status. In a 1977 translation of Bourdieu and Passeron's widely cited article '*Cultural Reproduction and Social Reproduction*' (1971) the term 'cultural capital' is defined as 'instruments for the appropriation of symbolic wealth worthy of being sought and possessed. For example, games technology may be seen to be without merit, however, the symbolic wealth associated with the skills for playing games technology in an informal space could be viewed as significant capital in the formal school space. Bourdieu's theories of cultural capital are not constrained by boundaries. They present themselves as useful tools for interpretive comment when examining children's experiences of multimedia texts and may be placed in relation to new technologies, software and learning spaces which are socially lived and constructed.

'Traditional' pursuits such as reading and writing typographic text are highly prized and, as such, have a higher status than the ability to complete a computer game. When examining the field of photography, Bourdieu positioned it 'halfway between 'vulgar' activities abandoned to the anarchy of individual preferences, and noble cultural activities subject to strict rules' (1971:176). This could equally be applied to the study of computer games in the classroom where they are viewed as activities arising from 'individual

preferences' associated with what may be described as 'low status' symbolic wealth as opposed to 'noble' literary activities such as reading and writing. Thus, curriculum construction and pedagogic action would result in cultural reproduction. It can be argued that, the computer signifies symbolic capital, in the primary classroom and is mainly used to support those pursuits which may be considered to be high status and 'noble'. Effectively, the computer will be used in a manner which fits in with existing practice and instead of allowing interactive multimedia to flourish, it has been restricted. In this sense, Papert's argument regarding the potential of the computer as a 'subversive instrument of change' (1993b:39) may be seen in a new light. It is possible that the computer is used to 'enforce School's ways' (ibid) which do not embrace the new methods of communication involving, for example, multimodal texts such as the computer game. Typographic texts maintain their authority within the school and the 'traditions' of the classroom remain relatively untouched by advances in multimedia technologies which are evident within the home.

As discussed in the previous chapter, the argument for the use of computer games in schools is growing with some researchers who identify the educational advantages arising from their use. Although, according to Williamson,

> 'teachers have diverse perceptions of gaming as a potentially educational activity, ranging from those who wouldn't consider it at all to those who believe it is capable of enhancing young people's engagement and motivation.'
>
> (2009:25)

Within the field of education, computer games have yet to establish themselves as a legitimate and valuable form of cultural capital. It appears that part of the argument for their use arises from the interest and motivation towards learning they generate in children and young people. It is noticeable that although a growing array of publications gives voice to the argument for the use of computer games in school, the voice of children is largely absent from these discussions.

As suggested by Pea (1993:51), it is rare that a mind would work alone and the generation of knowledge including the affordances or latent possibilities, of objects such as

computers will be mediated through social interaction with others. The term 'affordances' is used in the sense that 'objects possess some universal operational meanings (what can be done with these objects) that is directly communicated to the users' (Kaptelinen 1996:56). When designing and developing a software resource the context in which it will be used would influence the outcome. For instance, if the designer perceived the school context as being structured, formal and National Curriculum-focussed then the content and operation of the software would be constructed accordingly. A child's interactions with other people and with objects, such as computer software and hardware within the contextual setting, will also assist in the development of each child's view of the world around them (Wertsch 1991, Zinchenko 1985).

To summarise, ICTs bring new opportunities for teaching and learning yet, there is little evidence that these have been widely adopted within primary schools. Ofsted reported that, 'Investment in resources had improved teaching, but had still not made ICT a part of everyday learning' (2009:6). ICTs have been integrated into existing practice and used to reinforce what may be viewed as 'traditional' rather than reconfigure and redesign the context for learning within the school setting. For example, arguments for the use of computer games in the classroom are gaining momentum yet there has been little evidence of their presence in the school context. By contrast, the sales figures of computer games for the home entertainment market have exceeded those of DVDs. Furthermore, according to individuals such as Prensky, because children are born into a world of technology they are digitally aware and often exceed the capabilities of their teachers. This seems to be supported by Ofsted who stated that 'teachers observed rarely showed pupils examples of how to apply and extend their ICT skills across the curriculum and this exacerbated the underachievement of potentially high-performing pupils' (2009:30).

Further exploration of children's experiences of ICT is necessary in order to ascertain whether Prensky's arguments may be substantiated. Furthermore, the perceived differences in home-school experiences of ICT would also benefit from further examination; in particular, those involving multimedia texts which include computer games. Children's experiences and perspectives are viewed as essential to the research process and will be examined with a view to discussing and explaining the phenomena.

2.3 Literacy, multimodality and multiliteracies in primary schools

The term *Literacy* has become dominant in the overall policy rhetoric of the UK Government over the last thirty years and occupies a central role within the formal, schooled curriculum of a post-industrial society. Indeed, since the 1870 Elementary Education Act, reading and writing, alongside arithmetic, have been central to the formal school curriculum. Employability and functionality in the everyday environment was connected to the process of decoding and encoding written text which may be described respectively as 'reading' and 'writing'. Becoming literate, in the sense that language can be encoded and decoded by an individual, is linked to economic prosperity and in the case of each individual, represents the opportunity to advance and improve their status in life (Cope & Kalantzis 2000:121).

However, the term 'literacy' involves more than the decoding or encoding of written text. Papert has highlighted limitations to what he calls, 'letteracy' and has pointed out that reading and writing may have been central to nineteenth century thinkers but this is no longer the case (1993a). Similarly, Jewitt highlights the challenges to 'traditional concepts' of literacy which have been largely created by new technologies.

> …educational policy and assessment continue to promote a linguistic view of literacy and a linear view of reading. The multimodal character of new technologies produces a tension for traditional conceptions of literacy that maintain language at their centre.
>
> (2006:8)

Literacy is embedded within the context of its use (Gee, Hull & Lankshear 1996:xii) and, from a sociocultural perspective, individuals have communicated in a variety of ways within any given social, historical and cultural context. The purpose and nature of the communication relates to more than a process of decoding and encoding, and extends to non-typographic activity such as 'values and gestures, context and meaning, actions and objects, talk and interaction, tools and spaces' (Lankshear & Knobel 2003:8). As such, it is not possible to separate the mechanistic process of reading and writing from the social practices in which they are located. This would suggest that the nature of the communication may alter. As digital technologies provide new tools, spaces and processes

for communicating, the way we perceive literacy will therefore need to be continually examined and reconfigured. Although image and sound are not new arrivals to the many forms of communication currently employed, the means by which they are generated, combined and disseminated are constantly being revised in the light of ICT policy.

In its 2004 publication '*More than words: multimodal texts in the classroom'* the United Kingdom Literacy Association (UKLA) has highlighted children's immersion in visual and media texts at home and school.

> 'Children are surrounded by visual texts of all kinds at home and at school. Some are in print: illustrated stories, picture books, information books, comics and magazines. Others are screen-based: television, video and different forms of multimedia communications. This means that children have experience of a wide range of texts that combine words and pictures, movement and sound, and they can use this in their classroom work'
>
> (UKLA 2004:3)

This helpful report suggests that there is a need to examine the implications for pedagogy in order to respond appropriately to the demands placed upon teaching and learning. Cope & Kalantzis (2000), Kress (2003), Lankshear & Knobel (2003) and Buckingham (2003), amongst others, have advocated 'multiliteracies' or 'new literacies' and explored its social, cultural, educational and political dimensions. The production, alongside the exchange and access of text, has facilitated multimodal versions of 'post-typographic forms of textual practice' referred to by some as 'the rich signal.' (Lanham 1994 cited in Lankshear & Knobel 2003:16). This has already been evident prior to the digital revolution with newspapers and film combining various channels of communication to convey meaning. For example, cinema and television combine sound and image in a variety of forms, whereas newspapers contain a more varied mixture of typography and image than was evident up until the 1980's. The advent of digital technologies has served to increase the range and variety of post-typographic texts together with alternate methods of design, production and distribution. Multiliteracies are the increasing number of skills, knowledge, competencies and abilities associated with the process of critically examining, interpreting and producing new forms of meaning-making through the convergence and

combination of various forms of media. Consequently, a 'new semiotic terrain' is constructed (Kellner 2002:163). The term 'semiotic' sometimes lacks precise definition (Chandler 2007:2) but may be best described as the study of signs such as images, sounds, gesture, words and objects (Chandler: 2007). Because it embraces a wide range of signs, it provides a valuable means of studying multimedia texts and their interpretation. Semiotics is highly pertinent to this research project as children's interactions with multimedia texts will involve the interpretation of signs such as those listed by Chandler. The language and theory of semiotics offers a means of describing and explaining the interpretation and meaning of signs and therefore offers the most purposeful means of examining new forms of literacy which involve post-typographic forms of communication.

Although seemingly similar to multimedia, 'multimodality' finds its roots in social semiotics and is concerned with the channel of communication, for example the visual and the aural. Meaning is generated through the combined use of modes such as image, and sound and each of the modes contributes to the resulting communication (Unsworth 2001). 'Multimodality' relates to the way in which different semiotic modes operate separately and in combination to offer various signifying opportunities (Carr, Schott, Burn & Buckingham 2004:21). For example, the intonation in speech can add emphasis to spoken words as can gestures or facial expressions. Additional messages may also be gained from written text through the selection of font colour, style and size. Each of these variables has the potential to affect the interpretation of any typographically generated text (Unsworth 2001:9). Multimodality provides a useful means of examining and explaining the way in which interactive multimedia texts may convey meaning as the visual and aural are combined in the design of this software. Cope & Kalantzis offer a valuable model (see fig 2) which attempts to document the many and varied elements of multimodal design. The authors state that.

> 'We have already identified six major areas in which functional grammars, the metalanguages that describe and explain patters of meaning, are required = Linguistic Design, Visual Design, Audio Design, Gestural Design, Spatial Design and Multimodal Design. Multimodal Design, however, is of a different order to the others as it represents the pattern of interconnection among the other modes.'

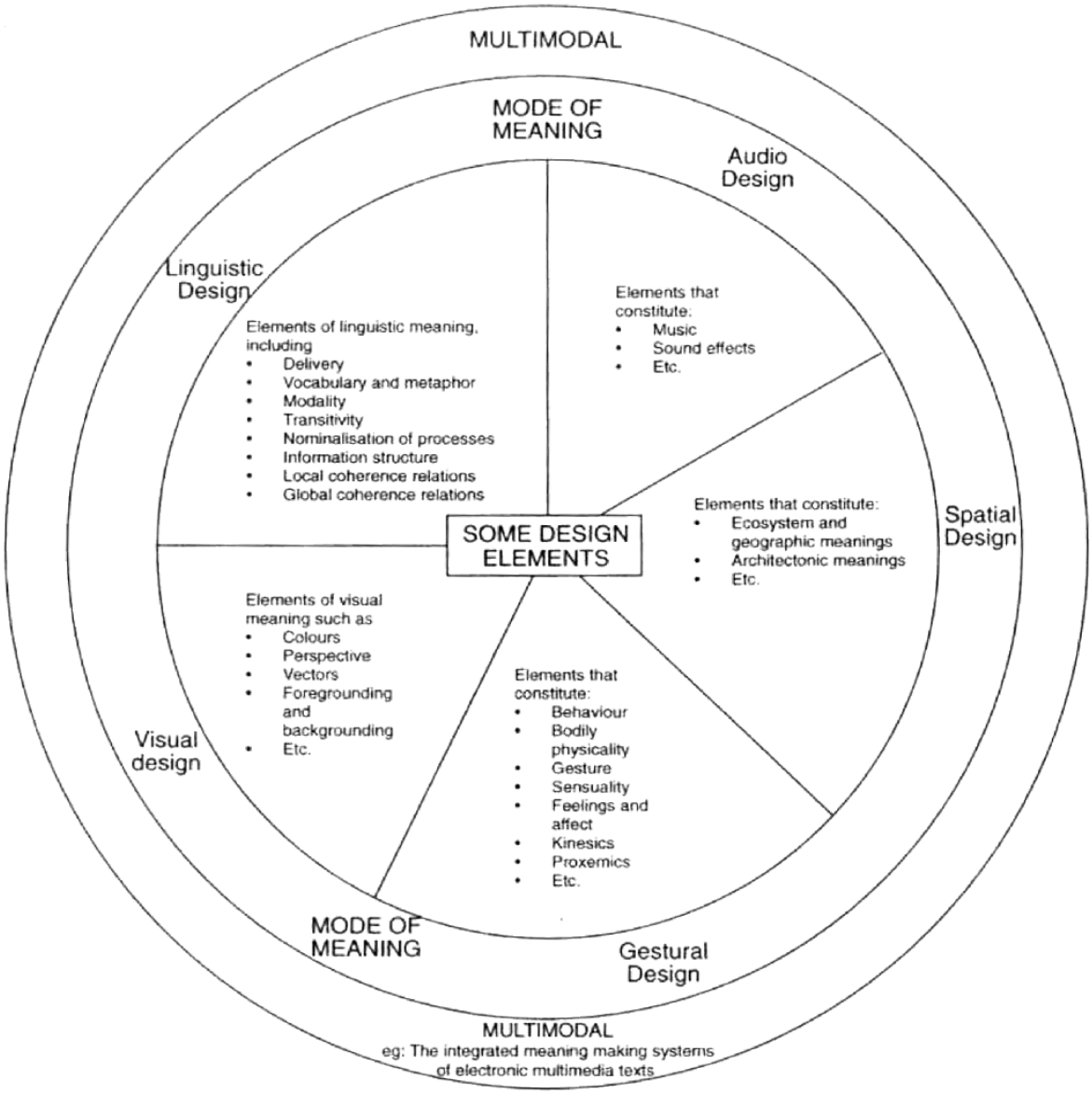
(Cope & Kalantzis 2000:25)

The model is helpful to this study as it provides an analytical framework of examining and discussing a meaning-making system which extends beyond the written. More specifically, it offers a means of identifying and classifying the various features of a multimodal text. As a relatively new field of study, Cope & Kalantzis explain that their 'objective is to come up with no more than approximately ten major Design elements for each of the six major areas' providing what they describe as a 'functional grammar' which describes and explains the patterns of meaning for each of the given areas. It is unclear why the authors have limited the list within each area to approximately ten elements. It is possible that they are aware that constructing an extensive list would lead to a sense of atomisation eventually losing the integrity of the complete message. The analysis of a meaning-making activity to its component parts will also be subject to criticism as it relies upon the judgements made by the interpreters of the message. Nevertheless, the process of specifying individual elements can help to simplify and operationalise a complex process. Furthermore, Cope & Kalantzis include the notion of 'Multimodal Design' which does recognises that, in addition to the constituent parts, there is a means of combining and connecting each and all of the components into a multimodal message.

Their model may be viewed as a helpful starting point because it offers language and structure to the analysis of multimodal texts. In order to gain an understanding of multimodal forms of communication it is necessary to develop a way of describing the associated features and processes which then provide a means of constructing theoretical perspectives and a shared understanding.

By using the framework to explore the nature of children's interactions with the texts it may be possible to gain insight into the process of interpretation. Of the five modes identified in Cope and Kalantzis's model, the audio and the visual are the most valuable as multimedia texts primarily contain these elements of multimodal design. However, where spoken words and images of people are included, the gestural and linguistic may also be helpful when analysing the texts.

Figure 2: Model of multimodal design



(Cope & Kalantzis 2000 p.26)

Where 'Multimodal Design' provides a framework for the analysis of a multimedia text itself, 'intertextuality' offers an alternative perspective on literature and literacy. This term has been attributed to Julia Kristeva who described texts as possessing two axes: the 'horizontal' which links the reader to the author of the text and the 'vertical' which connects the text to other texts (Kristeva 1980:69). By introducing the concept of connectedness beyond the boundaries of the text, Kristeva introduced a post-structuralist

perspective to literary study by arguing that the process of interpreting any text calls upon prior experience and understanding beyond the reading of a single text. It is valid in the context of ICT applications because one form of text may be readily transposed into another, described by Kristeva as 'the transposition of a system of signs into another system of signs' (Kristeva 1980:15). For example, an article in a newspaper may be converted into a film or a novel by incorporating one set of sign system within another. Video games often contain clear linkages with plots and storylines from films but less obvious are forms and styles drawn from other texts which may appear as quotations, images, sound clips, characterisation or perhaps incidents.

Intertextuality may therefore concern the convergence of media texts (Buckingham 2003:27). Examples are readily found in contemporary culture with games technologies, books and films referring to one another. The *Harry Potter* series of books has been cinematised and video games have also emerged which are loosely based upon the characters and plot of the original books. Other examples include films which have emerged as a result of a popular video game, such as *Lara Croft*, as well as films providing the original text upon which games are produced, such as *Shrek*. Popular culture in the form of television, cinema and computer games was described as a 'highly prevalent feature of young children's lives' (Marsh et al 2005:44). Practitioners reported that the inclusion of popular culture, media and/or new technologies 'has a positive impact on children's progress in speaking, listening and literacy' (ibid:76). Indeed, previous research undertaken by Marsh & Thompson highlighted the need to 'firmly embed the popular cultural and media texts children encounter in home and community into schooled literacy practices if we are to move the disparate elements in children's worlds a little closer together' (2001:277).

With the introduction of the hyperlink, intertextuality is also revealed as a connection between texts constructed through appropriate coding within and between electronic documents. The World Wide Web is fundamentally an intertextual system where readers may also participate as authors of an ever-growing construct such as *Wikipedia*. The 'horizontal' and 'vertical' axes of Kristeva (1980) exist in what appears to be a dynamic and seamless manner. Individuals are able to make connections between existing content

and their own as both author and reader in 'an infinitely re-centerable system whose provisional point of focus depends upon the reader, who becomes a truly active reader in yet another sense' (Trend 2001:105). The research question concerned with children's interactions with multimedia text and their relationship to new literacies would benefit from examination in the light of this concept. When observing children's interactions with multimedia text it will be important to not only examine how they are interpreting the text but also the role that they play when doing so. This would provide some indication as to whether there is a dynamic relationship between the role of the reader and the role of the author. Furthermore, it will be helpful to examine the children's wider experience and explore whether they are making intertextual connections between the various media texts. This would invite discussion on the way literacy, by way of the written word, may position itself with respect to new literacies associated with multimodal texts.

Methods of communication have been influenced by the increasing media formats and processes of transmission generated through microelectronics and digital technology. Knowledge will therefore 'change its shape when it is realised in the different modal material' (Kress 2003:50). Ontologically, changes in the very nature of literacies are connected with transformations in social practices where texts may be created, published, distributed and received in new ways. Post-typographic forms of textual practice such as those described by Lankshear & Knobel redefine the very nature of literacy and this has implications for pedagogy.

> 'constructing hyperlinks between documents and/or images, sounds, movies, semiotic languages (such as those used by the characters in the online episodic game *Banja*, or emoticons ('smileys') used in e-mail, online chat space or in instant messaging), manipulating a mouse to move *within* a text, reading file extensions and identifying what software will 'read' each file, producing 'non-linear' texts, navigating three-dimensional worlds online'
>
> (Lankshear & Knobel 2003:17).

Although the conventions of linguistic communication have been examined, the process of creating and analysing multimodal texts is, by comparison, less developed (Kress 2000) and in need of further research.

Children born within the last thirty years are immersed within the technological culture of the digital world and may be better placed to understand and interact with the various forms of communication which have emerged as a result of developments in ICT. Whereas the literate nineteenth century thinker would have interacted and engaged with typographic texts, the 21st century youth is effectively immersed in a culture that consists of multimodal and highly interactive forms of media in addition to typographic texts (2001). Tapscott (1998, 1999) Prensky (2001ab, 2003), Veen & Vrakking (2006) Howe & Strauss (2000, 2007) have introduced terms such 'the Net Generation', 'digital natives', 'homozappiens' and 'millenials' respectively and suggest that children of today are immersed in, and familiar with, a wide range of ICTs which include multimedia. If, as the logic of this argument suggests, children are naturally experienced in new forms of communication it would be appropriate to examine the way in which they interact with and interpret multimodal texts.

The thrust of the argument delivered by Prensky and his contemporaries is that schools are failing to respond to the ICT-adept learner of today. As such, there is a perceived 'digital divide' between home and school with children's home experience exceeding that gained at school. To a certain extent, these claims have been supported through work undertaken by Mumtaz (2001) and Downes, (1999b). Since then, there has been little research conducted on children's ICT experience at home and at school but there are a growing number of researchers such as Kennedy et al. (2006), Bennett, Maton & Kervin (2008) who question the arguments presented by those such as Prensky (2001a, 2001b, 2006). Bennett et al. suggest that the debate regarding the digital native may be '..likened to an academic form of a 'moral panic' and propose that 'a more measured and disinterested approach is now required to investigate 'digital natives' and their implications for education' (Bennett et al. 2008:775). Effectively, there is no consensus of opinion or firm empirical evidence regarding the existence of a 'digital native'.

2.4 The computer game as text: the role of the author, reader and the player

The term 'text' is problematic. The position taken within this research project is that text may include any form of medium which conveys a message or set of messages. For example, text may be verbal, non-verbal or both and include recordings made through the

use of audio, typographical and visual apparatus. Signs such as words, images sounds and/or gestures may be assembled according to the medium it occupies and the genre in which it operates (Chandler 2001:4). The purpose of the message in the context of this research project is to provide a means of constructing a narrative. Equally, the relationship between narrative and computer game is by no means established or widely accepted. According to Carlquist (2002) there are two main perspectives with regard to the study of computer games. Namely, the ludologists who focus upon the construction and design of game play and the narratologists who examine the computer game in relation to narrative-telling media. It is helpful to recognise that there are two perspectives when examining a computer game and it is necessary to critically analyse the arguments presented with regards to the computer game as narrative.

Juul maintains that narration is situated in events which happen at some other time whilst games are always placed within the present. This, he contends, prohibits the use of narrative structure such as flashbacks (1998). This argument presents a very inflexible view of narrative and ignores the way in which such activity may be transformed and developed through new methods of communicating. For example, flashbacks may punctuate the structure of some games and often provide clues in order to complete a given task or provide context, purpose and meaning to the game play. Furthermore, the notion that narrative occurs within one temporal zone; the time of the narrative, and cannot be generated at the time of the game play could be countered by exploring the relationship and co-existence of the two processes. Metz states that 'one of the functions of narrative is to invent one time scheme in terms of another time scheme' (1974:18). Effectively, Metz describes the time in which the narrative exists and the time during which the narrative is told or a 'doubly temporal sequence' (Metz 1974:18). Genette also makes a distinction between the actual time of the events as the 'narrative' and the telling of those events as the 'narrating,' which can be viewed semiotically as the time of the 'signified' and the 'signifier' (1980). Children may therefore interact with a computer game in 'real time' as narrative and retell their game-play journey afterwards by narrating. The analysis of texts in terms of their multimodalities and the meaning-making process of individuals 'reading' them may therefore be a useful means of analysing media texts such as games.

Genette also provides a useful distinction between the story and the narrative with the former relating to 'content' such as actions, characters and setting, and the latter the statement or discourse surrounding the events. In this manner, one story could give rise to a great number of narratives with the various events, actions and characters emphasised or minimised according to the narrative route selected (1980:27). In addition to the narrative arising from the child describing their game-play journey, software may also be designed to allow multiple routes to unfold which therefore generate variations of narrative for children to experience. When examining observations of children interacting with computer games, these definitions may be usefully employed in order to consider the contributory factors, such as software design, which give rise to the pupil's understanding of narrative.

Carlquist argues that there are at least three separate layers of storytelling in games. Firstly, the 'out-of-game' storytelling comprise video clips or cut scenes which do not involve player interaction; 'in-game' storytelling which occur in real-time during player interaction and finally 'external materials,' such as the instructional blurb, game manuals and sometimes books offering further background substance to the game activity (2002:14). Jenkins points towards the use of cinematographic techniques with off-screen transformations marking the passage of time or the resulting effect of player action on other characters, items or setting within the game (2004:127). This theoretical contribution is utilised in *Myst* where a long animated clip provides an introduction to the setting and characters. Video messages from Atrus's two sons become increasingly intelligible as 'pages' of their books are discovered and returned by the player. Computer games may often be generated after the release of a film allowing the company concerned to capitalise on the success of an existing narrative played out on the cinema screen. As discussed earlier, intertextuality through a range of media texts has been demonstrated by the *Harry Potter* phenomena where the books were converted to a film and then a computer game with associated magazines and websites offering advice or 'cheats' to help the player complete the various challenges. This commercial practice has since become commonplace. Occasionally the reverse occurs with a successful computer game triggering investment in a film version, as in the case of *Tomb Raider* and *Hitman.* Overall, a rich tapestry of intertextuality is generated, enriching the external materials and

the player's awareness and experience of narrative within and beyond the game environment. Therefore, the notions of intertextuality and cinematographic techniques are viewed as critical understandings which are necessary for the analysis of the data in Chapter Five.

Some types of computer games are impossible to place within the narrative structure, for example, Tetris and Pac-Man contain little or nothing by way of story largely due to their simplicity (Jenkins 2004:119, Carlquist 2002:13 Aarseth 1997:95 Eskelinen 2004:37). Wolf suggests that the development of narrative within computer games occurred as a result of increasingly complex representations of time and space alongside more sophisticated screen graphics. He continues to compare the medium of the computer game with that of television and film, which all contain similar use of audiovisual constructions, and space and time through an on-screen or 'diegetic' presence (2001:93).

Games require the viewer to interact with the screen elements presented in order to move through the content. The viewer, or rather the player, is assuming a participatory role and therefore exerts some element of control over the action presented on the screen. Wolf also refers to the viewer as a 'surrogate character' which can participate and affect the game's journey within the constraints of the programming (2001:93). This is another point of argument. As a game needs to be played in order to exist, ludologists contend that narrative is not the dominant arena that computer games inhabit. However, the reader of books, or the audience of a play or film, is also active in the interpretation of the media presented. Each reader, or viewer, generates their own version based upon their personal experiences, knowledge, understanding of and interaction with the representation. Nevertheless, the computer game is a still more complex process of interaction and generates a growing number of questions associated with participation, co-creation, transformation and distribution (Cover 2004:173).

In the process of designing and developing a computer game, there could be hundreds of people involved at multiple levels. The concept of one 'author' creating a literary text is not sufficient when considering the intricacies of a computer game. The process of design and construction may be similar in some way to that of a film; however, it may be argued that the necessity of a player results in the addition of another author or co-constructor.

Where multiplayer games are concerned there are as many co-authors as there are players and in massively multiplayer online role playing games (MMORPGs) authorship may be extraordinarily complex. Cover contends that the basic model of sender-message-receiver is no longer pertinent to the analysis of new media texts such as the computer game which reside in a history of the audience's struggle as co-creator and participant in the construction of text (2004:178). By providing opportunities for texts to be transformed, -not just consumed,- by the audience, there is a sense of empowerment, involvement and ownership, all of which require active participation of the reader-author-player. Such levels of engagement may generate increased levels of interest and motivation; a discussion considered within a previous section which relates to work on interactivity and immersion by Prensky 2001a and McMahan 2003. Equally, as highlighted by Pearce (2004), the primary objective of the computer game designer is that the player is presented with a compelling framework to interact with and this does not always involve a compelling story.

2.5 Linearity

In computer games such as first-person shooter, action-adventure or role-playing games, the player negotiates various levels and stages of the game, actively making decisions regarding the route and the actions of the on-screen avatar. Where narrative structure is concerned, the player is engaging with the elements of the story, described by Genette (1980) as the content or, more simply, the 'what' in a narrative (Chatman 1989). Of the myriad choices facing the player, each selection and action results in the construction of a non-linear text. In a similar manner to books, which incorporated the 'choose your own ending' content, multimedia texts may provide the reader with opportunities to select routes, character action and consequences. The use of hypertext allows the reader to participate in the construction of the narrative in a manner beyond the direct control of the author. Previous work by Joyce (1990) and Moulthrop (1991) have demonstrated that linkages may be used to shape the construction of literature in creative and imaginative ways.

Unsurprisingly, there are arguments surrounding the nature of literature constructed through the use of hypertexts. For some, the lack of structure and fluency created through

the rather fractured composition resulting from the use of hypertext does not constitute a linear, pleasurable and therefore an acceptable, narrative. Whilst Joyce (1990) and Moulthrop (1991) have maintained the viability of hypertext literature, other researchers have encountered difficulties when attempting to construct non-linear texts. Wood (2006) reported that 'The linear nature of the original story prevented readers from fully understanding the change in perspective. By switching rapidly between characters the continuity and context was affected in an adverse manner and consequently the feature was not effective' (2006:20-21). Wood attributes the fractured narrative to the linearity of the original paper-based book which is disrupted when attempts to create non-linear routes are imposed upon the natural structure of the text. Plowman (1996) appears to support this argument but suggests that it is more appropriate to conceptualise narrative routes as 'multi-linear,' like branches of a tree, where readers may select one of many routes to navigate. In this way, the narrative may be perceived as spatial rather than linear in nature. Plowman (1996) argues that to develop such stories it would be necessary to think in multiple, almost labyrinthine narratives; a concept which may be challenging to individuals who have become accustomed to thinking in a singular linear format. Wood (2006) struggled to reconstruct a story which corresponded in a non-linear format as the original version was paper-based and designed to be read in a linear manner. Challenges such as this are perhaps another indication of what it means to be literate within the 21st century where the creation of multi-linear or non-linear multimedia interactive environments is just as crucial as being able to interpret them.

Additional arguments against the necessity of linearity in narrative point to the nature of print itself as being subject to both change and development over time. Hypertext writing, if appropriately constructed, may offer structure and a satisfying experience for the reader (Bernstein & Greco 2004:167). Although the structure may be different and distinct from that of linear print, hypertext literature is relevant to the narrative of human expression and imagination. Bernstein and Greco (2004) continue to add that the use of the term 'non-linear' is 'too general to be informative and provides little indication of the complex process of creating navigational links between nodes.

In referring to Roland Barthes's ideal text (1970), Landow, suggests that hypertext corresponds to this idea with 'text composed of blocks of words (or images) linked electronically by multiple paths, chains or trails in an open-ended, perpetually unfinished textuality described by the terms link, node, network, web and path' (Landow 1997:2). However, this definition of hypertext does not take into account the rapid and continuous developments in ICT which have resulted in the comparably sophisticated and complex hypermedia texts, combining animation, typographic text, video and sound. Additionally, the hypertext structure does not do justice to the potential offered by programming which not only offers linkages between wider ranges of media but includes what may be described as artificial intelligence or AI. Software incorporating AI can create environments with less predictability. For example, entering the same room twice within an adventure game does not mean that the same events will be encountered. Virtual characters can appear to operate independently or even learn from prior experience. To a greater or lesser extent, the reader interacts with the content and may determine the course of the story. In so doing, their action and the design of the narrative serve to blur the boundaries between author and reader. Viires argues that the eventual path created by the reader is always constructed within the parameters set out by the author even though there may be multiple routes from which to select.

> 'Yet another paradoxical view is the argument a reader becomes an author . A work of cyberliterature presented as a hypertext would be first and foremost characterised by links connecting blocks of texts. A reader follows these links and makes choices. Such active reading has been commonly called interactive read- ing , arguing that this way the reader becomes an author. At the same time these links have been intentionally and purposefully created by the original author.'
>
> (2005:157)

In this way, the reading is always determined by the constraints imposed by the author, Parks (2002) continues this argument to deny the reader any authorial role and suggests it would make no sense to assign the same status to someone who had merely navigated the existing structure. Furthermore, Parks asserts that traditional literature in the form of books allows the reader greater freedom when imagining different routes beyond that which is written in the script. This seems to be an argument which counters itself as it is

also possible to imagine what might exist beyond the boundaries of other texts such as paintings, films and computer games. Visual texts also offer the reader/player opportunities to imagine alternatives endings and off-screen narrative.

In an attempt to resolve the polarised views of the physical, traditional book text verses the digital, interactive text, Aarseth has proposed an alternative perspective, namely that of the cybertext or cyberliterature (1997). The argument for non-linearity is convincing and Aarseth argues that the non-linear path is the result of an individual making navigational decisions on the route taken. This immediately creates instances of 'what might have been' with unexplored paths created at every point where a route is selected. Non-linearity does not describe the actual path taken but the text in its entirety. Multiple routes which can, rather than have to, be navigated constitute a text which is not comprised of a single linear path. This definition, although useful, does not dispense with the linear path; this still exists despite the attention Aarseth draws to the route left unexplored. Ultimately, the final journey experienced by the reader is linear. Whilst Parks (2002) may attempt to deny the reader or player any role in the generation of a resulting text the fact remains that the text would not exist without the action of the reader/player.

For this reason, Aarseth has applied the term 'ergodic' to such texts which he defines as, '..a work of physical construction that various concepts of 'reading' do not account for.' Aarseth emphasises the 'non-trivial' action required which gives rise to the existence of a text. The most compelling aspect of Aarseth's argument is that which opposes the use of existing structures to examine a new and different form of text. Yet replacing one structure with another may still possess limitations when analysing new forms of text. Nevertheless, by constantly returning to the literature verses game debate the possibility of examining, developing and understanding new and emerging forms of text will be hampered. Furthermore, the role of the reader and the nature of the text are both necessary elements in the study of new forms of text, such as computer games, because the narrative arising from the text only exists as a result of human action.

2.6 Conclusion

Throughout the literature review, the existence of false dichotomies was in evidence. The digital native/digital immigrant debate seemed to create an artificial dividing line between

young and old with the school and home contexts respectively viewed as out-of-date and technologically-rich. New forms of text have also created a renewed examination of linear and non-linear models of navigation and an equally active debate between ludologists and narratologists where games technologies are concerned. At the same time, the concept of 'literacy' has been challenged and claims of new literacies or multiliteracies have been made as a result of emerging ICT which allow communication in a variety of modalities and by an increasing range of processes.

The digital native debate remains a central theme to this research project and it is through direct observation of, and discussion with, children that the notion of the digital native will be critically analysed. Also pertinent to this research project is the debate surrounding new literacies. Particular attention will be given to the way in which children interact with, navigate and interpret multimodal texts. The inclusion of video games connects the digital native debate to the notion of new literacies. Potentially, children will have a wealth of experience with such software and where new literacies are concerned, video games may offer a rich, multimodal text for use in the classroom.

To examine these perspectives in more depth it is necessary to study the experiences of children with regard to ICT and, more specifically, multimedia texts. Although some research has been conducted on children's experiences of ICT at home and at school this is limited and does not focus upon multimedia texts. Similarly, there has been much debate regarding new literacies and the potential of computer games as new forms of text with a view to integrating them within the school context. To understand more clearly these phenomena it is important to examine the experiences of children. The following chapter will discuss the methodology involved in this research project.

Chapter 3 Methodology and Research Methods

3.1 Introduction

The aim of the research project is to consider pedagogical implications of using multimedia texts within the school context. Although multimedia texts, by definition, may embrace any media source which makes use of more than one medium, for example television and newspapers, this research project will focus on those which require interaction from the child and involve the production of narrative, for example computer or video games and multimedia stories. In order to consider pedagogical implications it will be necessary to examine children's experiences and perceptions of multimedia text and, in particular, the ways in which children interact with multimedia texts.

When examining children's experiences of 'reading' multimedia texts it will be useful to select an example which has been designed for the school context and one which may be described as a computer game and is used predominately within the home. This not only allows opportunity to examine the way in which children 'read' multimedia text but also provides a means of studying and evaluating the computer game in terms of narrative production. The routes through the texts as a result of selecting navigational links and the way in which this generates a developing story line will be examined. In both instances, the focus will be upon the use of the text within the school context as opposed to games play and the home context.

This chapter comprises six sections which provide a rationale for the epistemological and ontological perspective adopted, the methodological approach taken and the data collection methods selected. Section 3.2 focuses upon the epistemological perspective of the research project and offers a conceptual framework underpinning section 3.3 which addresses the methodological approach taken. The data collection methods are discussed in section 3.4 with three sub-sections presenting each of the methods undertaken and their relevance to the research questions identified in Chapter One. Prior to the concluding section, specific attention is given to the two multimedia texts selected for this research project in section 3.5.

3.2 Constructing the conceptual framework: a phenomenological perspective

This research project seeks to evaluate many elements and contributory factors which may relate directly or indirectly to the design, development, use and therefore experience of an interactive, multimedia text. Human computer interaction (HCI) is a multi-disciplined field involving 'computer engineering, programming languages, input/output devices….an understanding of human behaviour, of social interaction, environment, attitudes, motivation and so on' (Faulkner 1998:3).

Epistemologically, the research is situated within the 'interpretivist paradigm' 'variously labelled as 'post-positivistic', 'ethnographic', 'phenomenological', 'subjective', 'hermeneutic', 'humanistic' and 'naturalistic'' (Robson 1993:59). As such, humans are viewed as operating in a different manner to objects as they possess awareness and are conscious of themselves and their surroundings. They are able to reflect upon their actions and their interactions with other individuals. In its broadest terms, the nature of human activity is that of meaning-making through self-reflection, language and thought; a process described by Giddens in 1984 as 'reflexivity' (cited in Benton & Craib 2001:75). It is also true to say that human activity can be unpredictable and therefore unlikely to be governed by a set of rules which may be universally applied to all individuals. Whereas the positivist paradigm generally seeks to identify order, structure and a sense of predictability, the interpretivist paradigm acknowledges the existence of free will within human-kind. The intention is to seek idiographic (concentrating on a single case) as opposed to nomothetic (generalised or universal) knowledge (Crotty 1998:67).

Phenomenology is 'the study of lived human phenomena within the everyday social contexts in which the phenomena occur from the perspective of those who experience them' (Titchen & Hobson, 2005:121). Although not the first to employ the term, Husserl is attributed as the founder of phenomenology which he described as 'a science of the essential structures of pure consciousness with its own distinctive method' (Moran 2000:60). The aim of phenomenology is the return to the concrete, or 'Back to the things themselves' (Eagleton, 1983:56; Moustakas, 1994:26). When studying phenomena, the researcher is expected to set aside personal understandings and effectively 'bracket' them (Crotty 1998:79), in an attempt to recapture a perception of the world without prejudices

and assumptions brought about by socialisation and enculturation, referred to as 'epoche' by Husserl (Moustakas 1994:26).

The meaning which individuals attach to their lived experience remains the focus of a phenomenological inquiry. The process of attributing meaning to such actions through interpretation was described by Weber as 'verstehen' which, although difficult to translate, generally refers to understanding the various processes occurring within an individual's head, such as the logical and symbolic systems in addition to the context or culture in which the individual lives (Benton & Craib 2001:79). By combining both understanding and explanation, Weber's sociology detached itself from the preceding hermeneutic tradition which argued that explanation was the domain of the natural sciences (Delanty 1997:48).' Phenomenological inquiry would therefore present itself as an appropriate means of examining the interpretations of actions associated with the 'reading' of post-typographic forms of communication.

Phenomenology, according to Schutz, is situated within the interaction between individuals (Ferguson, 2006:90). As such, the meaning, use and context of conversation and interchange of individuals, including the researcher, are viewed as elements by which the social reality in which we live may be understood. The everyday language of children who are interacting with a multimedia text would provide opportunity to examine the socially derived meanings and ideas they possess with regard to these objects. Schutz viewed common language as the 'typifying medium par excellence,' (1951:167) where the process of identifying generic features related to the completion of a specific action may be described as 'typification' (Appelrouth & Desfor Edles 2008:541). This is also applicable to the observed actions of children as they interact with multimedia texts through conversation. Useful commentary on their actions allows a researcher to identify and examine the generic characteristics of reading multimodal texts.

In order to gain understanding of children's experiences of multimedia text it will therefore be necessary to not only examine the actions undertaken, but also the conversations between the children and between the children and the researcher. Arising interpretations may not be obtained by observation of the actions alone because their purpose will be infused by the intentions and meanings attributed to them through existing

‘stocks of knowledge’ generated from what has already been experienced and taken for granted and from the synthesis of inner experience (Schutz 1967:80). For example, although the computer may be described as an object, its use and purpose will not only be dependent upon the culture, society and context in which it is located, but also upon each individual’s view of computers and associated technology arising from personal experience. Children may have a wide-ranging experience of multimedia software and this may affect their expectations of and interactions with multimedia titles. Although it is possible to observe children interacting with software, it is the children’s conversation and explanation which may be most revealing and illuminative when interpreting the nature of their experience.

In addition to the concepts of ‘stocks of knowledge’ and ‘typification’, there are several related issues in Schutz’s phenomenology on ‘inter-subjectivity’. Schutz makes a careful distinction between the examination of an action which is ‘performed without any communicative intent’ and those where ‘communicative intent was present’ (Schutz 1967:113). In the latter instance, as the observer we would ‘put ourselves in the place of the actor and identify our lived experiences with his’ (Schutz 1967:114) yet acknowledge that ‘we know with certainty that the other person’s subjective experience of his own action is in principle different from our own imagined picture of what we would do in the same situation’ (Schutz 1967:114-115). This concept of inter-subjectivity calls upon the use of stocks of knowledge in order to ‘provide actors with rules for interpreting interactions, relationships, organisations, institutions and the physical world’ (Appelrouth & Desfor Edles 2008:541). In order to have some insight into the stocks of knowledge which a child may possess it will therefore be necessary to understand the experiences they have gained by using multimedia texts. Furthermore, to ascertain how an individual child’s experiences compare to others it will be useful to gather data from a larger sample of children thus providing necessary background information. In this way it may be possible to find out whether individual children have similar experiences to one another or whether their experience has little in common with others.

Phenomenologically, emphasis is placed upon the examination of an individual’s experience with the understanding that all experiences, having been subject to their

singular life journey, will therefore be unique to each individual (Pring 2004:100). Observation of actions by a researcher may provide descriptions of activity but the subjectivity requires the researcher to understand those actions and events from the perspective of the individual to whom they are attached. As such, the research project cannot make any claims with regard to generalisability. As Pring points out, 'interpretation' may be understood in different ways. He outlines five examples of interpreting the meaning of actions (2004:100). Four of these are relevant to this research project and are discussed below.

First, the embedded intentions of an action may arise from the immediate conscious purpose or a wider field of contributory factors. For example, the click of a mouse button could arise from the conscious purpose of accessing another screen or the activation of an interactive element such as sound or animation. Equally, it could be due to a combination of the child's prior experience of multimedia texts giving rise to expectations of interactive features and the interpretation of visual images.

Second, the significance of an act or incident to the individual unique to their life experiences, for example each child's experience of multimedia will be unique to themselves and the act of reading a multimedia text will therefore be of varying significance to each child.

Third, the use of language to convey meaning will also be subject to the personal experience and the understandings that an individual has of the language system employed. As children are in the early stages of language development, they will recognise and use vocabulary which is relevant to their age. This has been taken into consideration. For example, the questionnaire has been constructed using language which is accessible to the children. There are also implications when analysing the children's responses as descriptions or explanations may be limited due to their developing understanding of language.

Fourth, all actions including gesture, words and action will be subject to the interpretations of others and these, in turn, will be subject to the rules which give meaning to such behaviour. This would be particularly relevant when observing children as they engage

with multimedia text as facial expressions and any discussion arising between the children will be interpreted by an observer in the light of rules associated with such actions. A smile may indicate that the child is enjoying what they are doing whereas a frown may signal confusion. Similarly, the interpretation of multimedia text will also be governed by rules, for example visual images, sounds and colour may convey messages to the children. This links directly to section 2.3 and the discussions surrounding literacy, multimodality and multiliteracies.

The location and the participants for phenomenological research need to be carefully selected. As indicted earlier, it is important to identify existing familiarity (stocks of knowledge) with regard to the focus of the research project which, in this instance involves interaction with multimedia texts. Furthermore, as the research project is examining the experiences of multimedia text within the primary school context, the locale would need to be a primary school.

It is recognised that research tools associated with positivism remain helpful to interpretivist research activity (Hughes & Sharrock 1997:24). According to Crotty (1998:15), 'In most research textbooks, it is qualitative research and quantitative research that are set against each other as polar opposites.' He continues to add that, quantitative methods are not exclusive to objectivist research and the converse holds true with qualitative methods and subjectivist research. Effectively, such methods depend on the conditions under which the data has been collected and its use. For example, data collected from a questionnaire will provide quantifiable results in terms of the frequency of responses to closed questions. This data becomes illuminative when used in combination with qualitative data, such as observations and discussions, as they elicit interpretations and individual perceptions.

To summarise, the behaviour of individuals interacting with a computer program may be observed, counted and/or measured to provide statistical data. Although this could provide some indication of what is occurring during the interaction between human and computer, it would not provide opportunities to examine the meanings which individuals attribute to and create through such interaction. It is entirely possible that one individual's response will differ to another's. This may occur during the interpretation of the text or, at a

functional level, during the operation of the resource itself. It is therefore important that qualitative data, which reflects such processes, is collected in order to ascertain the experiences and understanding individuals gather from these activities. As such, the interpretive approach, as described by Robson (1993:19) or more generally, a 'naturalistic inquiry' (Schwandt 1997:101), is clearly suitable for this research project.

3.3 A case study approach

Within the perspectives so far located, the research project has adopted a case study approach which is described by Bogdan & Biklen as 'a detailed examination of one setting, or one single subject, one single depository of documents, or one particular event' (1982:58). Yin also highlights the linkage between the nature of the research questions and the selected method and states that 'how and why questions are more *explanatory* and likely to lead to the use of case studies, histories and experiments as the preferred research methods' (2009:9). The research project observes and examines children's experiences of multimedia texts as opposed to an organisation or a life history. More specifically, this research project examines *how* children interact with multimedia texts within the primary school. As a phenomenological research project it will be necessary to gather data which illuminates the children's 'stocks of knowledge' in addition to a thick description of their interactions with multimedia texts and subsequent explanations which may shed light upon the associated intentions of their actions. The distinctive features of the setting are also linked inextricably with children's experiences of multimedia texts within the school context. The construction of the taught curriculum, perceptions of literacy, the physical environment and available resources are some of the contributory factors to the singularity of each primary school. It is therefore important to select the primary school as the locale for the research.

The features of a case study, according to Yin, are twofold and involve the scope, the data collection and data analysis strategies (2009:18). The scope of the case study may be described as;

> '…an empirical inquiry that

> - investigates a contemporary phenomenon in depth and within its real life context, especially when
>
> - the boundaries between phenomenon and context are not clearly evident. ‘
>
> (Yin 2009:18)

Children’s interactions with multimedia text are contemporary phenomena and the contextual conditions of the school are highly pertinent to gaining an understanding of the phenomena. Consequently, data collection and data analysis strategies will need to attend to the ‘technically distinctive situation in which there will be more variables of interest than data points’ (Yin 2009). For this reason, a range of data sources is required, with each source providing further points of triangulation designed to converge in order to provide a richly-textured opportunity for studying the phenomena.

Case study may be conceived as the main method of inquiry with a range of data collection methods such as interview, observations, analysis of video and the design of the multimedia text used in combination. The multiple methods of data collection illuminate the phenomena being studied. For example, data on video provides a real-time record of children’s activities and response to their engagement with multimedia text. This is useful because all mouse, keyboard, screen activity, discussion and facial reactions can be replayed and analysed. This alone provides multiple sources of data with opportunities to examine not just the screen interactions but also the emotional and social interactions which are all aspects of the child’s experience. Children’s interactions with multimedia texts are complex and contain multiple layers of data which will require systematic analysis with each action carefully examined separately and in relation to other actions to ascertain what interpretations may be formed. A more detailed explanation of this process is presented in section 3.4.2.

Triangulation may be described as a ‘multi-pronged approach’ (Picciano 2004:35) where the combination of qualitative and quantitative methods (Flick 2006:24), which ‘may exist side by side in an enquiry’ (Wellington 1996:17), corroborate one another (Silverman 2005:121). Where one method of data collection may possess limitations, the combination

of multiple methods provides opportunity to ascertain agreement or contradiction in the data gathered. As discussed in a previous section, individuals may believe and therefore communicate one thing during interview but demonstrate another during observations. If, therefore, interviews are combined with observations it may be possible to identify these contradictions. In addition to the simultaneous recording of screen activity, mouse clicks, facial reactions and social interactions additional sources of data through the use of a questionnaire have been employed in this research project. As stated earlier, it is important to point out that although a variety of data-collection strategies have been employed 'in a manner encouraging convergent lines of inquiry' (Yin 2009:42) this research project does not make any claims regarding generalisability.

Although used as a means of triangulation when studying the complex nature of children's experiences of multimedia text (Robson 2002:483), the various data collection methods also complement one another. Different methods of data collection were also selected on their suitability in yielding relevant data for specific research questions and the range of these methods generated breadth and range to the data-gathering process.

The use of a questionnaire incorporating open and closed questions would yield both qualitative and quantitative data which would be useful background data to the subsequent video analysis. The nature of a questionnaire is such that detailed or thick descriptions of the phenomena being studied are not forthcoming yet with the inclusion of open questions, there are opportunities for clarification, justification, explanation and elaboration (Marshall 1997:40). Essentially, questionnaires generate quantitative data which may be counted and analysed statistically and may contain some element of qualitative data which complements the quantitative data (see fig 3). The major component of data is therefore quantitative with qualitative data assuming a minor role.

The video recording of children's interactions with multimedia texts through the use of specialised screen and video capture generates a rich source of qualitative data. The use of relevant software provide a facility which automatically counts mouse clicks and logs the precise time and location of each click as numerical data. In contrast to questionnaires, additional opportunities to generate quantitative data from screen and video capture

complement the qualitative video and audio. The major component of data in this instance is qualitative with quantitative data assuming a minor role.

When undertaking an education research project it is necessary to consider ethical implications, because there are human participants involved. In this research project it is necessary to work with children and therefore particular consideration needs to be given to their vulnerability. Permission has been gained from the relevant individuals and committees who may be described as the 'gatekeepers' (Farrell 2005:75); who were the Faculty Research Ethics Committee, the school, its teachers, parents and the children themselves (see appendix A for the letter to parents/guardians). All parties concerned have received appropriate information which describes the nature and purpose of the research. A working relationship between the junior school and the researcher had already been in existence for a number of years and good contact with the school gatekeepers predated the research.

The sensitive nature of data which includes the capture of moving image and the involvement of children is recognised and understood. Confidentiality has been negotiated with the greatest of care and the reporting of the research project has avoided any mention of either school or individual involved in the data collection process. Primary data will be kept until the completion of this research or until the end of 2011, whichever is first whereupon it will be permanently destroyed. Until this time, all recorded data will remain on one computer in the possession of the researcher and backed up to an external hard drive. Video clips containing the faces of the children will not be submitted with the thesis but will be available should the need arise. Confidentiality and anonymity has been observed to ensure identities are protected.

Any further use of data containing images of the children, for example, publication of journal articles, book chapters or research conferences will require permission from the appropriate individuals to be sought on a separate basis as this lies beyond the agreement of the research undertaken. Images of children are viewed as sensitive data and a complete understanding and agreement has been established to ensure these are handled appropriately (General Teaching Council 2006, National Children's Bureau 2003).

Punch provides examples of ethical issues such as reciprocity, intervention, honesty and trust in addition to harm and risk (2000:59). Where reciprocity is concerned, it does appear that much is gained by the researcher whilst little is offered in return to the school, the children or the parents. A report has been provided for all concerned so that resulting knowledge is shared. At the end of the data-gathering process, all of the multimedia resources were left with the school.

The necessity for intervention with regard to 'harmful, illegal or wrongful behaviour' (Punch 2000:59), was not anticipated as the focus of the research did not set out to provoke any actions or occasions where intervention would become an issue. However, events such as this are not altogether foreseeable and, if encountered, they would have been carefully considered based upon the circumstances. The awareness of harm and management of risk required some attention. When working with computers there is a responsibility to ensure children are not spending excessive time staring at the screen or seated in a manner which may be bad for their health or posture. Issues related to accessing the World Wide Web were avoided as the laptops were not connected to the Internet. The batteries for the laptops were fully charged to reduce the need for power cables however both laptops were located on a table where the power socket was in easy reach and did not obstruct any thoroughfare.

Finally, the multimedia titles selected were both appropriate for the age of children concerned and therefore contained content which would not be considered harmful. In both instances, the researcher checked each independently to ensure that the content did not contain any inappropriate content. The involvement of the class teachers was actively sought and a copy of each title left with them prior to the data collection process to ensure that the texts were equally acceptable to the teachers.

3.4 The data collection methods

In order to collect the necessary data a suburban junior school was contacted. Boys and girls between the ages of seven and eleven attend the three-form entry community school. The pupils on roll come from a wide variety of social backgrounds and the proportion of pupils entitled to free school meals is below the national average. The majority of the

pupils are of White British descent and are fluent in English. The percentage of pupils identified as having special educational needs is above average. During the early part of one afternoon, the 33 children with consent forms were located in one classroom. One of the class teachers and a classroom assistant remained in the classroom whilst the purpose and process of completing the questionnaire was introduced to the class by the researcher.

The researcher completed a self-introduction to the group of children and explained that the purpose of the questionnaire was to find out what multimedia games and stories the children interacted with and what they felt about them. Examples of multimedia titles were shown and some children offered their own ideas and asked questions for clarification. The importance of providing their own information and being as accurate and honest as possible was also reinforced to encourage the children to consider and respond to the questions. The researcher was also aware that some children within the year group had special educational needs associated with reading and writing typographic text and would need assistance in completing the questionnaire. In such instances, it was agreed that the researcher, the class teacher or a teaching assistant would provide support, as an amanuensis, and therefore read the questions and write the answers for those children. The introduction to, distribution, completion and collection of the questionnaire took just over one hour.

The field research for the project has been undertaken in three stages which combines the use of qualitative and quantitative data-collection. The first stage consists of a paper-based questionnaire which incorporates closed and open questions. The purpose of the questionnaire is to provide a means of understanding the general nature of year five children's experience of multimedia texts at home and at school.

It is necessary to ascertain, from the children's perspective, their experiences of multimedia text at home and at school. From the children's responses to the questionnaire, it would be possible to recognise the general experience of the year five children both collectively and individually. The six children undertaking the third, observational stage of the inquiry would be randomly selected from the returned questionnaires. Subsequent examination of each child's action and interpretation of multimedia texts would also be

informed by the broader context of their experience represented by each child's responses to the questionnaire.

The second stage calls upon the examination of each multimedia text to determine the number, range and significance of interactive elements present. This requires a numerical count of the interactive elements in terms of number and range and also demands some interpretation by the researcher regarding their significance.

The third stage involves observational data of children's interactions with the multimedia texts. In this instance, screen interactions through the use of a mouse have been recorded using specialised screen capture software whilst a web cam simultaneously records video of the child's face as they interact with the software.

The following section is divided into three subsections providing a detailed explanation and analysis of the data collection methods employed for the purposes of answering the research questions. The selection criteria and description of the two multimedia texts is discussed in section 3.5.

In so doing, the advantages and limitations of the various methods will be discussed and a rationale offered for the selection of both the data collection tools and the multimedia texts.

3.4.1 The questionnaire

The completion of a questionnaire at the beginning of the data collection process provided opportunity to engage with the nature of year five children's experience of computers and, more specifically, multimedia within and beyond the school environment. For example, data on access to a computer at home provided some indication as to the resources available to the children and the nature of the activities undertaken whilst at home. The children were subsequently asked to list the range of multimedia titles accessed at home and at school and to provide a brief evaluation of the titles encountered as a means of assessing their expectations and experience of the software listed.

The questionnaire allowed facts and opinions to be gathered which would provide complementary background data to the more qualitative forms of analysis received through observations and interview (Wellington 1996:52).

A critical aspect of the questionnaire construction was the accessibility of the language for the children. To gain responses from the children they would need to interpret the questions accurately and be able to enter their responses as independently as possible. Marshall suggests that the language used in the questionnaire should be pitched at the 'lowest educational standard likely to feature in your sample' (1997:40). Questions and instructions were therefore presented as simple sentences and the language used was appropriate for children aged nine years old. For example, the term 'narrative' was replaced by the term 'story' as this was universally understood by the children. Some terminology associated with ICT such as 'interactive' and 'multimedia' were included in the wording of the questions. However, technical or complex terms were kept to a minimum and explained by the researcher during the introduction.

Tick box responses were included whenever possible and appropriate in order to avoid writing unnecessarily. These questions may be described as 'closed' as the possible answers are predetermined and listed for the respondent to select (Gillham 2000:5, Peterson 2000:36). To provide some flexibility, blank boxes were included with three of the closed questions to allow the children to write in an alternative response to those listed. Additionally, six open questions were used to provide children with opportunities to describe and explain their experience and evaluation of multimedia games and stories. Answers to questions such as this are often difficult to anticipate and providing closed questions would limit responses and therefore reduce the freedom of the respondent to express their thoughts and feelings. Open questions also provide opportunity for the respondents to add justification and explanation to shorter, closed questions (Peterson 2000:30). There were eleven questions in total; five of which were closed and six were open. The questions were arranged on one piece of A4 paper with questions one to six on the first side and questions seven to eleven on the second side. The use of Comic Sans font created a more child-friendly style and additional line spacing added between each question to improve the ease with which the form could be read.

As suggested by Wellington (1996:54) the closed questions began the questionnaire and open ended questions requiring the children's opinion were left to the end. For example, the first question, 'Do you use a computer at home?' required a 'yes' or 'no' response. Similarly, question four required the children to indicate which equipment, besides the computer, they had used to play games. Brand name and logos of each games system were added as images to act as a visual prompt for the children. In addition to the named systems, three additional boxes were included to allow responses for mobile phones, other systems not listed and 'none'.

3.4.2 MediaCam AV screen and video capture

The interaction of the children with the multimedia titles necessitated the collection of complex observational data involving verbal and non-verbal forms of communication. In these instances, the responses of the children through mouse clicks, eye movements, facial expression and verbal interaction with another child, or the researcher, all constituted necessary forms of data. The mouse clicks would indicate the areas of the screen which the child had actively selected, whilst the eye movements and facial expression would indicate which aspects of the screen the child had viewed. The analysis of multimedia as a 'text' comprising digital elements such as hyperlinks, animation and sound also presents specific, indeed, unique challenges. Burn and Parker have highlighted that, in contrast to books or films, analysis of multimedia text such as computer games is problematic (2003:63). Only when the game is played or the software used can the contents take the form of a journey created through a vast number of highly individualised selections and personal motivations. Unlike a book or a film which can be read or watched in order to be studied, the software requires the action of the player as a necessary ingredient. The argument presented here is that both user and software are components of the resulting narrative.

Actions associated with screen interaction, for example, a smile or verbal interaction might occur at the precise time of the screen interaction therefore making the association between action and response difficult to identify. Observations of the various interactions are likely to be over-looked as facial responses are sometimes fleeting and mouse movements can be easily missed. The use of still images would provide some documented

interaction between child and software, but this would be extremely difficult to capture through a series of static images. Furthermore, with and without the facility of still image capture, the point at which the observation is made or the image captured is fixed with only one angle revealed at any one time. This would result in observations or images of either the screen or the child's face but not both at the same time unless more than one observer or camera is involved.

Simultaneous mouse movements, screen activity and the child's response to the multimedia environment requires the recording of moving image for both screen and user activity. Collier has highlighted the necessity of visual records, specifically video, when viewing 'real life' with opportunities to view, rewind, slow down or speed up what has been recorded in order to study what we normally have 'but one chance to observe, record and comprehend'(2001:49). As each child engages with a multimedia text in their own way, the resulting video footage will document personal preferences, selections and responses.

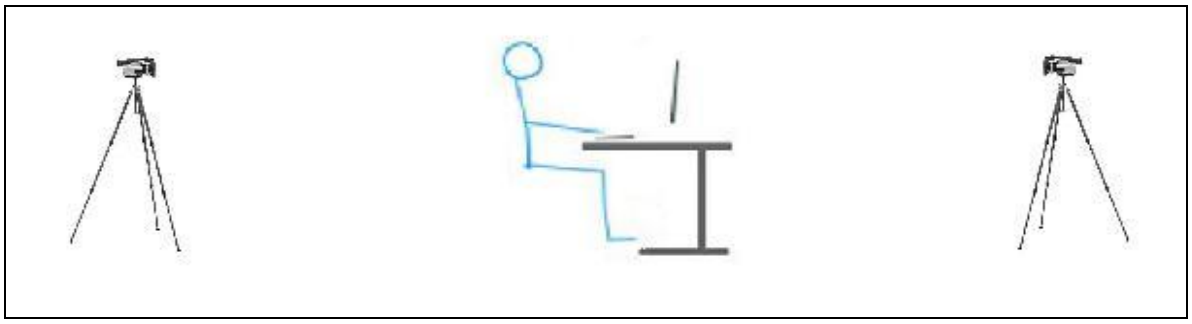
Furthermore, recording screen activity or the game player's face provides partial indication of the perceptions and experiences gained during interaction with the multimedia text. Consequently, discussion with either peer or researcher during the period of interaction with the multimedia text provides further insight into each child's interpretations of the various elements presented on the screen in addition to their evaluations of each title.

Essentially, the ability to capture the *reality* of child-software interaction and any discussions arising from the experiences is necessary. Therefore, in addition to audio recordings of verbal interactions, video recordings of screen activity and the faces of the individual children as they interact with the software are required. Initially, two video cameras were considered; one placed behind the children and focussed upon the screen and the other positioned in front of the children and directed on their faces. The cameras were to be placed some distance away with the optical zoom facility engaged to reduce the level of intrusiveness upon the children's activity. To compensate for the potential loss of audio clarity in the sound recording, a digital voice recorder was also included in this

design to be placed between the two computers, close to the children, in order to capture any discussion.

However, whilst trialling this system of data capture, difficulties arose when attempting to gain a recording from either camera which was not obstructed by either the computer screen or the children themselves. The camera directed towards the children's faces could only capture what was not obscured by the back of the computer screen whilst the camera directed at the screens could only capture what was not obscured by the children themselves when they were seated at the computer. (See figure 3)

Figure 3: Position of video cameras in relation to the child seated at the laptop



To obtain a clear and uninterrupted field of vision for the video cameras this design was replaced by the use of specialised video capture and analysis software installed on each laptop computer. This software, *MediaCam AV* (Netu2 Version 5.1 Release 1.0, Nov 1 2006) has been specifically designed to capture all screen activity including mouse clicks and keystrokes. The addition of a webcam situated above the screen recorded the face of the individual seated at the computer and all sound. Prior to recording, settings for the quality and nature of the webcam video, sound and screen recording were all selected to optimise the recorded data for subsequent analysis (see figures 4-9). These settings included the size of the video capture and the number of frames recorded per minute of both web cam video and mouse cursor in addition to the quality of the sound recording.

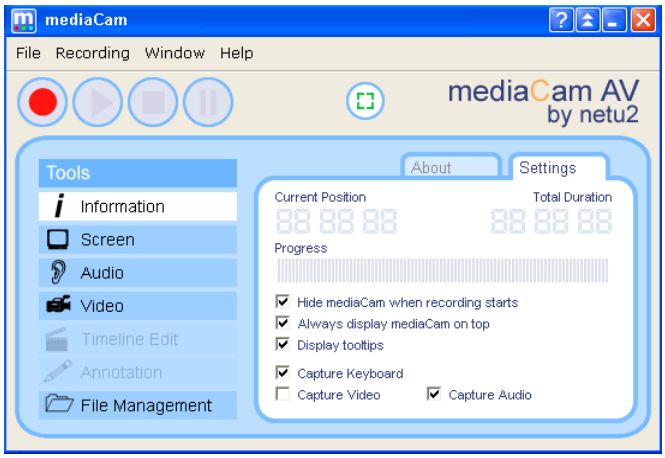


Figure 4: Screen shot 1 *Media CamAV* Information and data capture selection window.

The information screen provides tick box options for data capture. Recordings may include or omit keyboard capture, video and audio streams. The program window can also remain visible or it can be hidden to avoid obscuring or interfering with the screen activity. A timer is visible and provides a numerical indicator of hours, minutes and seconds of recording. During playback, it presents the chronological position and highlights the total duration of the recording.

Screen recording software has been used in a variety of contexts, for example, usability studies where interaction between the human and the software environment, sometimes referred to as HCI, is observed and analysed (Dix et al. 1998:428). This allows designers and software developers to evaluate the effectiveness and efficiency of the interface, and assess the experience of the user (Preece, Rogers & Sharp 2002:14). Aspects of usability, such as the ease of navigation and the user experience, will be evaluated as an integral component of the interactional processes in this project.

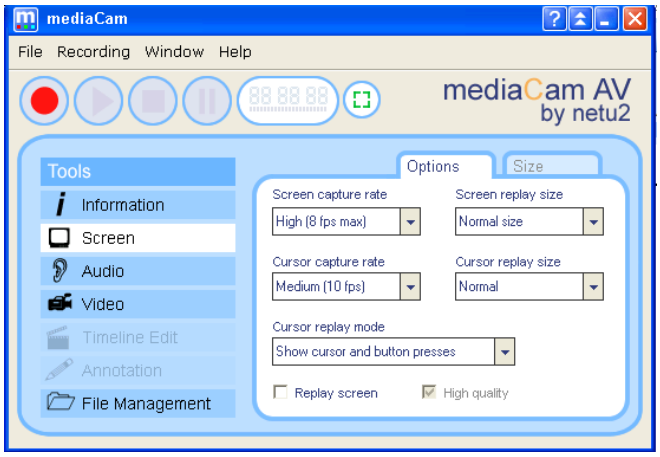


Figure 5: Screen shot 2 *Media CamAV* Screen recording options.

From the screen recording tab it is possible to set the frames per second for both cursor and screen. Additionally, the size of the cursor when replayed and the screen size can also be increased or decreased beyond its normal size. Other facilities provide options for the capture of the cursor and mouse button presses. In summary the cursor may be visible or not and mouse button presses may or may not be recorded as required.

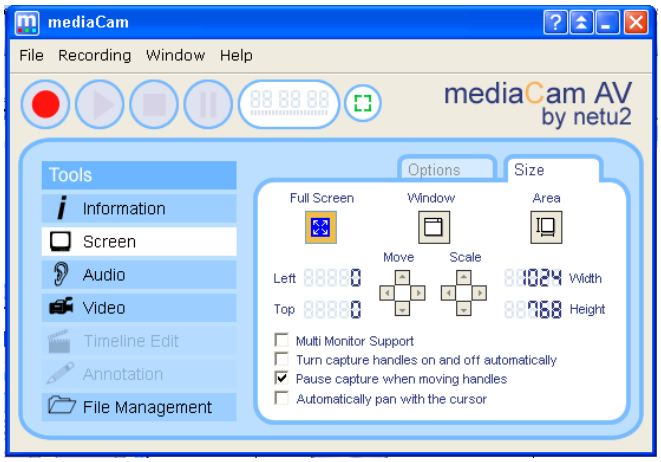


Figure 6: Screen shot 3 Media CamAV screen recording settings

It is also possible to determine how much of the screen is captured. For example, an active window may be selected as opposed to the full screen.

Figure 7: Screen Shot 4 *Media CamAV* sound recording settings

The audio settings allow the appropriate sound recording device to be selected and the quality of the sound recording to be set. The webcam possesses a microphone however a separate microphone connected via the computer microphone socket could have been selected instead.

Figure 8: Screen Shot 5 MediaCam AV video recording options

Where the video recording is concerned, the frames per minute of the capture can be set. More frames per minute provide a higher quality video but this also increases the size of the file. Similarly, the capture resolution can be increased to allow a higher quality image but this increases the file size. The position of the replay can be preset as can the level of transparency; however, it is also possible to change these later during playback.

The facilities of the software also provide opportunities for annotation (see figure 9). This consists of text boxes, arrows and freehand drawing over the top of the playback. These annotations can either be saved with the video recording of the screen activity

or saved as a separate file and added as an overlay. Video clips generated through the use of *MediaCam AV* can be exported in a variety of formats; however, in order to have the greatest control over playback the freely available *MediaCam AV Player* is most appropriate. In this format, clips may be not only be paused, but the speed of playback may also be altered and the annotations in addition to mouse clicks may be viewed through the program's various facilities without any reduction in the quality of the recording. For example, the pop-up window provides opportunity to select specific mouse clicks located within the timeline of the video and individual annotations at the point at which they appear on the clip. This is not possible in alternative formats which prevent the viewer from easily locating specific events and points of analysis.

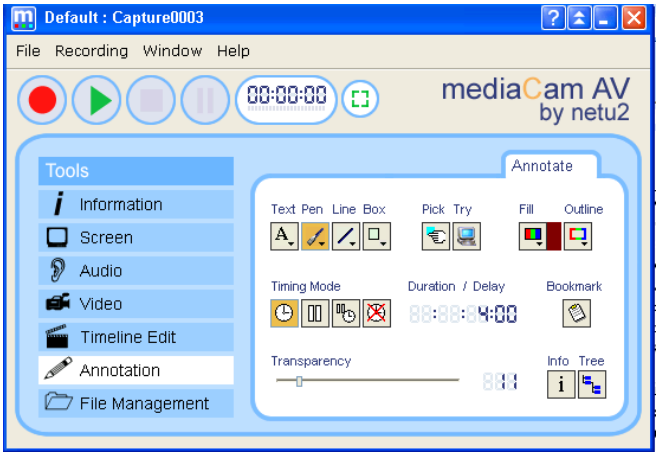


Figure 9: Screen shot 6 MediaCam AV annotation of playback

The annotation tab was only active during playback. A basic range of annotation tools were available including boxes, straight lines and arrows, freehand lines and text boxes. Further options allow the annotation to remain on screen for a specific amount of time and for the playback to pause or continue at the point at which the annotation is placed. The addition of bookmarks allows the user to move between annotations more quickly.

The use of such software was less intrusive than the use of digital video cameras and therefore minimised the researcher effect. For example, the webcam, although visible, was less so than two video cameras on tripods placed in front of and behind the children. Effectively, the *MediaCam AV* software replaced one of the video cameras whilst the webcam replaced the other resulting in minimal use of visible recording

equipment. Two further benefits of using *MediaCam AV* included the ability to trace accurately the movement of the mouse and identify each mouse click. By comparison, video cameras would not provide any clear indication of individual mouse clicks which could be missed quite easily. Without a clear camera shot of the screen it would also be difficult to record the movement of the mouse. The use of *MediaCam AV* offered certainty of capturing both mouse movement and mouse click by providing a video record of these interactions. The use of *MediaCam AV* also ensured that the face of the child, the screen activity in addition to any audio such as discussion between the children or sound effects from the software were automatically synchronised at the time they occurred.

Analysis of the video clips was undertaken through multiple viewings with the clips replayed several times. On each occasion, the layers of meaning and the complexities associated with children's interactions and experiences of multimedia texts were examined and re-examined in order to ascertain typification in the observed actions (Appelrouth & Desfor Edles 2008:541). Through an interplay between theoretical frameworks (see section 3.4.3) and the analysis of the video, dominant themes were identified and their relationship to one another studied.

3.4.3 Analysis of the multimedia texts

In order to examine the children's interactions with the multimedia texts, the clip associated with each child was viewed and annotations added to the screen image using the tools provided by the *MediaCam AV* software (see figure 9). For example, text boxes were added at the points where a child explored the screen with multiple mouse clicks or appeared to react to a specific event which was evidenced by a comment and/or as facial reaction. As the annotations, mouse clicks and keyboard strokes effectively 'tagged' a moment in time it was possible to quickly navigate to specific points in the clip and compare events throughout the duration of the recording. This was a useful tool which greatly supported the process of analysis.

The annotated version for each child was saved under a new file name in order to retain an original version. Each annotated version was then viewed and sectioned into smaller clips which provided examples of children's interactions for further analysis and discussion. In order to maintain anonymity, the webcam image of the children's faces was omitted from the final clips incorporated into the thesis through the use of

hyperlinks (see chapter 5). Although it is possible to export the *MediaCam AV* clips into alternative formats such as *Macromedia Flash, Powerpoint* and *AVI* movies which may be viewed on Macintosh and PC platforms, these versions do not provide opportunity to examine the annotations and the markers generated through the automatic recording of mouse clicks and keyboard strokes. Within this research project, these data are integral to the analysis of children's interactions with multimedia text. *Media Play* was therefore selected as this is freely downloadable and offers the highest level of functionality when viewing the clips and the associated data such as the timing and frequency of mouse clicks. Consequently, this version limits access to the clips to a PC only platform.

As discussed in section 3.3, the boundaries between children's experiences of multimedia text and the context of the primary school are not evident. In addition to the physical setting, the virtual constructs of the software will also affect children's experiences. This case study will therefore take into account the design of the two texts when examining children's interactions with the software. Usability may account for ease and efficiency and the user experience will correspond to the feelings and emotions which arise through interaction; for example fun, entertainment, challenge or motivation (Reece, Rogers & Sharp 2002:21). Consideration for usability may ease the frustration of the user but the purpose of the design, whether it is entertainment, education or a combination of the two will be consistent with the intended experience. User experience is a subjective aspect of multimedia design and, consequently, the experience of each child will be personal. The software may be constructed to offer a particular experience but this cannot be guaranteed. Furthermore, the way in which designers perceive the context and purpose will influence the multimedia design.

Navigation, interactivity and the use of multimedia components will collectively and independently affect the user experience. Ease of navigation will allow a user to move within the multimedia text yet concentrate on the text rather than the technological limitations and possible ambiguities created by bad design. This should not be confused with intended obstacles such as puzzles or problems which are designed to impede progress but engage the user in challenging activities germane to game-play. Alongside ease of navigation are navigational routes and the overall structure of the multimedia text. The sensation or illusion of being within an environment will be enhanced by the way a user is able to move within the landscape: something which

may be achieved without the use of graphical interface. A sense of involvement may be achieved through the interactions between a reader/player and the text. Interactions may include a range of features such as navigational links, activation of additional media, making decisions which affect the direction of the narrative or the completions of specific tasks.

Laurel's 1993 work '*Computer as Theatre'* offers some useful definitions and distinctions in relation to interactivity which may be useful when analysing the observations and recordings of children working with the multimedia texts. Laurel contends that there are three variables which collectively govern interactivity in a multimedia environment; frequency, range and significance. Frequency relates to the number of hyperlinks, range refers to the number of choices available and significance corresponds to the way in which the choices affect what happens. A multimedia text with low interactivity would therefore contain a limited range of hyperlinks on a rare or occasional basis which would have little or no consequence upon the developing action. Some caution should be observed when analysing data such as this because high frequency and a wide range of hyperlinks would not automatically designate a multimedia text as highly interactive. The significance resulting from the activation of a hyperlink, referred to as 'agency' by Murray (1997:128), also requires consideration. Some games, such as chess, have few and infrequent actions involved, yet the significance or agency of each action is high. Conversely, some multimedia texts may require or offer opportunity for frequent use of a mouse or joystick yet there is little agency or significance in the resulting action.

Although these variables may offer some illumination regarding the relationship between mouse click, interactive element and interactivity they do not acknowledge the reader/player experience of interactivity. Laurel suggests a fourth variable, participation, which is altogether more subjective and rudimentary than the previous three (Laurel 1993:20). Participation may be described as the feeling of being involved in the action. The frequency, range and significance of the hyperlinks may contribute to the participatory nature of the text but other design factors such as imagery, sound effects, background music, narrative and the role of the player/reader also affect this experience. More frequently, the term 'immersion' is used to describe this effect (Ryan 2001:120, McMahan 2003:68, Yellowlees Douglas & Hargadon 2004:196) whereby the player/reader is 'transported to a simulated place' (Murray

1997:98) and imagines themselves as acting within that place. At this point, it is necessary to return to the distinction made by McMahan (2003:68) between the 'diegetic' and the 'non-diegetic' levels of immersion as this schema provides a means of focussing upon different elements of the same text. In the first instance, the reader/player is immersed in the narrative whilst in the second it is the game-play. The two are different and would benefit from being distinguished from one another when analysing children's interactions with game-oriented multimedia texts. McMahan (ibid) suggests that the term 'engagement' (p69) would be helpful when referring to non-diegetic immersion where the concentration of activity is upon developing strategies, solving problems, collecting rewards such as points or coins and advancing to another level. Immersion, within the diegetic, sometimes referred to as 'presence' (Ryan 2001:66), is the illusion of physical presence within a simulated or virtual world. In part, a sense of immersion is created by the graphics and sound effects and is enhanced by the ability to move freely around the virtual landscape and interact with the features of the surroundings as if there were a physical connection. The purposeful use of narrative allows the player/reader to have a reason to interact with the environment and with the addition of a role, the player/reader assumes an identity. Some games place the player in the first person perspective and allow an apparent freedom in movement thus enhancing the sense of presence. When analysing children's interactions with computer games, the extent to which the child is engaging in the diegetic or the non-diegetic will need to be examined. Furthermore, the interplay between the two may also be considered. It is possible that one may act as a catalyst for the other but equally, one may also distract the child from the other.

To summarise, interactivity may involve the use of the mouse or an alternative device to activate hyperlinks programmed into the multimedia text, but it cannot be reduced to this action alone. The sense of agency resulting from such interactions in terms of plot or game will be of greater importance to the level of interactivity experienced by the reader/player. Engagement (McMahan 2003:69) in a computer game's strategy can also be considered as a contributory factor as can immersion, alternatively referred to as 'presence' (Ryan 2001:66), within the diegetic aspects of a game.

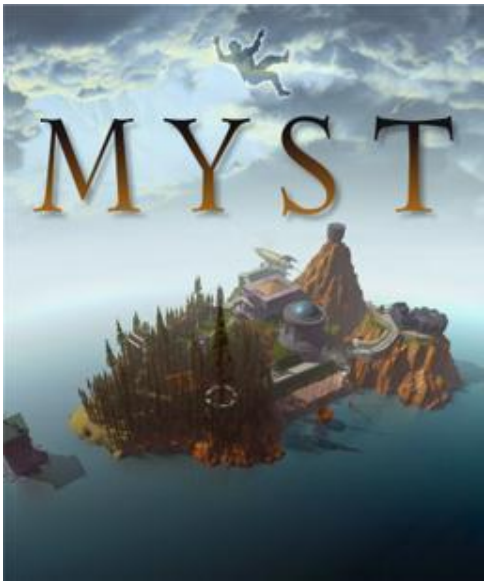
By examining a multimedia text and identifying the number, nature and purpose of hyperlinks contained within it, it would be possible to compare levels of interactivity with another multimedia text. This analysis would, however, be incomplete without

examining the experiences of the child as player/reader. Interactivity through engagement and presence may, in part, be observed from the reactions and interactions of children with both text and one another. Providing opportunity for the children to discuss their experiences during and after their interactions with the two texts may offer further insight into the more complex aspects of interactivity. To understand the latter more fully, further examination and discussion regarding the nature of narrative and the role of the reader in the light of multimedia texts, such as computer games, will be presented later in this chapter.

3.5 Selection of two *multimedia* texts: *Myst* and *The Lost Boy*

The two multimedia texts selected for this research project have been identified by the individual publishers as suitable for children within upper key stage two. The first, a computer game called *Myst* (1993) from the *Myst* series, has been developed by the company Cyan World (see figure 10). This is an immersive, graphic interactive puzzle-adventure primarily designed for entertainment purposes and listed as suitable for ages seven and above.

Figure 10: Cover of Myst CD ROM game for the personal computer



The second piece of software is a multimedia text created in 2004 by Pearson Education publishing specifically for the educational market. The selected title, *The Lost Boy* (Cooper 2004) is one from a range of titles collectively referred to by Longman as 'Digitexts' and advertised as providing opportunities to 'develop the ICT literacy skills that children need in the twenty-first century'. *The Lost Boy* is marketed

as being appropriate for year five pupils and is described by the creators as a ‘mystery story’.

The marketing strategies of the creators of each title have targeted different audiences. Longman have focussed upon the educational market whilst Ubisoft, the company which markets Cyan World’s product, have placed the *Myst* series firmly within the entertainment market. As such, the two titles differ in a number of ways. The primary purpose of *The Lost Boy* is that of narrative whilst *Myst* employs narrative in order to offer context to the game. Both titles contain an element of mystery and both claim interactive features. The user in *The Lost Boy* is not involved in the story which is mainly retold in the third person apart from sections where the character of the Lost Boy presents his perspective in first person. *Myst* includes the user or player as the ‘stranger’ who, although never seen, undertakes interaction in the first person perspective. Both pieces of software have won awards in their respective markets. In 2006, Longman Digitexts received a BETT award for Key Stage 2 English whilst *Myst* won numerous awards within the gaming context after its initial release in 1993.

The Lost Boy (see figure 11) is set in Cornish Port and focuses upon a boy who is found adrift and unconscious in a small wooden boat by two children and their father. Multimedia elements involve photographs, sound effects, voice clips, a variety of drawn images and hyperlinks between screens and multimedia elements.

Myst is also a mystery and the instructions inform the player that they have been transported to a world found within a book. Upon entry to this world, the player is free to explore the surroundings as an unseen ‘stranger’. The world includes a library which contains a variety of books. *Sirrus* and *Achenar*, the two sons of *Atrus* have been imprisoned within two separate books. The stranger is ultimately faced with several options in the concluding stages of the game and more than one ending is available.

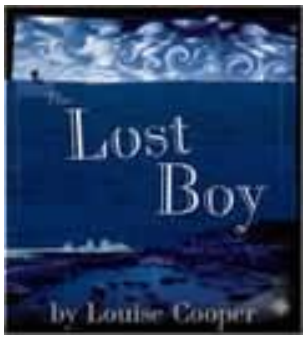
Myst provides navigational freedom to wander around the digital landscape. Some areas are inaccessible until a problem has been solved by the user. The various problems may be completed in any order and, once certain conditions have been fulfilled, the user can gain access to the four distinctly different, separate worlds, where more problems need to be solved in the ultimate quest of completing the game. The user moves through the architecture of *Myst* one image at a time as opposed to a

free-roaming three-dimensional experience. Apart from the two sons trapped within their respective books, the landscape of *Myst* is devoid of any other inhabitant.

The Lost Boy does not prevent the user from navigating between pages. The use of the 'back' facility or the selection of a particular page or chapter can be made from a visual plan of the story. However, during normal reading of the story there are some restrictions on progress through the screen pages. Although there are various sub-sections within each chapter which can be accessed in any order, they all must be accessed. Only then will the navigational compass, allowing advance to the next chapter or main section, be made active. The user can choose to override the main screen events through the use of the visual navigation tool.

Initially, *Myst V* (2005) was chosen as this has a comparable release date to *The Lost Boy* (2004) but on closer inspection of *Myst V* it was clear that some prior understanding of the *Myst* series would be beneficial. Furthermore, there were lengthy introductory sequences of animation in *Myst V* which needed to be viewed before interaction with the game began. Although the first *Myst* version is considerably older, the nature of the graphic interface is similar in some ways to *The Lost Boy*.

Figure 11: Cover of *The Lost Boy* CD ROM multimedia text



In addition to the software titles, two laptop computers were used so that both children in each pair were able to simultaneously, yet independently, interact with the software. Laptop computers were used in preference to the school computer system to avoid any potential technical complications either for the data capture or for the school network due to installation issues. On each computer, *MediaCam AV* was installed alongside the drivers for the webcam and the necessary files for both pieces of software. In both instances, identical webcams were used. One laptop was slightly older than the other

and consequently processed the visual data slightly slower than the other, but it did not significantly affect the experience of the user.

3.6 Conclusion

The methodology of this research project undertakes a phenomenological approach. It is the lived experiences of the children which are central to this case study and data collection methods will seek to capture these experiences and elicit the children's perspectives regarding multimedia texts. As the phenomena and the locale are both inextricably linked, data collection strategies will be undertaken which will capture the detail of both and provide opportunities for convergence. Qualitative and quantitative data collection will be necessary as children's interactions with multimedia texts will result in data which may be counted. For example, mouse clicks, in addition to video data which records facial expressions and other actions such as conversation. The research project is located within one school involving a random selection of children within year five and therefore constitutes a case study. The children involved in the questionnaire provide useful background data regarding the experiences of year five children whereas the six children involved in the video data provide the thick description of interaction and experience necessary for the close analysis of the phenomena. The following chapter will provide an analysis of the questionnaire and chapter 5 will examine and discuss the video data of the six children's interactions with each multimedia text.

Chapter 4: Analysis of the responses to the questionnaire

4.1 Introduction

Data collected from the questionnaire was collated and analysed in the light of the literature reviewed in Chapter Two. The questionnaire provides opportunity to examine children's experiences of multimedia text at home and at school in order to consider whether the children involved in this research project may be regarded as 'digital natives.' By drawing upon Bourdieu's concepts of cultural capital, these phenomena will be analysed in more depth with a view to offering explanations for differing experiences between multimedia software accessed at school and at home. The discussion arising from the analysis of the questionnaire offers useful foundational information for Chapter Five where the experiences and interactions of six, randomly selected children with multimedia texts are critically analysed. The research questions pertinent to this chapter may be identified as the following:

- What are children's experiences of interactive multimedia texts?
- How do children's experiences of multimedia texts between school and home compare?
- To what extent can children be considered to be 'digital natives'?

Section 4.2 presents the numerical data relating to the age and gender of the children who completed the questionnaire and summarises the children's access to, and use of, the home computer. Furthermore, the range and variety of additional technologies available within the home and which offer opportunity to access multimedia texts are presented within this section. This provides necessary background data when examining arguments associated with the existence of the digital native. Although particularly pertinent to section 4.2, this research question will also be considered in subsequent sections within this chapter and will be returned to in the following chapter.

The contents of section 4.3 categorise the range and variety of multimedia texts accessed on the home computer and alternative devices, such as games consoles. This corresponds directly with the research question which focuses upon children's experiences of multimedia texts, specifically, those resulting from the home and the

school contexts. The analysis of this data generates useful background information regarding children's experiences of multimedia text. In particular, it offers opportunity to compare the experiences of the six children selected for the next stage to that of a wider range of children and indicate how representative they are of children within their year.

To conclude this chapter, section 4.4 identifies the main points arising from the analysis of this data. These points will be examined in more depth within the final concluding chapter.

4.2 Children's access to ICTs within the home

The data from the completed questionnaires were entered onto a spreadsheet to allow specific fields and records to be searched and sorted. All of the responses given by one child to the questions listed comprised one record with answers to individual questions providing the fields for analysis. Although the children had written their names upon the questionnaire; when transferring the responses to the spreadsheet, each child was assigned a number in place of their name to ensure anonymity in electronically stored data.

Out of a possible 85 participants, 36 children undertook this stage of the data collection process and completed their forms providing a percentage response of just over forty-two. Table 1 provides a summary of the composition of the group by age and gender.

Table 1: Summary of the age and gender of the respondents to the questionnaire

		Age nine		Age Ten	
	Number of respondents	Number	Percentage rounded to 2 dp	Number	Percentage rounded to 2 dp
Boys	14	10	71.43%	4	28.57%
Girls	22	18	81.82%	4	18.18%
Total number of respondents	36	28	77.78%	8	22.22%

All of the respondents, without exception, indicated that they had access to a home computer. However, access may vary according to the factors operating within each household; for example the number of computers available, the number of individuals competing for the use of a machine and the location of the computer within the home. It is therefore possible that access may vary between regular and unrestricted to infrequent and limited.

The responses to the second question regarding the use of the computer at home were grouped according to the software or activity described. For example, references to using, searching or surfing the WWW were all placed within one category (using/searching the WWW) while references to writing, typing or word processing were all placed within the word processing category. In some instances, both activity and software used for the activity were included; such responses were listed separately to those which only identified software or activity. After collating the responses, it appeared that the most popular activity involved playing games (table 2). The next most frequently listed activity was 'research' followed closely by 'homework' and 'e-mail'.

Table 2: Summary of the type of activities/software used by respondents on the home computer

Activity		Number of children	Percentage response (rounded to 2 decimal places)
playing games	The shaded cells identify those responses which were given as an example in the questionnaire	30	83.33
research		18	50
homework		17	47.22
e-mail		16	44.44
Using/searching the WWW		10	27.78
Word processing		9	25
Watching video/digital video disks		5	13.89
Graphics programs (e.g. Paint)		4	11.11
Music/mp3/Garageband		4	11.11
Club Penguin		2	5.56
Webcam		2	5.56
Ordering on the Web (with parents' help)		1	2.78
Microsoft Network		1	2.78

On occasions, the use of specific terminology and examples of software used highlighted the knowledge and understanding of the child. For example, 'surfing' the web suggested some freedom and confidence in the use of the World Wide Web as a source of information. Some of the examples of computer games such as 'Dragon Fable', a MMORPG require prerequisites regarding computer capability. Firstly, some understanding of the World Wide Web is required in order to access the game portal. Secondly, the variables involved in the successful completion of tasks require a relatively advanced knowledge of games technology. Additional features include on-line discussion forums where advice, suggestions for development and general interchange regarding the game takes place. Although the questionnaire responses provides some indication of the activity undertaken on the computer by respondents, it does not provide precise evidence of the respondent's aptitude or participation in the use of the listed activities or the level of support provided by adults and peers within the household.

Four examples of computer use were provided on the questionnaire and these comprised the four most frequent responses. Although the examples were intended to support respondents in their interpretation of, and response to, the question, they may also have provided overly broad categories with some overlap in software application. For example, 'homework' could involve a wide range of applications, including word processing software, the WWW, graphics packages and e-mail. Despite this overlap between the examples provided, the undertaking of homework does indicate school-related activity as opposed to leisure and pastimes. Nevertheless, it is also possible that the inclusion of these examples influenced some of the respondents' answers and they have selected the categories offered in preference to describing activities in their own words

Some additional categories and descriptions were added by the respondents. For example, watching videos or DVDs, listening to music or using graphics packages were included in some questionnaire responses. Ten respondents who had not selected the example of 'research' included some reference to using/searching or surfing the WWW. These activities may be regarded as research-oriented in a formal, study-oriented sense of the word, whereas the inclusion of separate categories such as 'using

the WWW' may signify a self-directed and personal interest-oriented use of the WWW. Where 'surfing' is concerned respondents could be following hyperlinks from one site to another without specifically searching for anything. In some instances, the activity in addition to the software used have been combined in an answer such as 'ordering on the Web,' which provides a clear outline of computer use. Club Penguin is a social networking site with penguin avatars representing the child. This response also provides a more specific description of computer use.

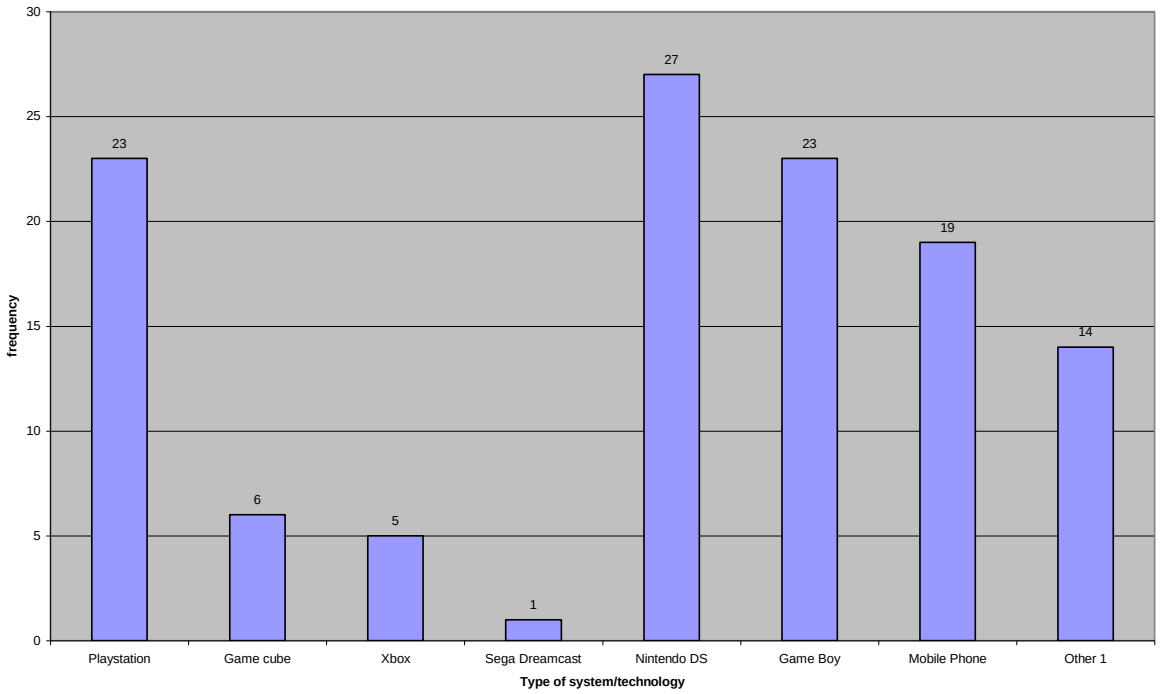
Use of the WWW and, more generally, the Internet within the home environment may be influenced by a number of factors. Where parents and guardians have purchased Internet access, education has been their main motivation (Mumtaz 2001; Buckingham 2002; Livingstone 2003). However, some researchers have suggested that because of the level of information handling skills required to use the Internet effectively, children find it difficult to locate and use relevant sources through this medium (Fasick 1992). Livingstone also highlights what she refers to as a 'digital generation gap' where parents are still uncertain and wary of the Internet and are developing strategies to monitor and manage children's use (2003:149). Although parents may view Internet access in a household as an important educational advantage for their children, the digital divide between parent and child may result in children appropriating the potential of the Internet for their own interests (Livingstone 2001) with parents supervising less at home than teachers do at school (Kerawalla & Crook 2002). Alternatively, Facer et al. highlight the possibility of school competence falling behind that gained through free exploration at home but they also warn against overestimating the extent and nature of expertise achieved at home (2001). Essentially, the portrayal of the child as a naturally adept user of ICT is problematic.

Overall, the collated responses appeared to correspond with the findings of other studies such as Sutherland et al. For example, the vast majority of the children involved in the case study engaged in games play as opposed to any other activity (2000:209). A similar case study undertaken by Downes (1999b) in Australia also suggested that playing games was the most popular use of the computer. A case study of 983 students aged 16-19 by Selwyn also found that word processing, followed closely by games playing, were the most frequent activities undertaken by the students (1998:217). However, as Sutherland (2000:195) points out, 'the context of home computer use amongst young people is far from a simple and uniform phenomenon'

and the responses to the questionnaire can only provide a limited insight into the way in which children interact with the computer within the home environment. Certainly, the data collected for this research does highlight the popularity of games playing, although this does not necessarily mean that this was the most frequent activity. Whereas the extensive research undertaken by Downes, (1999b), Sutherland et al. (2000) and Selwyn (1998) have focussed specifically on children's, or young adults', use of computers within their homes and provide a more comprehensive set of data related to preferences and experiences, this project has sought to examine the range and diversity of multimedia titles encountered both at school and at home in greater depth.

Consequently, it is also necessary to examine children's access to alternative devices which offer similar opportunities. For example, games stations such as the *Playstation* or *Game Cube* are specifically designed to support interactive, multimedia games play. Question four therefore required the respondents to identify the range of such devices to which they had access. The responses have been presented as both chart and table (see chart 1 and table 3) and a full list of the questions is available within the appendix (Appendix B).

Chart 1: Access to alternative devices for multimedia stories and digital games playing



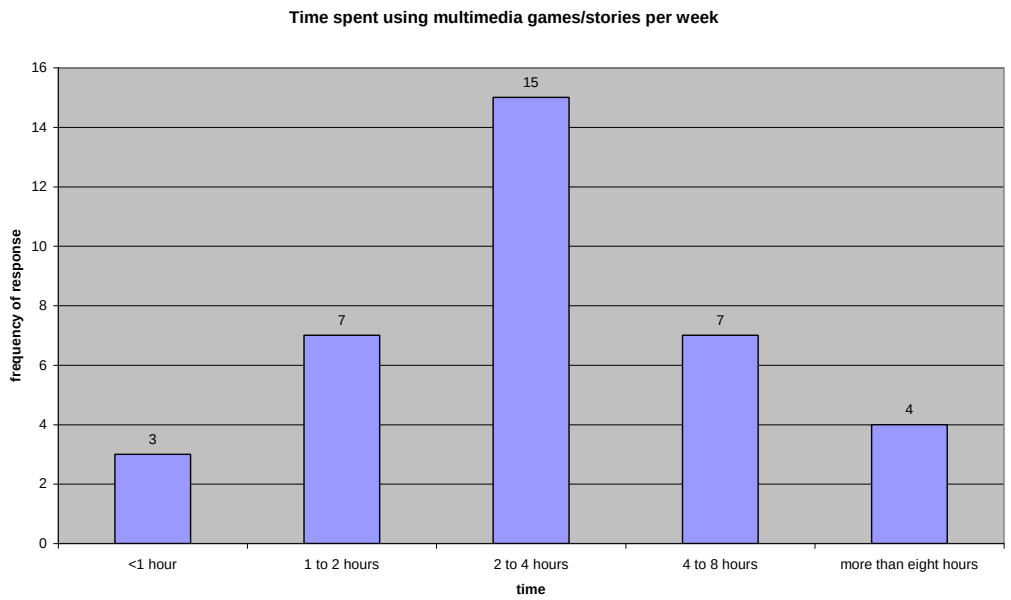
All respondents possessed one or more of the listed technologies with the least being one and the most six. The mean number of technologies per individual was calculated at just over three (3.31 to 2 decimal places) with a total of 119 devices owned by the 36 respondents. In four instances, the range was limited to DVD players or a parent's mobile phone. Generally, the results appear to suggest that the respondents had access to a variety of technologies and therefore had opportunity to interact with a range of multimedia titles.

Table 3: Access to alternative devices for multimedia stories and digital games playing

Number of games consoles/devices per individual	0	1	2	3	4	5	6
Number of respondents	0	6	4	11	5	6	3

Specific technologies such as the Sega Dreamcast were launched in 1998 and discontinued in 2001, which would account for the limited number of consoles accessed by the respondents. Conversely, the Playstation, Nintendo DS and GameBoy are either relatively new to the market or have been regularly updated to maintain their competitive edge.

Chart 2: Children's estimation of time spent using multimedia games/stories per week



The tick box element of question six allowed the respondents to select an approximate time which represented the number of hours they spent playing games over a period of a week (see chart 2). Collectively, the 36 respondents interacted with the multimedia

titles for a minimum of 97 hours and a maximum of 167 hours or more each week. During the course of a week, the mean amount of time per respondent equates to between 2.69 at the least and in excess of 4.64 hours at the most (both rounded to two decimal places).

4.3 Children's experiences of multimedia texts at home and at school

The responses to question three provided a more detailed overview of the types of games played on the computer. These are summarised in table 4. To provide some interpretation of this data, each game was categorised. Classification of video and computer games is problematic. As indicated by Newman (2004:11), the most frequently used method of classification is genre; a method evident in both marketing description and academic literature (Griffiths 1999, Berens & Howard 2001). Effectively the player's experiences and interactions with the system provide the criteria for classification. The range of possible interactions and experiences create complexity when attempting to identify indicators which allow games to be positioned into specific groups. As a result, there is no firm consensus within the games industry, or among academics for a set of criteria or genres. It is possible to find categories which describe similar genres but with different names. For example, those described as 'stealth' games may also be situated within the 'shooter' category. Furthermore, some games may involve a variety of activities or subplots which allow them to be placed into more than one category (Wolf, 2001:116). In order to classify the range of games listed within the questionnaire responses, a system using genre has been adapted and developed from work previously presented by Wolf (2001: 116-134) and one offered by McFarlane, Sparrowhawk & Heald (2002:8). In both instances, the categories had been generated from each researcher's perspective of games genre. Sparrowhawk & Heald (2002) had approached this process from an educational standpoint with titles selected for their perceived educational value. The resulting list of genres was therefore less comprehensive than the range of titles available for purchase. For example, war/strategy games were not evident within the list of software selected by Sparowhawk & Heald for their research. Neither were role-playing games, rhythm/music/party or platform games. In some instances, the violent content which may be involved in some of the genres such as war games would automatically make their inclusion within Sparrowhawk & Heald's research problematic. Other genres such as rhythm/music/party being more recent additions to

the ever-increasing range of available titles and were, perhaps, omitted due to their limited status at that time.

Table 4: Multimedia titles used on the home computer and their frequency according to genre.

Genre	Description of genre	Game title	Frequency for each title	Overall frequency	Number of respondents
Adventure	Often requires the solving of puzzles with no demand placed upon the player in terms of reflex.	Rugrats	1	1	1
Action-Adventure	Usually involves a series of challenges set within a theme. Can include role-playing games	Star Wars Battle Front Harry Potter Tarzan	1 1 2	4	4
Strategy/ war games	These can also be classed as historical simulations or adventure/quest however, they are distinct from the other categories as they often involve specific military/war content.	Age of Empires Total War (Rome) Battle for Middle Earth War hammer 40000 War Hammer; Mark of Chaos Age of Mythology War Games (no specific title given)	1 1 1 1 1 2 1	8	6
role-playing game	The player is represented by an on-screen character set within a role. In some designs players from around the world are able to interact in an online environment as an on-screen character or avatar. Players often engage in challenges or quests.	Runescape City of Heroes Dragon Fable Adventure Quest Diablo ToonTown Pokemon	3 1 1 1 1 1 1	9	4
Simulations/ virtual life	Often represents a real-life scenario where variables affect the outcome of events. Sometimes referred to as 'god games'(Atkins, 2003:113)	The Sims Pony Valley Championship Manager Dogz Catz	4 1 1 2 1	9	6
Race games/sports games	Individuals attempt to beat others (real or computer generated) around a track or along a route. Often involves cars, bikes or other forms of transport.	Dune Buggy (miniclip) Scooter pro Car games (no specific title given) Evel Knievel	1 1 2 1	5	4
Maze games	Individuals try to navigate their way through a two or three dimensional route often overcoming challenges on their way.	Pokemon some involve maze games	1	1	1
Edutainment activities	Titles in this genre have elements of entertainment combined with clear educational purpose. Children's BBC contains free online games often with an educational purpose	The Zoombinis Typing Spongebob Spelling game (no specific title given) CBBC Voices in the Park	1 1 1 2 2	7	6
Shooting/ arcade games	The player is required to aim and fire at objects through levels of increasing complexity.	Mineball	1	1	1
Traditional games	For example, card games chess, battleship or Othello where an individual often plays against the computer.	Spider Solitaire	1	1	1

Platform Game (2D/3D)	Players are required to move along platforms and avoid obstacles in their path often collecting objects/points as they travel.		0	0	0
Rhythm/ Music / Party Game	These games sometimes involve individuals responding to music/rhythm in a competitive manner. In some instances, puzzles are included and this genre can be linked to the previously described 'puzzle' category.		0	0	0
Non-classifiable data entries	Club Penguin – social networking site with multiple games, mostly racing games Miniclip- free, on-line games covering a range of genres Agame.com free, on-line games covering a range of genres The Disney Channel. A variety of games based on Disney films/characters Mousebreaker, free online games MaxGames a website containing a variety of freely accessible games Heavy Games, another website with a variety of free games	Club Penguin MiniClip AGame.com The Disney Channel MouseBreaker MaxGames HeavyGames	6 7 1 3 1 1 1	20	13

Wolf (2001:116) has enlarged our understanding of categorisation by drawing upon the culture of computer games which already uses generic terms to classify titles. As Wolf points out, some of the existing terminology applied to game genre has been derived from moving imagery, for example 'adventure' or 'action-adventure' whilst others are specific to the computer game such as 'maze' or 'platform'(2001:116-134). Whilst some of these genres have been included within the list shown in table 4, many of those listed by Wolf can be located within the categories offered by Sparrowhawk & Heald. Where genres are not already represented, Wolf's list provides one of the most illuminating means of identifying additional genres to achieve a more detailed coverage. Nevertheless, the comprehensive categorisation offered by Wolf has been simplified and several genres have been combined within one, more general category. For example, 'Racing' and 'Fighting' games may be found within 'Race Games/Sports Games', with 'Pencil, and Paper Games' alongside 'Card' and 'Pinball Games' are placed within the 'Traditional Games' genre

The resulting set of genres found in table 4 is not as finely categorised as Wolf's list but it does provide a more comprehensive overview than that generated by Sparrowhawk & Heald. Where websites exist with details, description of, and often

access to, the game listed, the relevant hyperlink has been attached to the title of the game.

The frequency with which each title was listed by the respondents has been identified and recorded. For example, where two respondents list '*Age of Mythology'*, this has been recorded as a frequency of two. To gain some understanding of the number of respondents with access to a particular genre, a separate column has been created. If one child has identified both '*Age of Empires'* and '*Age of Mythology'* within their response, this has been recorded once in order to give some insight into the relative popularity of each genre.

Some games were not possible to place within one genre. This was because the game listed by the respondent could have related to several versions, all of which occupied different genres. For example, one child indicated that they played *Pokemon*. This does not exist in one form and it is possible to find various types of *Pokemon* games. Some are focussed as an adventure-quest whilst others involve mazes. *Miniclip* offers similar problems but for different reasons; a range of games are freely available from the *Miniclip* site. Where the respondents have identified a specific title of a game this has been included, however, it is not possible to categorise the website itself. *Club Penguin* is equally difficult to place as it is a social networking site for children. Each child is represented on screen as a cartoon penguin known as an avatar and, through the use of text; they may interact with other children who are also represented as penguin avatars. The child can become involved in various games, for example, race games where obstacles need to be avoided or tasks which may increase in difficulty and may be set against time. Some of the games are undertaken on an individual basis whilst others are against other penguin avatars. Competing in such games allows children to gain virtual gold coins which can be exchanged for screen goods once membership has been purchased for the child.

The above table indicates that the most frequently listed genres were strategy/war games, simulations/virtual life and 'edutainment', all of which were included in the responses of six individuals. Of these, there were marginally more simulation/virtual life titles used by the six responses recorded in this genre. Although there were four respondents signalling ownership of games within the role playing genre, the overall frequency of games' titles equalled that of the simulations/virtual life genre. It was

potentially significant to note that respondents often possessed a number of titles within one genre rather than a broad selection. This was particularly evident within the role playing genre where four individuals accounted for the seven titles listed. Four categories generated a limited response; adventure, maze games, shooting/arcade and traditional each gained an overall frequency of one. Two other genres did not appear to be accessed via the home computer; platform games and rhythm/music/party. However, there are limitations in terms of time, space and memory for the respondents to list all of the multimedia titles they used. The responses to this question allow some insight into such activity and the type of multimedia titles accessed within the home environment although this is neither comprehensive nor detailed.

Where question three gathered data regarding the multimedia titles accessed on a personal computer, question five requested data on the titles accessed by using the range of games-playing platforms and other technological devices such as mobile phones and DVD players listed in question four. The collated data from the respondents has been entered into table 5. This table has retained the same genres for the games as listed in question three. In order to avoid repetition, the description of each category has been omitted.

Both the range and diversity of multimedia titles listed by the respondents has increased. Essentially, in comparison to table 4, all of the categories are represented by specific titles and the number of titles within each category has increased. The frequency of individual titles is generally higher and the number of respondents who have access to these titles is also greater. Simulations/virtual life and race/sports games show a marked difference with approximately two thirds of the respondents indicating they have access to these. The frequency of titles described as platform games also differed to the responses gained in question three. Just under half of the respondents indicated that they had access to a title categorised as a ‘platform game’ whilst previously there were no titles which could be located in this category.

In the remaining genres, there were some differences in both the number of titles and the number of respondents who possessed the various titles, although these only consisted of relatively small variations in comparison to those highlighted previously.

Table 3: Multimedia titles played on games consoles, handsets and additional technologies to the personal computer.

Genre	Game title	Frequency for each title	Overall frequency of genre	Number of respondents
Adventure	Ratchet and Clark	1	4	4
	Shrek the third	1		
	Charlotte's web	1		
	SpongeBob's Atlantis SquarePantis	1		
Action-Adventure	James Bond	1	14	11
	Crash Bandicoot	2		
	Lego Star Wars 1 and 2	2		
	Tomb Raider	1		
	Harry Potter and the Half Blood Prince	1		
	Charlie and the Chocolate Factory	2		
	Brave	1		
	Just Cause	1		
	Spiderman	1		
	Zelda	1		
	Eragon	1		
Strategy/ war games	Pawly Pets: Pet Hotel	3	4	4
	Spartan	1		
role-playing game	Final Fantasy	1	5	4
	Pirates of the Caribbean (action-role play)	1		
	Pokemon	3		
Simulations/ virtual life	Nintendogs	18	27	21
	Sims, Sims2	2		
	Sims2 Pets	1		
	Catz	1		
	Dogz	2		
	Purr Pals	1		
	New York Nights	1		
	Pony Friends	1		
Race games/sports games	Rugby 08	1	38	22
	Fifa, Fifa 2003, 2007, 2008	10		
	Football (no specific name)	3		
	Cars and racing (no specific name given)	2		
	Racing	1		
	Animal Crossing; Wild World	2		
	Golf	1		
	Barbie Horse Adventure	1		
	Wacky Races	1		
	Burnout	2		
	Tony Hawk Pro skater 4	1		
	Harry Potter; Quidditch World Cup	3		
	Crazy Frog Racer	1		
	Kart Driver 3	1		
	Boxing	1		
	WWE Smackdown.vs.RAW 2007 (wrestling)	1		
	Winning eleven; Pro evolution soccer 6	1		
	Wii Sports	1		
	SSX Tricky (snowboarding)	1		
	The Simpsons hit and run (mission-based driving)	1		
	The Simpsons Road Rage (mission-based driving)	1		
	Mario Kart	1		
Maze games/ puzzle	Snake	4	12	11
	Cooking Mama	6		
	Puzzles (no specific name given)	1		
	Super Bubble Pop	1		
Edutainment activities	Brain Training	2	3	3
	Read for Speed	1		
Shooting/ arcade games	Judge Dread (first person shooter)	1	3	3
	Halo 3 (science fiction first person shooter)	1		
	Star Wars Battle Front (science fiction shooter)	1		
Traditional games	Soduko	1	1	1

Platform Games (2D/3D)	Lion King Tom and Jerry Super Mario Mission Impossible Sonic Rush Shrek 2	1 1 14 1 1 2	20	15
Rhythm/ Music / Party Game	Bratz Sing Star Super Monkey Ball Touch and Roll	2 1 1	4	2

Some of the respondents added comments to their list which clearly indicated that they used more titles than those they had chosen to enter into the data entry box. One individual stated that they had '*many many many many more'* whilst another added a comment that they 'had over 100 Playstation games'.

Table 6 contains the children's responses to question seven which required them to identify the names of programs used at school which they considered to be multimedia games or stories. The responses were then analysed and classified according to the software type. Alternative methods of classification were considered, for example the classic role-based framework of tutor, tool and tutee (Taylor 1980) and the educational rationale system involving instructional, revelatory, conjectural and emancipatory paradigms (Kemmis, Atkin & Wright 1977) alongside the functional approach involving application type (Pelgrum & Plomp 1991). Each framework may be criticised and present limitations when selected as a means of analysing the children's responses. By focussing upon the educational rationale there is a tendency to stereotype the functionality of programs and categorisation by the role-based framework may limit consideration for software attributes. Use of software type may also be criticised for the lack of attention assigned to the human characteristics of learner and teacher. Nevertheless all frameworks offer a means of describing ideas and perceptions related to the various software packages within the context of the classroom. The analysis of this data does not seek to examine the educational rationale or the role of the software in relation to the learner but to gain insight into the range of programs the children perceived as being multimedia. Some children described the activity undertaken, as opposed to naming the software, which offered a more precise means of locating the appropriate category for the response.

Similar types of software were placed into the same category to allow a convenient overview of the range and variety listed. The frequency of similar types was recorded and, from the emerging data, the prevalent types may be determined. In some

instances, the title of the program is provided and these are relatively easy to categorise. On other occasions, a child provides a general description of the activities undertaken or the functionality of the software. As suggested earlier, all frameworks for categorising software are problematic for a number of reasons. In this instance, more than one category may be appropriate for one program, for example, *Powerpoint* may offer image editing facilities in addition to multimedia authoring and animation software such as *2Animate* includes image editing tools. In these instances, the primary purpose of the program provided the distinct categories. A second problem occurs when attempting to identify a program type from a child's description as opposed to a named program. In such cases, it may be argued that the child's description of their activity may be accepted as the primary purpose of the program in that instant regardless of whether the program used offers a wider functionality beyond that of the child's description.

Table 4: Multimedia games or stories used by the respondents on the computer at school

Title of the software	Frequency of response	Type of program
2Connect	6	Concept mapping
2Animate	15	Animation
2 Paint a Picture/2 Paint/Paint	9	Graphics
Voices in the Park	13	Multimedia story
Graph	2	Graphing
Slideshow	2	Photo slideshow
Powerpoint	5	Multimedia authoring
Presentation (possibly Powerpoint)	1	
Excel	2	Spreadsheet
Logo	1	Logo
Turtle Games (possibly Logo)	1	
Turtle Coordinates	2	
Games (no specific name given)	1	Game
Santa Claus set of games	1	
Hangman	2	
Primary Games 1-2 (maths)	4	
Maths Games (a description of a directional, logo-type activity is provided)	1	

Apart from the title '*Voices in the Park'* and some educational games, the responses from the children suggests that multimedia programs used during school time generally involve the construction of files which may involve varying levels of multimedia content. Logo-oriented programs may be presented visually as opposed to the more abstract mathematical interface of programs, such as *MSW Logo* and therefore possess some multimedia characteristics. Programs such as *Powerpoint* allow the construction of multimedia presentations involving the combination of sound, image and text. Graphics, animation and concept mapping software allow presentation of ideas through text and image whilst graphing software, including spreadsheets can present data visually. It is surprising that word processing is not included in the list as text and image may be combined within this type of program. It is possible that the primary use of word processing programs involves the use of written text and the term multimedia, although it includes writing, is more closely associated with images, animation and sound.

On closer inspection of the titles selected by the children it appears that, all apart from Excel, offer a more visual interface. If word processing software is used primarily for drafting written text the respondents may perceive it as primarily text-based rather than possessing multimedia potential. In contrast to the titles accessed through the home computer or the various games consoles, the range of programs listed is limited in variety and number. Apart from games which could be located within the edutainment category there were no linkages between home and school programs.

It is possible that, in their attempts to identify examples of multimedia text used at school, the children listed any software which could be connected to the term 'multimedia'. What is evident from the list generated from these responses is that whereas the construction of multimedia is catered for in the repertoire of programs used by the children, opportunities to 'read' such texts are extremely limited.

By comparison, children's experience of multimedia texts within the home context appears to be extensive and many of the titles listed within their questionnaire responses not only offer opportunity to develop narrative but also possess intertextual connections to film, book, graphic novel or a combination of these (see tables 4 and 5). Linkages between the National Curriculum and the various games can be identified

but these are neither obvious nor central to the design of the software and can, in some instances, be rather tenuous.

Clearly, multimedia texts, including computer games, are not embedded within the school culture. By examining the school setting and children's responses gathered from the questionnaire, it is possible to identify some of the factors which affect the availability and use of multimedia texts in the classroom. For example, it is clear that children had greater access to multimedia texts when at home because, in addition to the computer, there is more equipment, in the form of dedicated games consoles, (see table 3 and chart 1). By comparison, the school had one computer in each classroom and one computer suite which was shared by all of the classes. Quite simply, opportunities for children to interact with multimedia texts are more likely to occur in the home than in the school because there is an increased likelihood of gaining access to relevant technology. Furthermore, where computer games are concerned, there is often a large investment required from the player in terms of time. This is reflected in the children's estimation of the time they spend playing games each week (see chart 2). The children who responded to the questionnaire spent, on average, between 2.69 and in excess of 4.64 hours per week playing games on the various technologies at their disposal. It may also be noted that these figures only record the time the children spent playing games and do not include any additional time spent on other activities such as e-mail, homework-related tasks, word processing or searching the WWW (see table 2). In a curriculum where subjects compete for time it is highly unlikely that similar opportunities could be made available for pupils to play computer games in school.

Although this argument may, in part, account for the absence of computer games in the school it does not explain why there is only one example of a multimedia text listed in the children's responses. As discussed in Chapter Two, interactive multimedia texts such as Brøderbund's Talking Book series have been available since the early 1990's. Yet, unlike the increase in computer games, it appears that multimedia 'books' have not achieved a similar range and variety. In fact, according to the questionnaire responses, they are notable for their absence.

In terms of Bourdieu's concepts of cultural capital, the acquisition of literacies associated with the interpretation and construction of typographic text may be

regarded as an embodied form of cultural capital which is desirable and of high status (Bourdieu, 1986:244). Certainly, the ability to decode and encode typographic text requires the personal investment of time and is the result of labour-intensive activity. By this measure, being 'traditionally' literate may be regarded as a valuable cultural competence which is unevenly distributed because of the challenges associated with the process of becoming literate (Bourdieu, 1986:246). By comparison, the actions of activating and interpreting multimedia content are, perhaps, less well-regarded as they appear to be less challenging and the cultural competencies associated with their interpretation more evenly distributed. Multimedia texts such as computer games could be viewed as 'vulgar' activities' which generate 'low status' symbolic wealth (Bourdieu, 1971:176). In most instances, multimedia titles are employed to support the development of 'noble' activities in the form of typographic forms of literacy or understanding in other curriculum subjects such as science or mathematics (Bourdieu, 1971); this is reflected in the list of multimedia titles collated from the children's questionnaire responses.

In his seminal work, *Reproduction,* Bourdieu argued that the school's three main functions were to socialise individuals into a specific cultural tradition, reproduce social class relations and finally legitimise its function of social reproduction (Bourdieu and Passeron, 1977). Bourdieu continues to argue that the institution of the school undertakes a 'function of conserving, inculcating and consecrating' a cultural heritage in a manner which is similar to the role of a church. However, the rapid changes experienced over the last quarter of the twentieth century due to the influences of ICT challenge the cultural heritage which the school seeks to conserve. The struggles for legitimacy, where a system of social relations compete to define the dominant class, exist within 'field' of the school. Legitimacy is conferred in the form of symbolic capital which may be either economic or cultural. In its embodied form, cultural capital exists within the school in such things as books and the reading and writing of typographic text (Bourdieu 1997). Beyond the school, multimodal forms of communication such as computer games are pervasive and distinct from typographical text which struggle to be acknowledged as a valuable form of cultural capital worthy of inclusion within the formal educational setting.

The computer is viewed as an embodied form of cultural capital both at home and at school, (see table 2 and table 6) with Word-processing, spreadsheets, programming,

research and homework all evident as activities which are valued. The aforementioned programs are perceived to have direct linkages to the education and employability of an individual. The National Curriculum lists databases, spreadsheets and word processors as examples of software relevant to the ICT Programme of Study for ICT (DfEE 2000) and are included within a set of skills referred to as 'Key Skills' within the 14-19 curriculum (DfES 2005:39). Although it is undeniable that these programs and skills are relevant and worthwhile within our society, the data collected from this research project suggests that the school is conserving cultural traditions without embracing and acknowledging widespread changes in cultural practices involving multimedia texts such as computer games.

4.4 Conclusion

The following two points form an interim conclusion to the analysis of the data, specifically the points arising from the children's responses to the questionnaire.

The first point relates to the apparent differences in children's experience of ICT and, more specifically, multimedia texts at home and at school. The range and diversity of multimedia texts in the form of computer games are evident within the home context whereas the titles listed by the children as being accessed at school are limited. Multimedia texts at school are so limited that the children listed software which could not be considered as 'text' although they contained multimedia content or allowed children to interact with, or create, multimedia content. In the light of arguments surrounding new literacies and the increasing array of multimedia texts accessed at home, the question arises as to how the school may address such disparity.

The second point relates directly to the discussion surrounding the existence of children as 'digital natives'. From the questionnaire responses, there is evidence that some children are more experienced than others in the use of ICT, yet the existence of the 'digital native' is not completely revealed. In pragmatic terms, it may be suggested that there exists a range of experience with some children being more adept than others but in contrast to claims made regarding the homogenous digital expertise of children by virtue of their age, this is not substantiated by the empirical data. The ability to access and successfully complete a variety of computer games does suggest that children possess some expertise but this does not necessarily translate to all aspects of ICT. Furthermore, factors such as personal preference, access and

competing interests would affect the development of children's capability in ICT. The case for the 'digital native' is persuasive but the data gathered for this research project indicates that it is far from conclusive. The question as to what extent children may be considered to be digital natives will be returned to in chapter 5 where analysis of video will provide an opportunity to examine individual children's experiences in greater depth.

Chapter 5:Analysis of *MediaCam AV* data

5.1 Introduction

The previous chapter analysed questionnaire responses and provided useful background data to the subsequent analysis of video captured through the use of specialised software (*MediaCam AV*) previously described and discussed in Chapter Three. Although the questionnaire data provided some indication of the range and variety of multimedia texts accessed by the children at home and at school, the way in which they interact with such software cannot be determined. This chapter provides a thick description of children's interactions with multimedia texts and opportunity to critically analyse the complex and multiple layers of meaning associated with this phenomenon.

Section 5.2 provides a brief overview of the data collection process and then analyses the way in which the data may be examined with regard to interactivity, navigation and interpretation.

Children's interactions with each text are critically examined in turn with section 5.3 relating to *The Lost Boy* (a multimedia text designed for school) and section 5.4 focussing upon *Myst* (a multimedia text designed for home) thereby connecting with the following research question;

- How do children interact with multimedia texts?

And, more specifically;

- How do children interact with a multimedia text designed for the school context? (section 5.3)
- How do children interact with a multimedia text designed for the home context? (section 5.4)

The final research question, which is shown below, is integral to the analysis of children's interactions with both multimedia texts and will be discussed throughout sections 5.3 to 5.4.

- How do children's interactions with multimedia texts relate to the notion of new literacies?

Finally, section 5.5 will focus upon two children's interactions with the multimedia texts and compare the way in which their activity may be viewed in light of the digital native debate. This section will therefore reconnect with the following research question examined and discussed earlier in chapter four.

To what extent can children be considered to be 'digital natives'?

The concluding section (5.6) draws together the main discussion points arising from the research project which will be addressed in Chapter Six.

5.2 Analysis of data collected using *MediaCam AV*

Each of the children involved in this stage of the research interacted with the two multimedia texts. The organisation and process of capturing the video data, alongside the rationale for the selection of the children and the multimedia texts has been described in the Chapter Three. One child (Child B), through illness, was unable to attend the second of the two sessions and therefore no video footage exists. Child E completed the second session, however, due to unforeseen difficulties experienced during the recording of this data; the *MediaCam AV* file was corrupted.

The video recordings of each child's screen activity and webcam images of the child as they interacted with each of the multimedia titles were observed and analysed iteratively with annotations added to the video where particular activity presented opportunity for interpretive comment. Annotations were created by virtue of the editing facilities within the *Media Can AV* software. The videos of each child were then sectioned into smaller clips with each smaller clip providing examples of a child's interaction with, and experience of, the multimedia text. These smaller sections of video were analysed through repeated observation of each with further annotations added to the existing set. This process was further facilitated by the software through the ability to slow down the replay of specific events and the opportunity to examine precise moments with the face of the child and the screen activity synchronised. Theoretical perspectives and the video analysis were conducted in what may be described as an iterative process in order to identify and examine the emerging themes which will be discussed in greater depth within this chapter. Essentially, these may be identified as navigation, interaction and interpretation.

Although three distinct elements are presented for the purpose of analysis it is recognised that each interacts with, affects and is affected by the other two and cannot be isolated. Nonetheless, each element proves to be useful in focussing attention and providing opportunity to analyse the complex data captured during each child's engagement with the two texts.

Interaction involves the emotional, social as well as the physical aspects of the children's experience. The unique nature of multimedia texts requires the reader to interact with the on-screen elements. Whether this is extremely sophisticated or relatively minimal, interaction is a key element in the construction and unfolding of narrative within multimedia design and therefore constitutes one of the main categories. Laurel's (1993) notion of interactivity with multimedia texts provides a useful means of analysing the interactive components of *The Lost Boy* and *Myst*. It is possible to analyse each screen of the two texts and classify the number, range and significance of the interactive elements. This, in turn will provide opportunity to examine children's experiences of each text in the light of the interactivity offered by each.

The children were free to discuss their experiences with the researcher and their peer, and so interaction also extended to the social. Indeed, as the development of understanding is viewed as being socially constructed, the nature of social interaction within this research provides indication of children's experience of multimedia texts. Engagement with the software also triggers emotional responses. Whether these are initiated through the narrative, a sense of games-play or a combination of the two, the emotional response is viewed as a result of interaction between an individual and the multimedia text. Interactions may also be referred to as 'immersion' through the child's engagement with either story or game-play (McMahan 2003:68).

Linked to the notion of interaction are navigation and narrative structure. The path or paths taken by a child through a multimedia text and achieved through interactions with hyperlinks may be described as a navigational route and is instrumental in advancing the plot. Essentially, without moving through the various links and nodes, the child would not access the content and would therefore be unable to generate an understanding of the text. Finally, the process of interpretation relates to the way in which the children make sense of the multimedia text. The various signifiers present

in a multimodal text provide opportunities to trigger mental concepts which may be either physical or abstract. Physical concepts are those which may be observed or experienced through the senses. For example, the sound of a creaking door may present a mental concept of a door opening or closing. The form the door takes may be influenced by visual stimuli presented in the multimedia text or if no image of a door is available, the mental concept may be drawn from the child's personal experience. In some instances, partial representation within the text and personal experience may interplay with one another and the child constructs mental concepts which are assembled from both. Abstract concepts are not mental representations of concrete objects and whilst not directly experienced through the senses, they may be derived from sensory stimuli. For example, the abstract concept of fear may be constructed from personal experience of situations which triggered an emotional response described as 'fear'. Such situations will create mental concepts where sounds, temperature, textures and objects may all combine to generate an abstract concept.

All three elements; interaction, navigation and interpretation, are viewed as necessary in the design of multimedia narrative. Without interaction, the reader assumes the role of audience and views the narrative as opposed to actively advancing and perhaps influencing the unfolding of the text. Navigation as part of the design provides opportunities for the reader to select the routes through which the landscape of the text is traversed and interpretation plays an essential part in the meaning making derived from the reading of the text. In this way, it is possible to make distinctions between narrative which incorporate multimedia but do not invite or accommodate reader participation to those which do require reader action through mouse click and decision-making. As stated previously, each element overlaps with the others for example, navigation requires interaction with the screen elements and this, in turn, requires appropriate interpretation of the screen environment in order to identify and activate the relevant hyperlinks. Some clips may therefore be pertinent to one, two or all three elements but the analysis of the activity will foreground one of the elements.

5.3 The Lost Boy

The design of *The Lost Boy* incorporated four navigational tools. Firstly, the use of hyperlinks, clearly visible on the screen (see figure 12), which allowed the reader to access further subsections of the story. The animated compass at the bottom right of

the screen moved the story forward into the next section or chapter and only appeared when all of the visible hyperlinks had been activated. Secondly, the use of the back button enabled the reader to return to previously viewed screens in the reverse order in which they were accessed. Once the reader had travelled back, they needed to move through the story again using the visible hyperlinks as if they were reading the story for the first time.

Figure 12: Screen shot of The Lost Boy showing three visible hyperlinks (ringed)

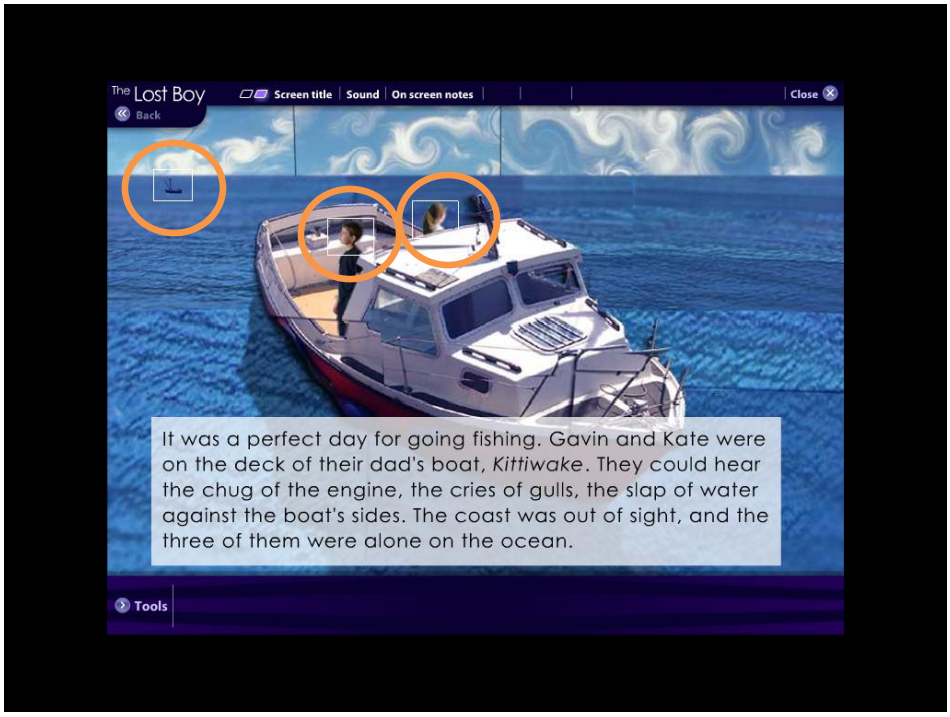
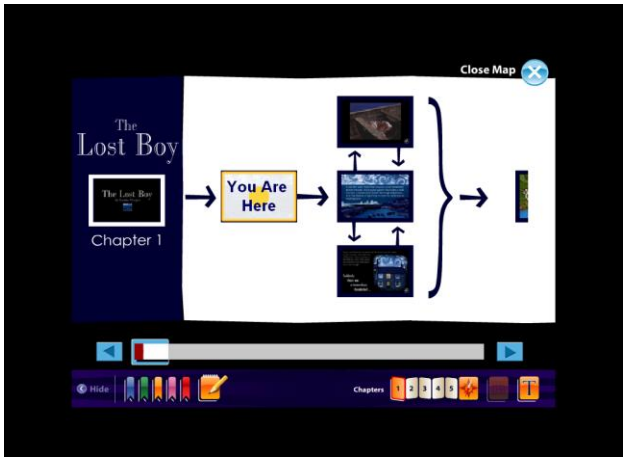


Figure 13: Navigation of the screens using the visual map accessed using the tools button.



The third navigational route was located within the tools button and provided a visual map of the screens. This provided complete flexibility to select and navigate to and from any point in the story (see figure 13). The reader is presented with a marker

indicating the current position and the slider allows movement forwards and backwards along the visual map. This navigational option highlighted the linearity of the structure. As can be seen in figure 13, although there are three screens which can be viewed in any order, they are located in a linear route with one screen preceding them and another following.

Figure 14: Navigational Links in The Lost Boy (chapter 1)

Figure 15: Navigational Links The Lost Boy Chapter 2

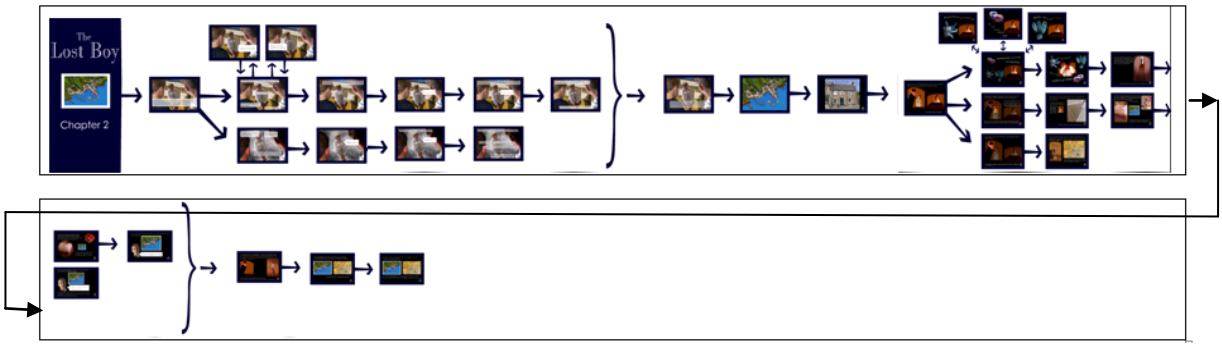
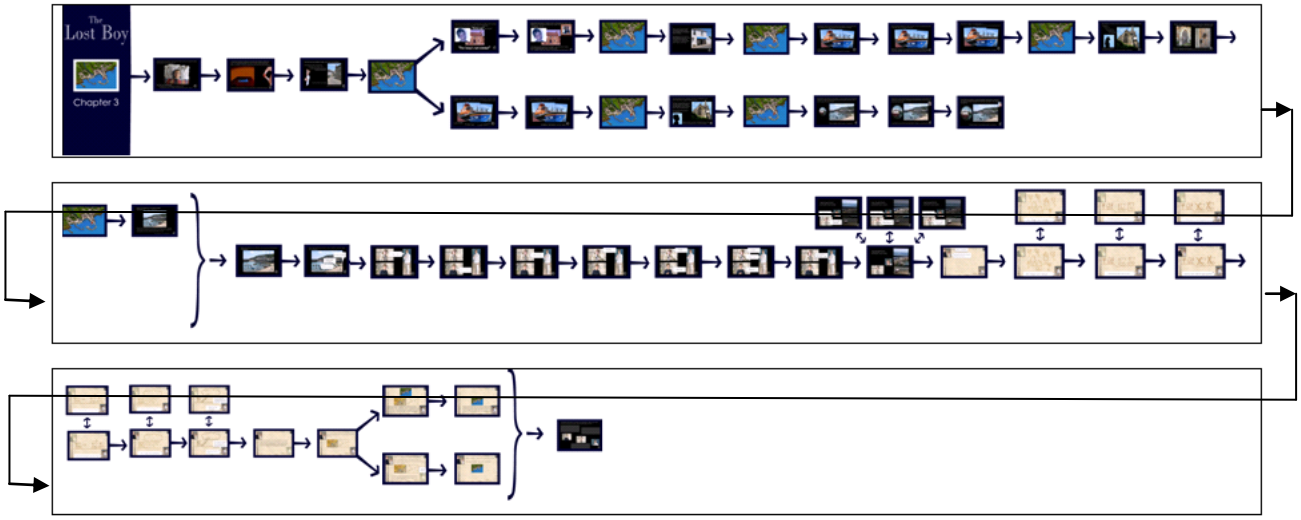


Figure 16; Navigational Links The Lost Boy Chapter 3



The resulting navigational route can be mapped out as shown below in figures 14, 15 and 16 which represent chapter one to three respectively and totalling 131 screens.

The fourth and final method of navigating involved the use of bookmarks. From the tools button, the bookmarks appear as five coloured markers (see figure 17). Once one is selected it creates a marker on the displayed screen which then allows the reader to return to the bookmark or move between several bookmarks. This offers the reader some influence over the navigation of the screens yet there is some assumption that the story is read through from beginning to end with the bookmarks merely serving to create a quicker mechanism of locating specific events. The design of this tool simulated its physical counterpart and in so doing, reinforced the connections between the digital, on-screen literature and the more conventional printed version.

Figure 17: the bookmark tools accessed from the tools button. The green bookmark has been selected.

When first faced with *The Lost Boy*, the children had no difficulty in activating the hyperlinks. The design of *The Lost Boy* was such that all hyperlinks were clearly visible so the children did not have to search the screen to locate any hidden hyperlinks. Nevertheless, there were numerous examples of the children apparently searching the screen either by hovering over likely hot spots or clicking areas of the screen in an exploratory manner (see clips 1A, 1B, 1C, 1D, 1E, 1F, and 6E in table 7. For instructions on how to install *mediaPlay* see appendix C). On occasions, the left, the right and both mouse buttons were selected to encourage further interactivity from the software (clip 1F time 33:36, clip 1A, clip 1B and clip 2A) demonstrating a more sophisticated understanding of mouse functionality than the software demanded. Some children investigated the tools button at the bottom of the screen. Child E made a number of attempts to select and drag the bookmark onto the main area of the screen anticipating a greater level of functionality [click and drag] than was available (clip 1E).

The children's mouse interactions with the screen elements could be divided into four main categories. Firstly, exploratory clicks which, in the case of *The Lost Boy*,

occurred almost entirely at the beginning of each child's experience of the text, with Child A exhibiting what appeared to be a higher frequency of such activity. Despite the use of highlighting and the cursor changing to a pointing hand, the parameters of interactivity and the rules of navigation were established through testing the screen with mouse clicks. All of the children, apart from Child F, were quick to recognise the patterns and processes of navigation such as the semi-transparent grey box over hyperlinks indicating a followed path.

The second category involved purposeful interactions where the child recognised and activated the hyperlinks. This type of interaction tended to dominate after the initial orientation and indicated that, in general, the children had worked out the way in which the text was designed and were able to navigate and activate hyperlinks without any difficulty (for examples see clip 1C and clip 1D) .

Indiscriminate and randomised interaction occurred when children appeared to click intentionally on the screen but for no apparent reason. Generally, this was not evident in the children's interactions with *The Lost Boy* apart from one instance with Child E (see clip 5E) who appeared to lose interest in the narrative and instead chose to interact with the navigational links and menu options. Child E had previously explored the navigational routes offered by the back button and the tools menu and it is possible that the exploration of the functionality of the available tools was more interesting than the narrative, resulting in what appeared to be random mouse clicks. When interacting with *Myst*, Child F and Child D also displayed this type of activity and these instances will be examined and discussed at a later stage within this chapter. The final type of interaction may be described as 'accidental'. Occasionally, the mouse is clicked but no apparent motive can be ascertained. It is possible that in these instances children are absent-mindedly clicking or have simply activated the mouse button by accident.

The way in which the children interacted with *The Lost Boy* may be attributed to the design of the text and the way in which navigational links and interactive features were presented to the children. At various points within *The Lost Boy*, up to three hyperlinks were visible. Each hyperlink accessed a separate screen or set of screens, all of which could be viewed in any order, for example three people's perspectives of a single event. On return to the screen where all three hyperlinks were accessed, a

followed link would still be visible but now as a semi-transparent grey box in the same location (see figure 18). Once all hyperlinks have been followed, the compass appears on the main screen which, upon selection, takes the reader into the subsequent screen or set of screens depicting the story.

Figure 18: A section of one screen of The Lost Boy with visible hyperlinks (shot A) and one followed hyperlink ringed (shot B)

Shot A Shot B

When navigating through the screens one child (F) expressed her sense of confusion with the ordering of the story, in particular the layout of the text and the sequence in which they were displayed (see clip 2F). The confusion arose due to her use of the 'back' button which presented the history of the screens she had accessed in reverse. With no forward button, the child had to either work her way through the screens again or use the navigational menu accessed via the tools button. When offering some explanation for her confusion she insisted that the writing was set out in a way which made it difficult to follow the story. Not only did she encounter problems when she tried to retrace her steps through the screens after using the back button, but she also found the screen layout unhelpful and the order of the written content challenging. It is not altogether clear how the presentation caused confusion for Child F but it is possible that she believed there was one correct route and when trying to retrace her steps she became uncertain on which selection to make. This is perhaps some indication of the dominance of singular linearity found in the majority of printed typographic texts and the relative inexperience of Child F in navigating through alternative structures.

Table 7: summary of the hyperlinks to relevant clips referred to within the analysis of The Lost Boy

Lost Boy	Clip set 1: Navigation	Clip Set 2:- Navigation	Clip set 3: Interpretation	Clip set 4: Interpretation	Clip set 5: Interaction	Clip Set 6: Interaction
Child A	Lost Boy clip 1	Lost Boy clip 2	Lost Boy clip 3	Lost Boy clip 4	Lost Boy clip 5	Lost Boy clip 6
Child B	Lost Boy clip 1		Lost Boy clip 3		Lost Boy clip 5	Lost Boy clip 6
Child C	Lost Boy clip 1		Lost Boy clip 3	Lost Boy clip 4	Lost Boy clip 5	
Child D	Lost Boy clip 1	Lost Boy clip 2	Lost Boy clip 3		Lost Boy clip 5	Lost Boy clip 6
Child E	Lost Boy clip 1		Lost Boy clip 3		Lost Boy clip 5	Lost Boy clip 6
Child F	Lost Boy clip 1	Lost Boy clip 2	Lost Boy clip 3		Lost Boy clip 5	

By way of comparison, when asked if it made any difference to the order in which the links were selected, Child D answered 'I think it's quite clever, I don't think it matters what order you do them in'(see clip 6D). In this instance, Child D viewed the ability to choose the order yet leave the narrative unaffected as a positive feature. An indication that the child concerned was perhaps content with the design or did not expect to engage in a narrative where their actions could affect the outcome of events portrayed on the screen. Child B arrived a similar conclusion to Child D regarding the effect of their action upon the unfolding narrative but Child B's response did not appear to be as positive as Child D (see clip 6B).

In analysing the children's interactions with *The Lost Boy*, it became apparent that the freedom for exploration was rather limited. Although the Digitext series is marketed as a design which '*allows children to explore and navigate around the text, actively making their own reading choices*' (2004) these are limited. For example, the children are forced to visit almost every screen before the compass appears which allows progression to the next set of screens. The back button does not have a counterpart which allows the child to go forward. Although the visual map does offer a more flexible option, this is the equivalent of a contents page, allowing a more direct route to a screen or the beginning of a chapter. The model presented is very close to a printed book and although multimedia and hyperlinks are included, the similarities in design between digital and print-based are recognisable.

Figure 19: Navigational Route of Child A for The Lost Boy

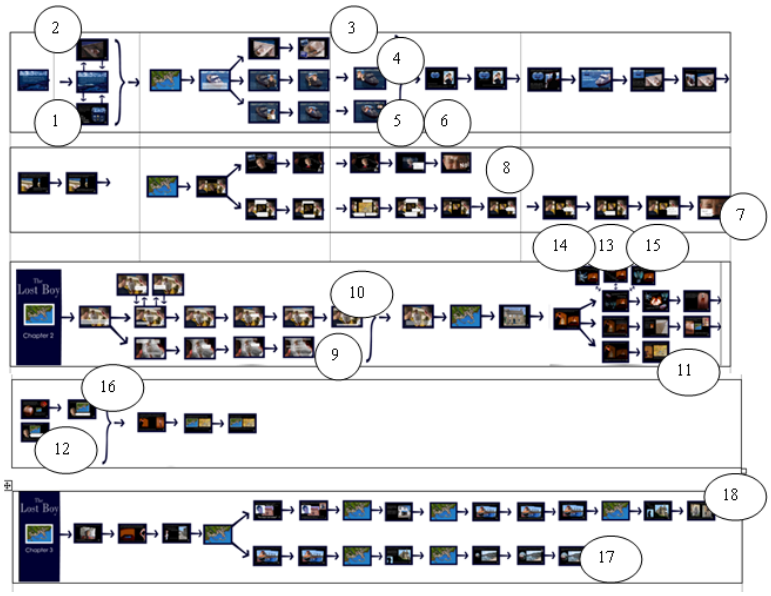
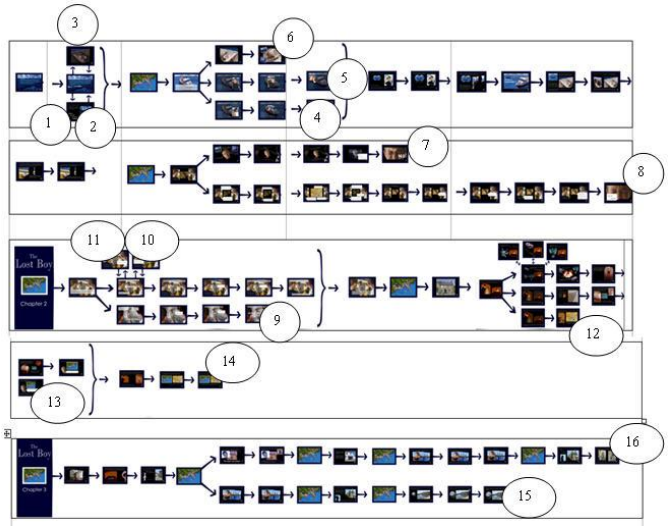


Figure 20: Navigational Route of Child B for The Lost Boy



When mapping out the children's navigational route through *The Lost Boy*, it became apparent that there was little variation between one child's path and another. For example the only differences between Child A's route (see figure 19) and Child C's route (see figure 21) occurred at the beginning when Child C selected the back button at point one and Child A repeated one route at point five/six then at the end of chapter one when Child A and Child C viewed screens ending at points seven and eight in a different order to one another. This is not to say that each child will have had the same experience of the text, but the routes taken are quite similar. Indeed, Child F, as discussed previously, did find some aspects of the navigation within *The Lost Boy*

challenging but ultimately, once this had been resolved the path taken by Child F (see figure 24) was similar to those of Child A and C.

Child B (see figure 20) varied his path towards the end of chapter two and did not select the three separate links on the Lost Boy's narrative and therefore missed out the points labelled thirteen, fourteen, and fifteen on Child A's route (see figure 19). On questioning Child B whether he wanted to view those screens, he indicated that he had seen them on Child A's computer so did not need to.

Figure 21: Navigational Route of Child C for The Lost Boy

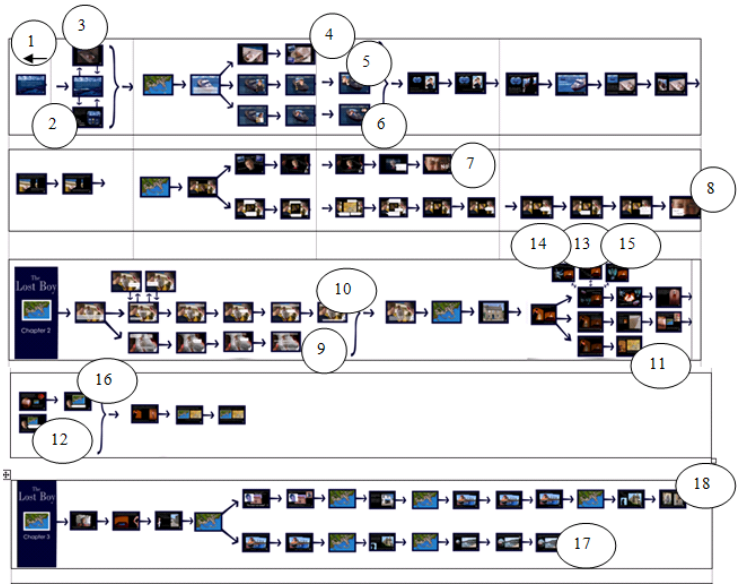
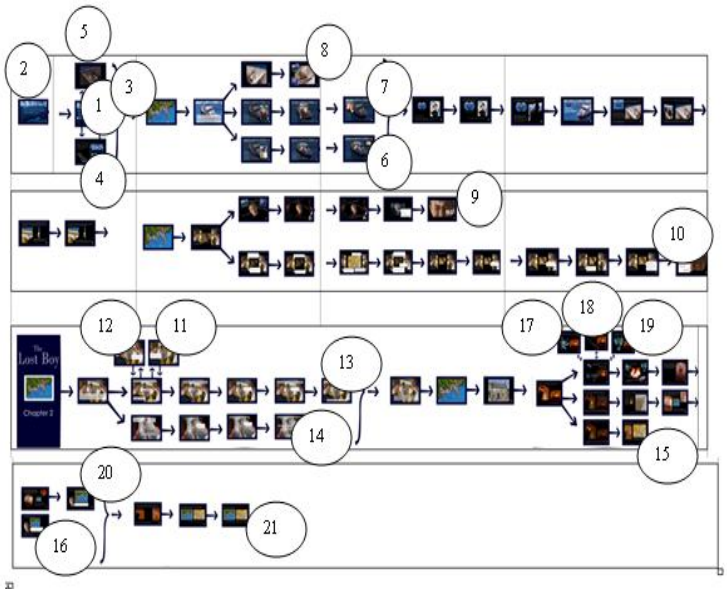


Figure 22: Navigational Route of Child D for The Lost Boy



Child D took longer to read the screens and by the end of the allotted time for this activity had only completed the first two chapters (see figure 22). Apart from using the back button at the very beginning to view the first screen twice, their navigational route was similar to Child A, B and C (see figures 19, 20 and 21 respectively).

Figure 23: Navigational Route of Child E for The Lost Boy

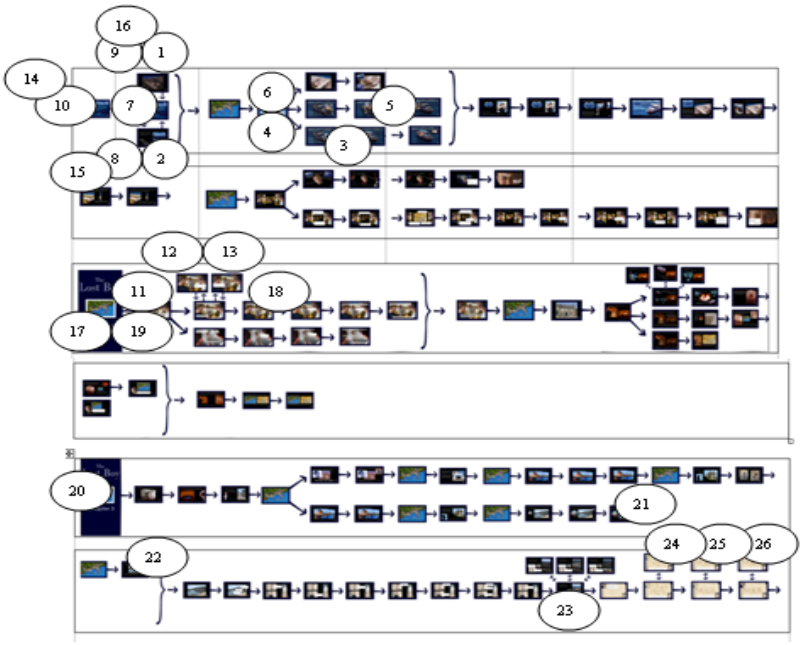
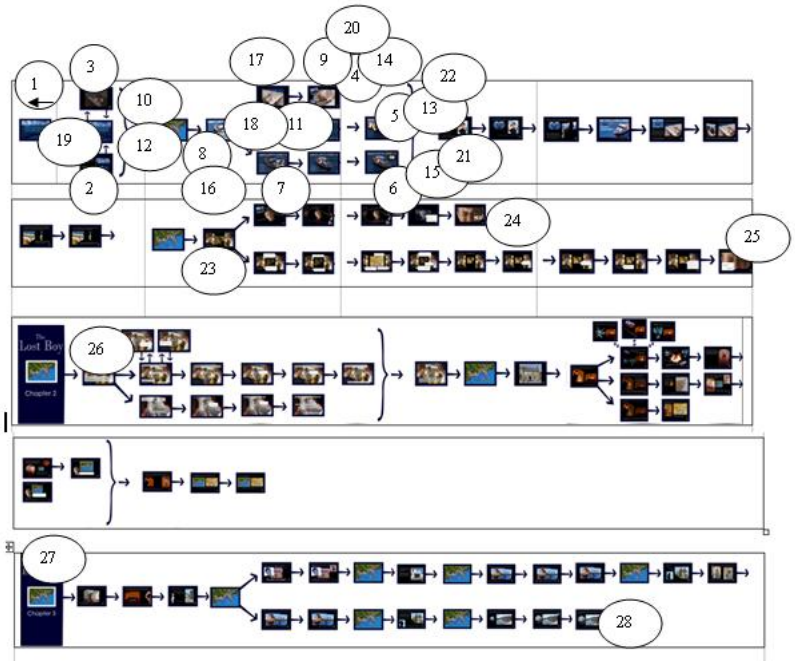


Figure 24: Navigational Route of Child F for The Lost Boy



The navigational route of Child E (see figure 23) differed from the other five children. Child E began by reading the story and progressing through the screens in the same manner as his peers. He then spent some time exploring the back button and the tools menu which provided access to bookmarks, a notepad and a quick method of locating and jumping to a specific screen. From this point onwards, Child E navigated some of the screens in the same way as the other children but preferred to interact with the tools menu. This resulted in a fractured story with sections missed or revisited.

Where linearity is concerned, the marketing material describes the design as '*A truly non-linear approach which develops important skills… pupils actively choose the way they navigate and read through the text, capturing imagination and maintaining concentration*' (Digitexts 2004). In the case of *The Lost Boy*, navigation may include decisions regarding the order in which some screens are viewed but this design does not necessarily constitute a non-linear text. As discussed previously, the concept of non-linearity is subject to a variety of interpretations. If, by non-linearity, the creators of Digitexts are describing the ability to view a selection of screens in any order, then *The Lost Boy* does, on some occasions, possess these elements of navigation. Nevertheless, the ability to view selected screens in any order results in a relatively structured, linear text whilst the non-linear cybertexts described by Aarseth (1997:2) consist of multiple routes where the navigation will result in paths which are not taken yet still exist. The model presented by *The Lost Boy* is one of false non-linearity: almost all screens have to be viewed and constitute a similar experience to the viewing of several pages of a book in any order, where the story itself remains undisturbed, rather than alternative routes which result in paths untravelled comprised of different events, actions and consequences. The children are able to choose the way they navigate through the text but freedom is limited and there is no opportunity to deviate from the one main route. This theme will be developed further in Chapter Six where, theoretical issues in the light of data presented and analysed within this chapter, will be examined and discussed in greater depth.

Further to the navigational routes, an analysis of the interactive elements contained within 100 screens provided the details listed in table 8. Laurel's notion of frequency, range and significance is helpful in understanding the interactivity of a multimedia text such as a video game. In total, there were 132 separate interactive elements. The mean average is calculated at just over one per screen (1.32) with one, at the least, and

four at the most and the mode being one. Two types of interactive elements could be found with 115 (87.1%) providing navigational links to other screens. In some instances, the page activated as a result of a navigational link contained animation and sound at the beginning, for example the first few screens, once activated, contained sound effects of the sea and some animation of waves, lightning and thunder (see clip 3B). As the main purpose of the interactive element was to access another screen it was categorised as a navigational link but the sound and animation presented on the following screen were noted. Seventeen elements (12.9%) provided sound and/or animation and resulted in no navigational links to other screens. Statistically, the number, variety and significance of the interactive elements within *The Lost Boy* are limited. If the nature of the navigational route is also considered, the role of the child as reader appears to be the digital equivalent to turning the pages of a book. There are elements of choice regarding the order in which routes are explored but the resulting narrative is not influenced by the actions of the child beyond that of revealing the next screen or chapter (for example see clip 5B and clip 5D).

In numerical terms, it may be ventured that *The Lost Boy* is limited in its interactivity and therefore reduces the children's sense of agency; that their actions influence the outcomes of the narrative. Regardless of the frequency of interactive elements, those that do exist cannot be considered to be of high significance as they do not affect the outcome. The elements which do exist are of low significance. Counter to this argument is the child's own experience. Regardless of the statistics and the potential for greater interactivity, a child may feel that their presence is essential to the development of the narrative. This is dependent upon more than just the three variables of frequency, range and significance and will involve the children's prior experiences of multimedia texts in addition to their expectations and preferences. A child who has engaged in video games which require extensive selections based on strategy and decision-making may be disappointed with the lack of opportunity to affect the screen content. Alternatively, they may find this design a refreshing change from the titles they normally engage with. Child D thought that *The Lost Boy* was '*quite clever'* because it did not '*matter which order you click on them*' (see clip 6D) whereas Child A appeared less impressed and explained that '*you just click on the compass to go to the next screen'*. Child B concentrated on the way the various links presented the different perspectives of the characters (see clip 6B) and stated that this

made the story '*vary a bit'* as, once a link is selected, it '*goes through what they're thinking'*.

As noted earlier, some children explored the screens by clicking on various features to test for hidden interactivity and upon analysing the mouse clicks undertaken by each child it was evident that two children in particular were more active than the other four. A summary of these data can be found in table 8. Direct comparisons between each child are not possible as each child took a different amount of time to navigate the text and would therefore have viewed a different number of screens in a specific amount of time. Furthermore, in some instances the screens were not always visited in the same order as other children so direct comparison of the mouse clicks per screen is not without its limitations, particularly where Child E and F are concerned. They both revisited some of the screens (see figures 23 and 24 respectively) and, in the case of Child E, missed sections out.

Nevertheless, counting the number of mouse clicks over a set period of time, and the number of mouse clicks over 100 consecutive screens, does provide some rudimentary means of comparing the children's mouse activity. Child A. B and C appeared to engage with the narrative as opposed to Child E who preferred to explore the various tools and menu options (see figure 23). Child D took more time to read each screen and progressed more slowly than the other children (see figure 22). As stated previously, Child F experienced some navigational difficulty in the early stages but this was later resolved.

According to the questionnaire responses completed by each child, the most experienced video games-players were Child A, Child B and Child E. Whereas Child A and B had accessed some of the more sophisticated games listed, Child E indicated that he spent the most time playing games than the other children in the sample. Child A progressed most rapidly through the screens and was the most active in the use of the mouse, often exploring the screens with the mouse whenever he felt there might have been an interactive element for example, see clip 5A. Child E's relatively high mouse click count arose because of his interaction with the technology as opposed to the narrative. Child B and C did not continue to make exploratory clicks beyond the initial screens and their mouse click count exceeded the maximum number of interactive elements (see table 8) available by ten and nineteen respectively.

Table 8: Number of mouse clicks (The Lost Boy)

Child	Mouse clicks in 30 minutes	Mean average of clicks per minute	Mouse clicks over 100 screens	Mean average of clicks per screen
A	172	5.73	175	1.75
B	96	3.2	142	1.42
C	102	3.4	151	1.51
D	84	2.8	111 (only completed 74 screens in total)	1.5
E	143	4.77	147 (focussed on menu bar therefore did not access all screens in chapter 1, 2 and 3)	1.47
F	121	4.03	128 (some navigational difficulties therefore repeated some screens)	1.28

Analysis of each video suggested that the children's interactions with *The Lost Boy* could be placed into two main categories; those which could be described as interactions with the narrative and those which corresponded to interactions with the technology. Child A was alert to any possibility of an interactive element for the duration of the observed time whereas child B, C, D and F interacted with the narrative after some exploration of the first few screens and the initial confusion displayed by child F (for example see clip 5B and clip 5D). Child E differed from the other children and interacted with the technology by activating the various menu options without any specific purpose related to the narrative. It was also noted that Child F was particularly intrigued by the animated effects of the compass and on more than one occasion moved the mouse cursor over the image as if playing with it (see clip 5F). Child A assessed the interactivity of each screen yet he also engaged with the narrative and exhibited enjoyment and interest in the events portrayed on the screen (see clip 6A).

Further to the interactivity offered by the software and the children's interactions with the narrative and the technology, another dimension of interactivity was observed,

namely that of social interaction. In the case of *The Lost Boy*, it was largely infrequent and limited. In all instances, the tendency was to focus on their respective screens and, on occasions, make comments on the software design or some aspect of the narrative. At intervals, the researcher asked questions of the children which prompted some interaction but it was noted that there were few occasions when discussion was initiated by a child or that discussion occurred between the two children despite being encouraged to do so by the researcher. This could be due to the fact that this was the first of the two observation sessions and the children were perhaps overly cautious regarding the situation. Alternatively, the design of the software could have been such that the children did not need to engage in discussion with others. Navigation, apart from one instance, posed no difficulty to the children and the content could be read by all. Towards the end of the hour's observation, two different children on separate occasions initiated discussion when they felt they had worked out some of the mystery surrounding the lost boy (see clip 5C and clip 4A).

Table 9: Analysis of the interactive elements within The Lost Boy (100 screens)

<table>
<tr><th>Text</th><th>Number of interactive elements</th><th>Range of interactive elements</th><th>Significance (summary)</th></tr>
<tr><td>Lost Boy</td><td>132 interactive elements in total
<table><tr><th>number</th><th>screens</th></tr><tr><td>1</td><td>75</td></tr><tr><td>2</td><td>20</td></tr><tr><td>3</td><td>3</td></tr><tr><td>4</td><td>2</td></tr></table></td><td>115 navigational and (87.1%)

17 additional animation/sound content (12.9%)
<table><tr><th>range</th><th>screens</th></tr><tr><td>1</td><td>83</td></tr><tr><td>2</td><td>17</td></tr><tr><td>3</td><td>0</td></tr></table></td><td>The majority of the elements advanced the story (hyperlinks only advanced- to go to a specific screen the tools menu was required or the 'back' button to access the previously viewed screen)

Some hyperlinks activated sound files (voice recordings) Animations were sometimes automatically activated on opening a screen</td></tr>
</table>

The children used various multimedia elements in order to interpret the narrative. For example, the facial expressions of the focal character provided some means of interpreting the emotion he was feeling and the words he was saying (see clip 3F). This was also evident to a lesser extent when Child A attempted to interpret the language of the Lost Boy. The signifier of intonation and expression may support Child A. Similarly, when asked whether the images provided anything that the words

did not, Child C explained that the image representing the view seen through a pair of binoculars provides '*a picture in your mind of what the boy is looking through'* (see figure 25). This is an indication that the iconic is interpreted not only as a character's view through a pair of binoculars but also as a representation of that view. Essentially this is interpretation of the signifier at two levels; that of the message it is attempting to convey and at the same time the recognition that it is representational and not reality.

Figure 25: Image from the Lost Boy; view from the binoculars

She also added that it would be possible to '*work out the story without looking at the words'* but suggested that the pictures alone would not give you '*the exact story but you could if you didn't have the words*.' At the end of the session, Child C pointed to the image displayed on the screen at that time which depicted the boy on one knee, looking upwards (see figure 26) and explained that this showed that the boy was talking to someone and explaining something; an indication that visual images of expression and body language in addition to the written text are all drawn upon to interpret the character actions and interactions within the story.

Figure 26: Image of The Lost Boy –example of gesture

The ability to recognise the messages conveyed by the combined signifiers, in this instance image and typographic text, demonstrates aspects of children's multimodal awareness. Gesture, as a mode of meaning, contributes to the interpretation of a multimedia text (Cope & Kalantzis 2000:26). This was also evident when, for example, child F used the intonation and expression exhibited by the character of the lost boy to interpret what he was saying in the unknown language (see clip 3F). The

boy's eyes are shut tightly together and the image fills the screen (see figure 27). The audio of the boy's voice conveys alarm and the inclusion of exclamation marks signifies the boy's communication. By filling the screen with the image, the reader is confronted with an almost life-size section of the boy's face. Attention is therefore focussed upon the closed eyes and it may be argued that the message conveyed is magnified by the enlarged image. The interpretation of this screen alone involved not only gestural design (eyes) but also elements of audio (the voice of the Lost Boy) working in combination with the visual image to convey feeling and emotion. Although the words are not familiar to any of the children, the use of an exclamation mark is and this symbol, in addition to the intonation and expression in the boy's voice, provides a further cue regarding the meaning of the words. Collectively these provide an animated and exaggerated commentary for the benefit of the audience which, in this instance, is the reader (Barthes and Lavers, 1993).

Figure 27: Use of words, symbol, sound and image as signifiers of the Lost Boy's communication

Further examples of the children's interaction with and interpretation of the text were evident in all of the recorded videos although less so in the activity of Child E for the reasons highlighted earlier. Child A and C became quite engrossed in the story and were keen to explain the mystery of *The Lost Boy*. On reaching the screen with the Lost Boy contemplating the church, Child A interpreted the scene as the Lost Boy using the tower as a lookout point (see clip 3A). He did not consider the message conveyed in the written text which emphasised the Lost Boy's recognition of the apparent changes made to the church he had expected to see. On this occasion, it appeared that Child A had interpreted the image in line with the narrative he was

composing and ignoring the written text. Similarly, on the following screen, he interprets the dotted line as the path of the Lost Boy, evidence of his ability to understand the representation of the landscape in the format of a topological map. He adds further interpretation stating that '*he's a good runner..he's run there, there and there'* [using the mouse cursor to follow the route]. In so doing, it is evident that Child A has shown evidence of understanding iconic signifiers of directional relationships, distances, landmarks, and landscape features. He has also recognised the symbolic signifier of the dotted line and has connected this to the concept of a route, in this case, the path taken by the Lost Boy.

Clip 4C also documents Child C's attempts at interpreting the cartoon representations of the Lost Boy's story. The iconic signifiers of houses, people and boats are all interpreted as such and, at the same time, Child C constructs her own narrative to explain the events depicted, modifying these as more detail is revealed by the images and writing. Her ability to navigate the text is also demonstrated as she uses the back button to return to a screen where a link had been missed.

Child C also indicated that she was able to interpret topological maps (see clip 3C) when she compared the two images and attempted to explain the differences between them. In so doing, Child C draws upon additional knowledge and understanding with regard to the changes of landscape over time. In this way, the two maps provide a symbolic representation of the passage of time. At the moment she makes this connection, Child C is prompted to draw others into a discussion and instigates social interaction between herself, Child D and the researcher.

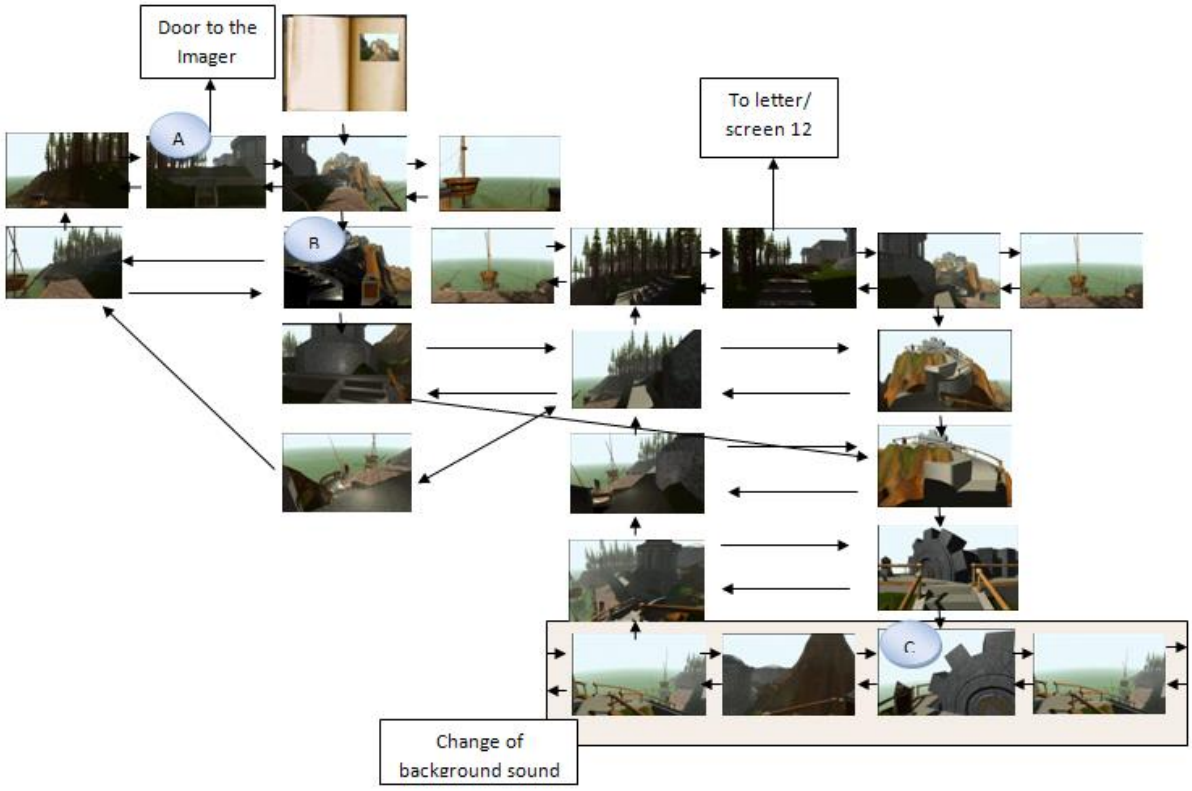
Further example of the interpretation of a symbolic signifier is evident when Child D and E are faced with think bubbles. Although Child E is familiar with this signifier (see clip 3E), Child D is uncertain (see clip 3D). Through social interaction with the researcher and application of logic, Child D makes the connection between speech bubbles and think bubbles and is able to explain what the symbols represent.

5.4 Myst

The design of *Myst* simulates a three dimensional environment although it is actually constructed by a series of static screens connected by hyperlinks which achieve the sensation of moving within a three dimensional world. The hyperlinks are not

highlighted as with *The Lost Boy* but may be discovered through active exploration with the mouse whereupon the cursor offers a visual indication of the direction of travel. As previously described, there are a variety of puzzles to solve in each of the interlinking worlds and clues to solving the puzzles lie within the books in the library. A brief explanation of the game is provided on the cover to the CD ROM and also on entering the world of Myst, however, navigation and interaction are unexplained and the menu bar is limited and hidden unless the mouse travels over the topmost part of the screen.

Figure 28: Navigational Links in Myst (1)

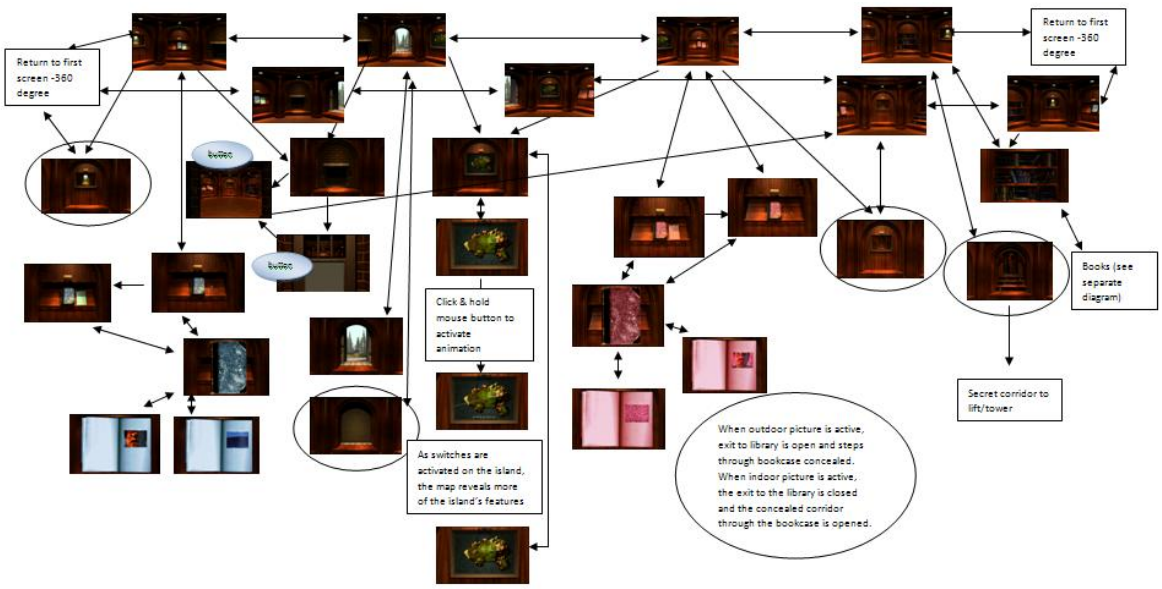


To provide some means of comparison to *The Lost Boy*, the navigational routes through 100 screens of *Myst* have been mapped out and presented as diagrams in figures 28, 29, 30 and 31. It was not possible to provide one diagram of all 100 screens which fitted onto one page although the four diagrams do link to create one set of connected screens. As with *The Lost Boy*, the entire text has not been mapped out and the relevant diagrams represent the navigational structure of the text. Furthermore, the children were unable to complete either text in the time available to them but the selected screens comprise parts of each text which the children did have time to access.

Figure 29: Navigational Links in Myst (2)

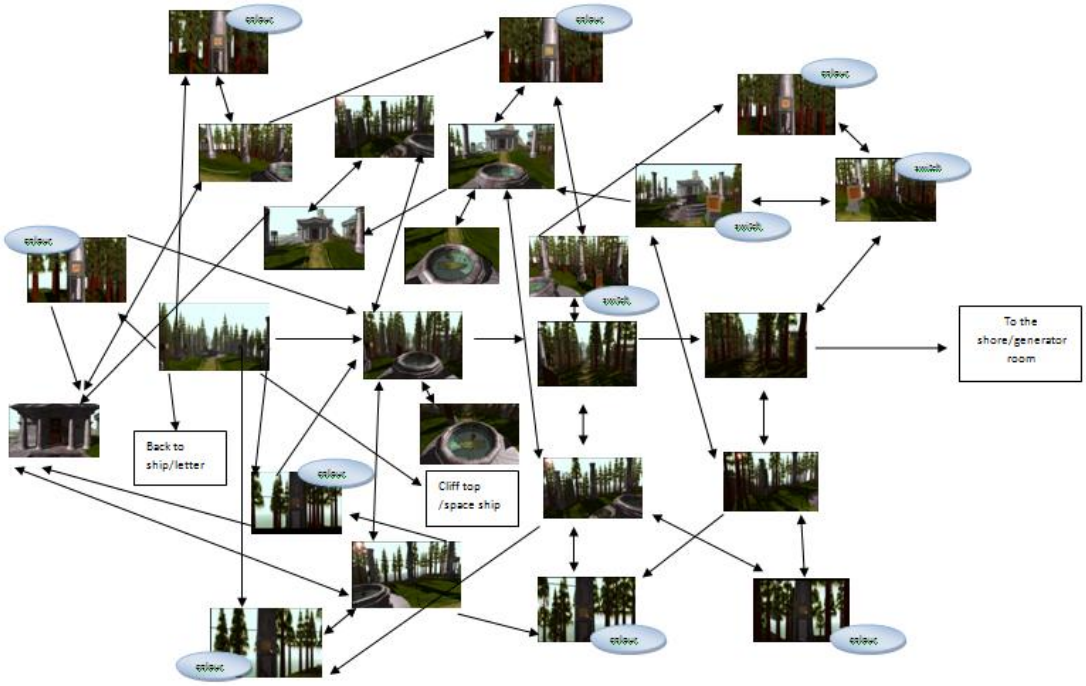
Interactive elements such as a switch, lever, button or a door are not highlighted but the children do not seem to encounter any difficulty in finding these. What is challenging is the ability to make connections between the various interactive features and recognise what the discovery means in terms of solving the mystery.

Figure 30: Navigational Links in Myst (3)



At various points, the background sound changes and adds a further dimension to the exploration of the on-screen environment.

Figure 31: Navigational Links in Myst (4)



Without any explanation regarding navigation, all of the children quickly worked out the way in which they could move around the virtual environment as demonstrated within clips 1A, 1C, 1D and 1F (see also table 10 for a summary of the clips referred to within this section). The mouse cursor could be described as both iconic and indexical (Chandler 2007:36, Kress 2010:63) as it represents a pointing hand and also indicates directionality within the world of *Myst*–right, left, up, down or straight on (see figure 32).

Figure 32: Directional signs in Myst

 Directional sign (left)	 Directional sign (forward)	 Directional sign (right)	 Directional sign (down)

Child A and Child E moved more rapidly through the screens than the other children and, in a relatively short space of time, they had each explored most of the first

‘island’. *Myst* seemed to offer a greater sense of freedom than *The Lost Boy* with the children able to move around the island in a manner similar to walking around a physical space. Indeed, one child referred to their interaction as ‘walking’ indicating that the symbolic representation was interpreted as the metaphor for traversing the virtual space on foot (see clip 1F).

Table 10: The hyperlinks to relevant clips referred to within the analysis of the hyperlinks to relevant clips referred to within the analysis of *Myst*.

Myst	Clip set: 1 Navigation	Clip set 2 Navigation	Clip set 3 Interpretation	Clip set 4 Interpretation	Clip set 5 Interaction	Clip set 6 Interaction
Child A	Myst clip 1	Myst clip 2	Myst clip 3	Myst clip 4	Myst clip 5	Myst clip 6
Child B	Child unwell and not at school therefore unable to undertake the activity					
Child C	Myst clip 1				Myst clip 5	
Child D	Myst clip 1		Myst clip 3	Myst clip 4	Myst clip 5	
Child E	Media Cam File corrupted, no footage available					
Child F	Myst clip 1		Myst clip 3		Myst clip 5	

As a narrative landscape, *Myst* did not force the children to follow a predetermined route but instead it allowed exploration. When mapping out the navigational routes of the children in *Myst* (see figures 33 to 42) it became apparent that there was greater variation between their individual paths than those exhibited in *The Lost Boy* (see figures 19 to 24). In many instances, each screen or node offered a choice of hyperlinks and therefore a number of possible routes. Ultimately, when each resulting path is unravelled, a string of nodes connected by the relevant link provides a linear record of the path taken despite the fact that the architecture of the text is web-like.

Child A moved rapidly through the various screens and had explored a greater number than the other children. During the first thirty minutes, he had explored much of the ‘island’ and thereafter began to spend more time on specific screens containing interactive features such as the generator room, the clock tower and the planetarium.

Figure 33: Navigational Route of Child A in Myst (part 1)

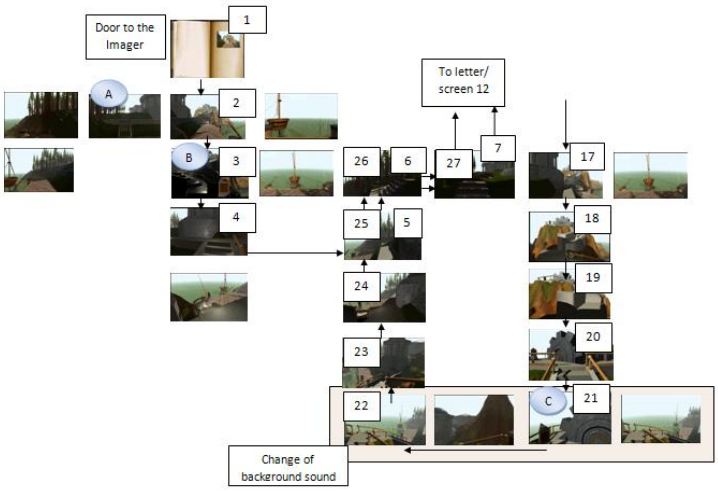


Figure 34: Navigational Route of Child A in Myst (part 2)

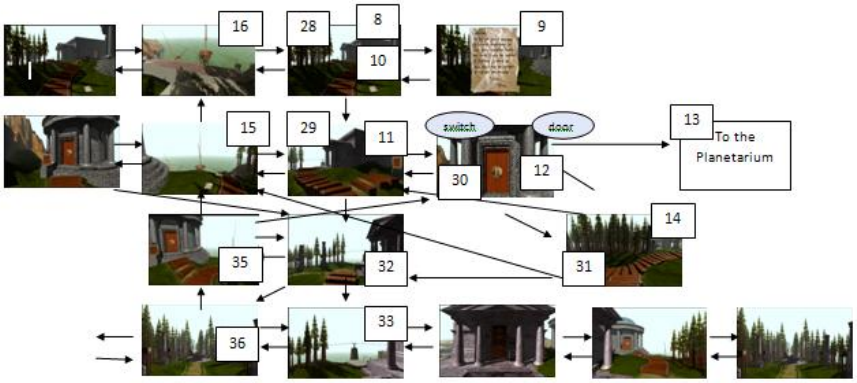


Figure 35: Navigational Route of Child A in Myst (part 3)

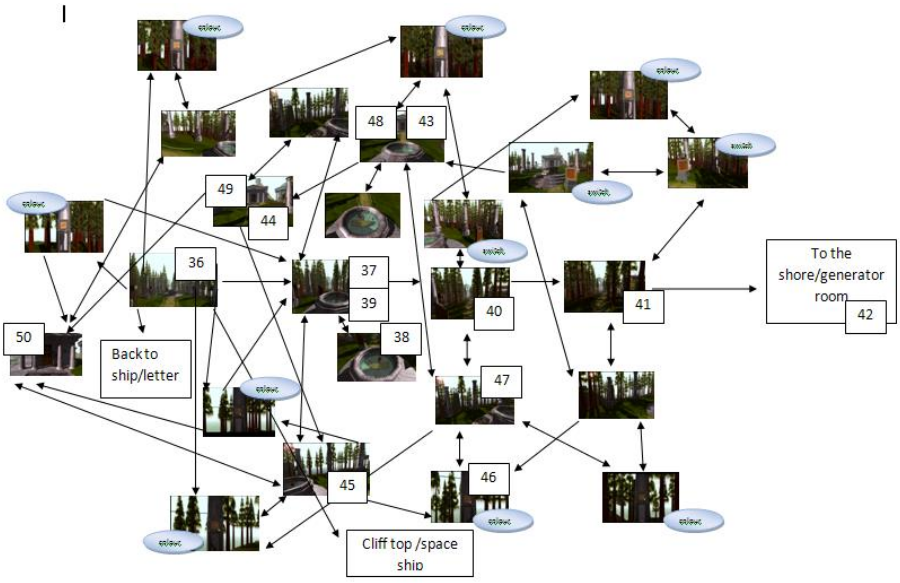


Figure 36: Navigational Route of Child C in Myst (part 1)

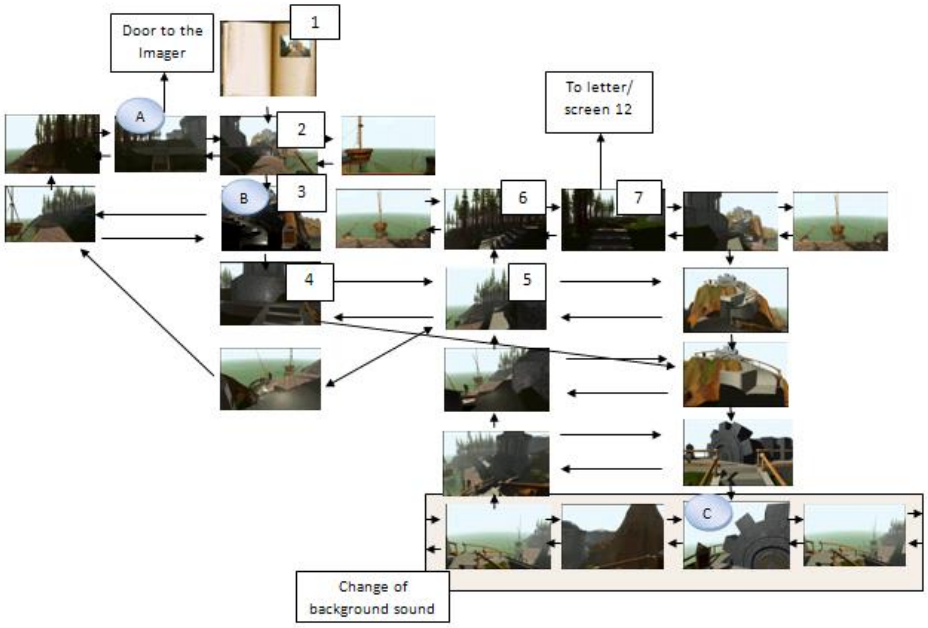


Figure 37: Navigational Route of Child C in Myst (part 2)

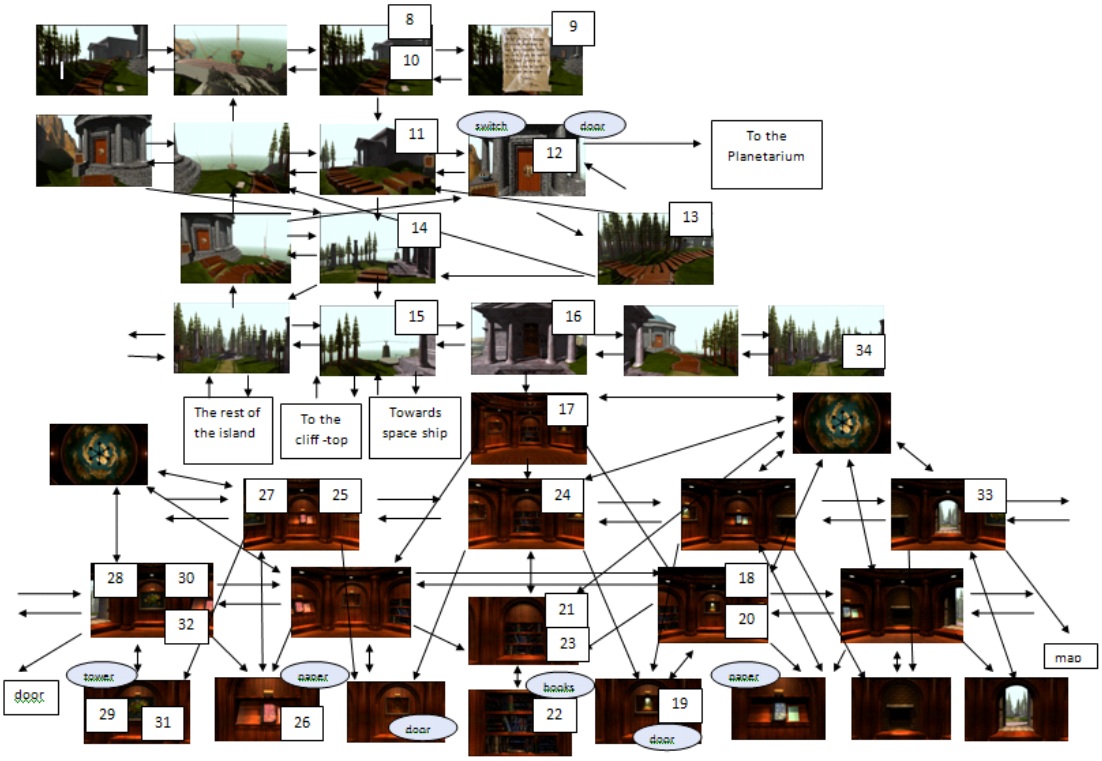
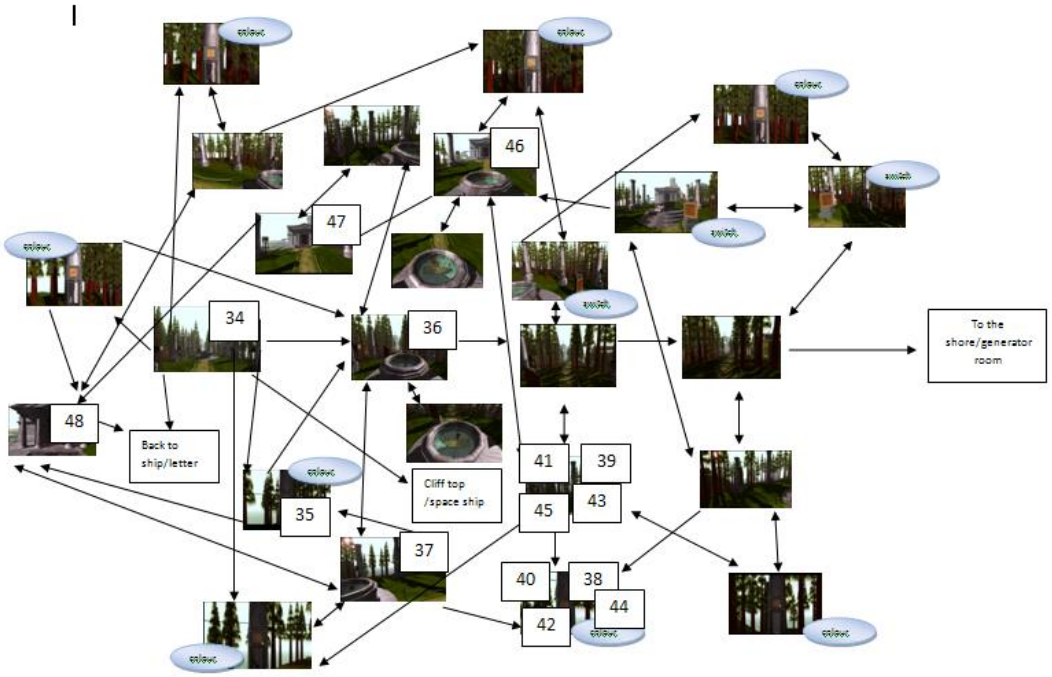


Figure 38: Navigational Route of Child C in Myst (part 3)



Child C spent more time in the library than Child A and did not move as quickly from one screen to another. She spent some time looking through the books contained within the library and appeared to take a little longer trying to work out what the images represented and what action she needed to undertake.

Figure 39: Navigational Route of Child D in Myst (part 1)

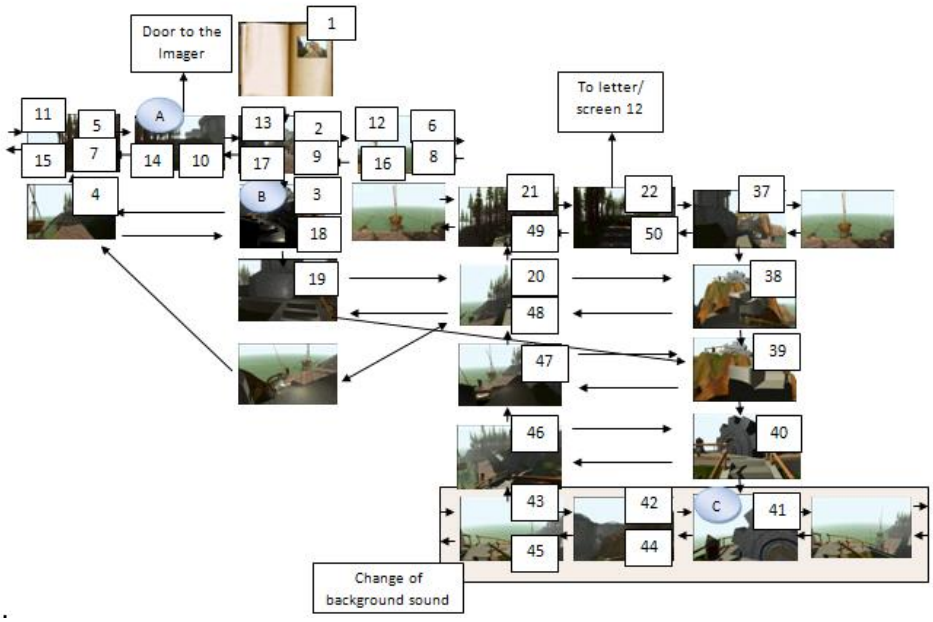


Figure 40: Navigational Route of Child D in Myst (part 2)

Child D was less inclined to explore the screens and quickly became frustrated (see figures 39 and 40).

Figure 41: Navigational Route of Child F in Myst (part 1)

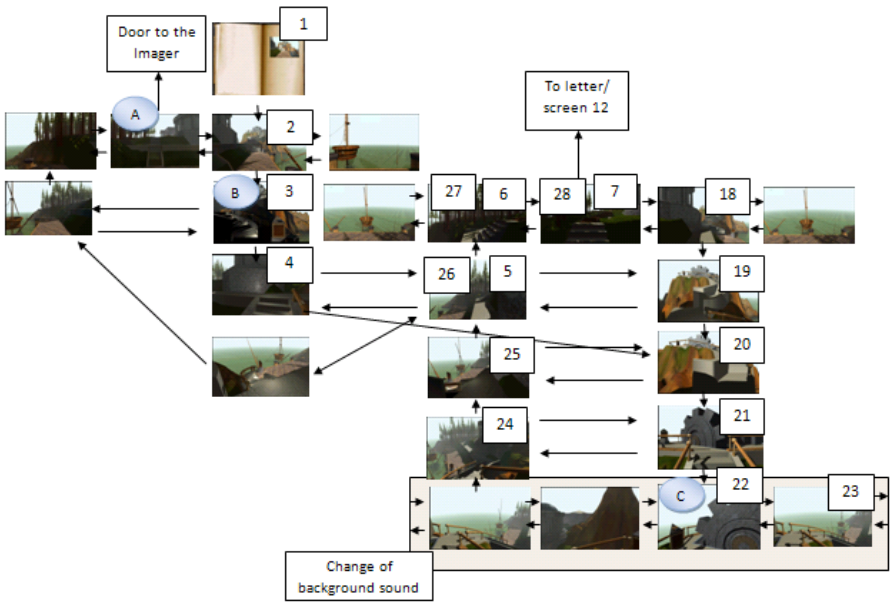
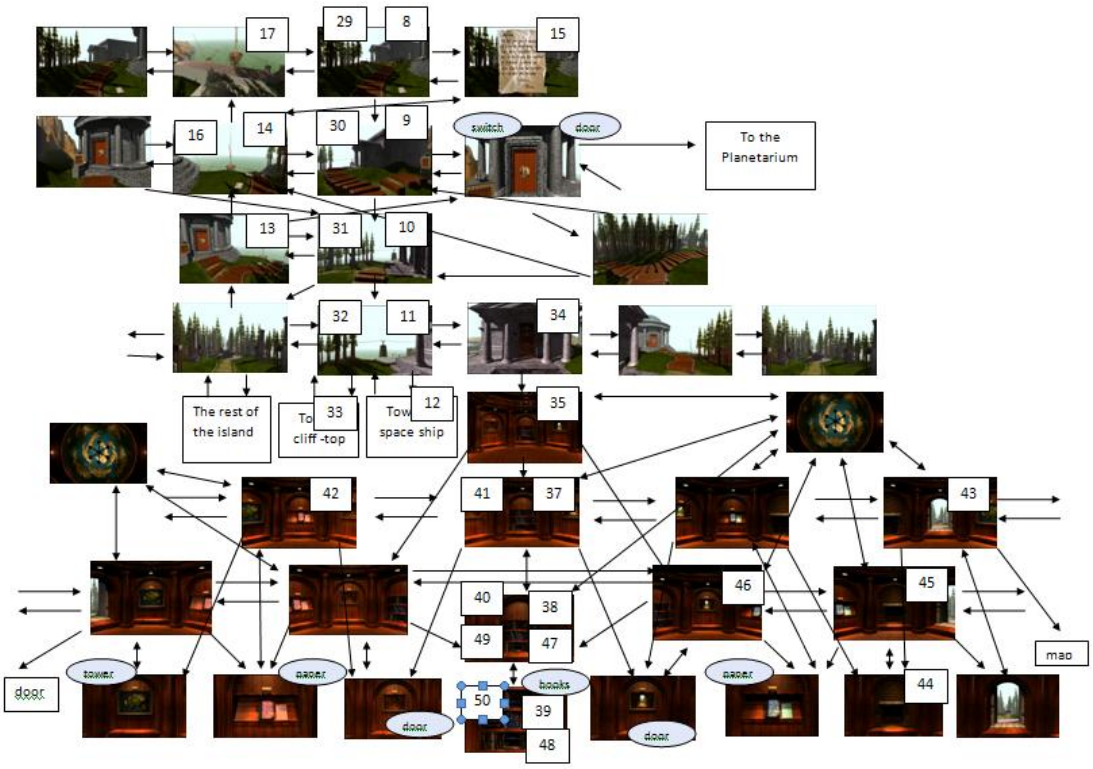


Figure 42: Navigational Route of Child F in Myst (part 2)



Where Aarseth's 'ergodic' text would contain routes which, through interaction and navigation, would not be travelled by the child, *Myst* does not (1997). It is necessary for the child to visit all of the screens in order to complete the necessary tasks and so advance to another island. Only at the end of the game do multiple endings present themselves but these are limited and may be undertaken during separate replays of the game. This suggests that *Myst* cannot be viewed as a non-linear text by Aarseth's definition but perhaps a more complex, linear text which allows the reader/player to move through the connected screens rather than observing a predetermined order. Alternatively, if the existence of a path untravelled is viewed as alternative permutations which result in children undertaking a path different to one another, then there are a vast number of paths which each child does not travel in preference to the one that they do. *The Lost Boy* does have a limited number of screens which can be viewed in any order but these may be described as occasional and minor detours from one clearly defined path. When examining each child's route through *Myst* it is clear that each child generated an individual path which differed from the other children.

Unlike *The Lost Boy*, the development of narrative in *Myst* is unclear. From the onset, the reader/player is placed within the imaginary setting and needs to discover what the

island of *Myst* looks like; the characters, the main events, interactive elements and the solutions to the various problems. It may be argued that the role of the reader/player is more significant in *Myst* than in *The Lost Boy* as the progression of the narrative requires more than the advancement of a singular route and the decoding of text.

For example, all of the children revisited some of the screens on numerous occasions as can be seen from the diagrams of their respective routes (see figures 33 to 42). Child D became quite frustrated and, at one point, continually clicked the mouse and repeatedly visited the same set of screens (see clip 1D from time 01.27.89 and figure 39). Child D did not know what to do or what was expected of her in relation to the text. Navigationally, she easily moved from one screen to another, as did all of the children (see clips 1A, 1C, 1D and 1F). In addition to indicating direction, the pointer also changes to a hand holding an object such as a piece of paper or a match. In these instances, the sign may be viewed as an extension of the child. Although they are not physically holding any object, the iconic representation is acknowledged by the children as their presence within the on-screen world for example in clip 5C Child C clearly states that you could '*take the paper'*.

Myst includes music and sound effects which, combined with the images are designed to create an atmosphere. During the first few minutes of exploration, Child A stated that he was 'scared' (see clip 3A). At the same time, he was smiling and appeared to contradict what he was saying. The combined effect of sound and image does suggest an atmosphere of tension and it is possible that although Child A could not explain his reasons for feeling 'scared' he was drawing upon prior experience of media texts which convey suspense through multimodal interpretations. For example, the music may be described as eerie and sound effects such as creaking doors add to this. It may be argued that the sound of a creaking door is not necessarily sinister or eerie but if the same sound has been experienced within another context such as a horror/thriller film, it could become associated with a feeling of fear or tension.

Although interactive elements may be discovered through a trial and error approach involving mouse clicks on various images presented on the screen, there are some images which would invite exploration more than others. For example, the switches and levers convey a message of something which may be operated or activated. These images may be described as iconic as they represent artefacts which could be

experienced in the everyday world of the child's existence. Norman suggests that the natural constraints and affordances conveyed by any object allows the individual to 'determine the proper course of action even in a novel situation' (1998:82). The novel situation in the case of *Myst* exists not only in the nature of an on-screen, two dimensional environment but also in the novelty of the objects themselves. Although the visual representation may suggest that they are wheels to be turned or buttons to be pressed, the children need to work out what the outcome and relevance of such an action may be. For example, Child D recognises that she can click on a representation of a button which, in turn, switches the lights on and off within the planetarium but she does not yet understand why she would need to do this (see clip 3D). Later, within the same clip, she reads the letter and recognises that the 'switches' referred to within the letter are those encountered previously. She can identify the word with the visual representation and locates one of the switches encountered at an earlier point (see clip 4D) but she is still uncertain of their purpose. Similar encounters were documented by the other children at various points during their experience. For example, Child A (see clip 2A) contemplates the purpose of a button within the imager room.

Exploratory clicks were in evidence however, in comparison to *The Lost Boy*, these occurred more frequently and, over the same period of time, were greater in number. Many of the interactive objects remain inactive until specific puzzles have been solved, for example, the safe in the hut and the spacecraft door. Their appearance encourages the children to select them with the mouse; in some way, they give the impression of being an interactive element. The door to the space craft and the handle on the safe represent objects in the physical world which are designed to do something upon human interaction. Other interactive elements such as the pictures and the map on the wall in the library are not as easily explained. Despite representing objects which are not usually interactive as buttons, levers or switches are within the physical world, all of the children took the opportunity to click on them with the mouse. When analysing the video of each child's activity, it was clear that in each case there was greater exploration of the on-screen environment than witnessed in *The Lost Boy*. In some instances, the children were rewarded with an action which may be described as feedback. For example, doors opening or switches lighting up to indicate they were on, levers changing position or the sound of machinery. All of these provided signals to the children regarding action and response (see clip 2A, 3D). Other elements

suggested that there should be interactive features and provided both iconic and symbolic signifiers to support this interpretation such as the wheel and its associated mouse over cursor in the log hut. Despite interpreting these signifiers as meaning '*turn*' Child A did not receive the expected feedback (see clip 4A) as, unbeknown to Child A, the wheel would not do so until other actions had been completed.

Table 11: Number of mouse clicks of each child during their interaction with Myst

Child	Mouse clicks in 30 minutes	Mean average of clicks per minute	Mouse clicks over 100 screens	Mean average of clicks per screen
A	1064	35.47	250	2.5
B		Unwell therefore did not participate		
C	877	29.23	221	2.21
D	884	29.47	157	1.57
E		Video data corrupted		
F	662	22.07	162	1.62

Table 11 provides a summary of the number of mouse clicks of each child during the first thirty minutes and over 100 screens. In comparison to *The Lost Boy*, children exhibited a lot more mouse activity over the same period of time when engaged with *Myst*. In some instances, the number of mouse clicks in thirty minutes was over ten times the number observed for *The Lost Boy* (Child D). Child A was still the most active in the use of the mouse and registered 1064 clicks in thirty minutes.

Further examination of the data indicates that although there were a greater number of mouse clicks during the same amount of time, the number of clicks per screen were not vastly different and, in the case of Child D, were similar to *The Lost Boy*. Whereas almost every screen of *The Lost Boy* has written text, *Myst* has very little apart from the books in the library where there is a considerable amount of written text, far exceeding the overall written content in *The Lost Boy*. As a result, the children moved rapidly through the screens and this resulted in a much higher figure for the mouse clicks than the same thirty minutes spent with *The Lost Boy* text. Child A navigated through screens which possessed no interactive features until arriving at those that did (see clip 2A). This seems to suggest that Child A was adept at recognising the presence of interactive features on screens allowing him to move rapidly and purposefully through the various pathways.

The slightly higher mouse click count over 100 screens appears to be a direct result of the design of *Myst* which requires exploration of the screen in order to discover the interactive features. *The Lost Boy* highlights such elements but *Myst* does not yet it is interesting to note that this has not resulted in a very different number of mouse clicks per screen. There are, on average, more clicks registered but the difference never reaches, let alone exceeds, one mouse click per screen. The video recordings of the children's activity suggest that they moved rapidly through the screens in order to explore the environment and spent a small amount of time investigating each screen. Interactive elements were activated by mouse click but the children were generally received limited feedback and therefore chose to move to another screen in search of other content, (for example, see clips 4A, 1F). The design of *Myst* is such that additional conditions need to be met before the activation of one element allows access to more content and the access is most often in a different location to the point at which the conditions are set.

Child D clearly conveyed their feeling of frustration when repeatedly visiting screens in rapid succession as they tried to make sense of the on-screen environment and their role. The relationship between game and narrative is such that the children need to read the books in the library to understand the setting, the characters and the various landmarks. Embedded within the environment are puzzles which are incidental to the narrative but once solved provide greater access to the content. The elements of the story are not introduced or developed in a conventional format such as that within *The Lost Boy*. Instead, like pieces of a jigsaw puzzle, the children need to repeatedly explore and extract more information which they may then use to make sense of *Myst*. In so doing, the children develop a narrative through a process of constant revision.

Table 12 provides an analysis of the interactive elements found within 100 screens of *Myst*. In the same way *The Lost Boy* was examined, Laurel's notion of interactivity (1993), involving the number, range and significance of the interactive elements, provided the means of identifying and analysing the content of each screen. In comparison to *The Lost Boy*, *Myst* possessed more interactive elements yet there were similarities in the proportion of navigational to additional multimedia elements. The most notable difference in the interactive elements was the presence of buttons, levers, switches described earlier. Once their purpose was recognised they allowed access to more content. The interactive elements in *Myst* possessed greater significance as they

effectively created a barrier to the development of the narrative. *The Lost Boy* was designed to support progress through the screens but *Myst* is designed to impede the reader's journey.

Table 12: Analysis of the interactive elements in Myst (100 screens)

<table>
<tr><th>Text</th><th>Number of interactive elements</th><th>Range of interactive elements</th><th>Significance (summary)</th></tr>
<tr><td>Myst</td><td>283 interactive elements in total
<table><tr><th>number</th><th>screens</th></tr><tr><td>1</td><td>13</td></tr><tr><td>2</td><td>38</td></tr><tr><td>3</td><td>23</td></tr><tr><td>4</td><td>15</td></tr><tr><td>5</td><td>1</td></tr><tr><td>6</td><td>10</td></tr></table></td><td>245 navigational (86.6%)

38 additional animation/sound content (13.4%)
These either changed conditions or provided access to additional content
<table><tr><th>range</th><th>screens</th></tr><tr><td>1</td><td>75</td></tr><tr><td>2</td><td>17</td></tr><tr><td>3</td><td>8</td></tr></table></td><td>The majority of the links were navigational and allowed movement from one screen to another. Many of the screens offered a choice of navigational routes (see Myst mapping diagrams) to give the illusion of moving within a three-dimensional environment.

Some navigational links do not provide routes around the environment but provide additional information- such as video content or access to 'books'.

Some of the links connect together and operate in relation to other links. Progress to other areas of the environment is locked until the conditions set by the switches are appropriate.</td></tr>
</table>

In attempting to solve the many and varied puzzles presented to them, children were often observed engaging in conversation with their neighbour or with the researcher. In contrast to *The Lost Boy*, social interaction was evident from the onset of children's experience with *Myst* either to seek confirmation of their role, to share discoveries or to enlist assistance in solving the various challenges (see clip 5A, 6A, 3F, 1D, 5C).

5.5 Focussing upon Child A and Child F's interactions with multimedia texts

The video data and subsequent analysis of children's interactions with the two texts provided opportunity to return to the research question examining the extent to which children may be considered to be digital natives. The questionnaire offered useful background data which provided some indication as to the experiences of the six children with respect to the larger sample from which they had been selected. From the analysis of the questionnaire data presented in Chapter Four it can be seen that the children possessed a wide range of experiences with regard to ICT and, more specifically, multimedia texts. From the analysis of the video data it was evident that the children responded differently to one another when interacting with the two texts. Of particular interest was Child A whose mouse clicks exceeded any of the other children's for both texts. Furthermore, the rapidity with which Child A was able to recognise and understand what he needed to do in order to navigate and interact with each text also exceeded the time in which the other children acclimatised to the tasks presented to them.

Child F offered an interesting point of comparison to Child A as she found *The Lost Boy* difficult to navigate. Consequently, progress through the screens in the early stages was impeded although the average number of mouse clicks per minute was third highest with only Child A and Child E exceeding this frequency. However, on closer inspection, it is evident that Child F's frequency of mouse clicks was increased due to her frustration when she did not understand how to navigate. She pressed the left mouse button repeatedly in her attempts to understand the navigational process and route and expressed her frustration to the researcher.

When faced with *Myst*, Child A again achieved the highest frequency of mouse clicks and analysis of the screen video capture indicated that he found little difficulty in navigating the text, quickly recognising the role he needed to assume in order to engage with the game and the narrative. Although Child F initially found the navigation of *The Lost Boy* problematic, she did not appear to have the same issues when faced with *Myst*.

A summary of the statistics for Child A and Child F for both texts is presented in table 13.

Table 13: A comparison of Child A and Child F's interactions with the two multimedia texts

The Lost Boy				
Child	Mouse clicks in 30 minutes	Mean average of clicks per minute	Mouse clicks over 100 screens	Mean average of clicks per screen
A	172	5.73	175	1.75
F	121	4.03	128	1.28
Myst				
A	1064	35.47	250	2.5
F	662	22.07	162	1.62

According to their questionnaire responses (see table 14 for a summary of the 6 children's questionnaire responses), Child A and Child F had access to the same technologies when at home, namely a Playstation, a Nintendo DS, a Game Boy and a mobile phone. Child A indicated that he played '*Age of Empires'* and '*Age of Mythology'* on his home computer whereas Child F played '*Toontown, Runescape, Racing cars, and more*'. The games played by Child A on other devices were identified as '*Burnout, Spartan, Lego Starwars 1 and 2 and football'* and Child F listed '*FIFA 08, FIFA 07, Nintendogs, Super Mario, Simpsons Road Rage, Simpsons Hit and Run and more*'. Child A's games-playing preferences appeared to be mainly located within the 'strategy/war game' category (*Age of Empires, Age of Mythology, Spartan)* with some titles reflecting an interest in 'race/sports games' *(football, Burnout)* and 'action-adventure'*(Lego Starwars 1 and 2*). Child F was also interested in 'race/sports games' (*FIFA 08, FIFA 07, The Simpsons Hit and Run and the Simpsons Road Rage, Racing cars*) but the remaining titles indicated that, unlike Child A, she preferred 'role playing games' (*Runescape, Toontown*) and 'simulations/virtual life' (*Nintendogs*).

Other points of comparison involved the activities undertaken on the computer at home and the hours spent playing games on the various devices they had available. When listing activities undertaken on the home computer Child F stated that she used '*all of them* [of the given list] *especially email and games and word and watching DVD's and playing musical and others*.' Child A listed '*games, word processing, research*.' Although this appears to be a more limited list, for reasons given in chapter 4, this only offers an indication of computer use and does not present a detailed examination of computer usage. With regard to time spent playing computer games, Child F estimated that she spent about 2-4 hours per week on this activity and Child A

selected 4-8 hours. It may be noted that of the six children involved in this stage of the research project Child C indicated that she spent less than one hour each week playing computer games whereas Child E thought that he devoted more than 8 hours per week to this.

Clearly, the six children had varied and highly individual experiences of computer games. The time associated with games play alone does not seem to provide an indicator as to how children will interact with multimedia texts although it could be ventured that some experiences are brought to bear on the way in which children acclimatise to the various designs.

Table 14: A summary of the six children's responses to the questionnaire

	Child A	Child B	Child C	Child D	Child E	Child F
Computer use	'games, word processing, research'	'All of them and homework'	'e-mail, Web, Google, playing games, homework'	'playing games, looking at pictures and finding out facts on the web'	'All of them especially [expeshely] games, movies, cd, garageband'	All of them especially [expecially] email and games and word, watching DVDs and playing music and others'
PC games	Age of Empires, Age of mythology	Dragon Fable, Dune Buggy, Rome Total War, Age of Mythology Runescape	Zoombinis, Voices in the Park	Agame.com Miniclip	(no data entered)	Toontown, Runescape, Racing cars
Other games technologies	Playstation Nintendo DS Game Boy Mobile phone	Game Cube Nintendo DS Game Boy Mobile phone	Playstation Game Cube Game Boy Other(s)	Playstation Nintendo DS Game Boy	Playstation Nintendo DS Game Boy Mobile phone Other(s)	Playstation Nintendo DS Game Boy Mobile phone
Additional Games	Burnout, Spartan, Lego Starwars, 1 and 2, Football	Supermario, Nintendogs, Animal Crossing Wild World. Tony Hawke Proskater 4, Harry Potter Quidditch World Cup, Mission Impossible	Wacky Races, Crash Bandicoot	Brain training, Pawley Pets, Tom + Jerry, Lion King,	Rugby 08, Rachet and Clark, Nintendogs	FIFA 08, FIFA 07, Nintendogs, Supermario, Simpsons Road Rage, Simpsons Hit and Run, And more
Amount of time spent on games/wk	4-8 hours	4-8 hours	Less than an hour	2-4 hours	More than 8 hours	2 to 4 hours

It is possible that Child F had applied prior knowledge of navigation drawn from the use of the WWW when using *The Lost Boy*. The back button of a web browser is accompanied by a forward button yet *The Lost Boy* possessed only a back button which traced the story back through the route viewed until the beginning of the story was located whereupon the back button ceased to operate. From this point, the only

way to go forward to the screen reached before the back button was selected was to re-read the story or use the tools menu to locate and select the point required. No such problems were encountered with *Myst* but she explained that it was '*a little bit like one of the games I play with at home'*. In the first instance, prior knowledge had probably hampered her progress yet in the case of *Myst* her existing stocks of knowledge gained from games play had allowed her to approach an unknown situation with more success. Not only did Child F understand how to navigate, she also demonstrated that she was aware that interactive elements needed to be discovered by exploring the screen with the mouse. Furthermore, she recognised that she needed to take on a particular role in order to make sense of *Myst*. Although she did not appear as practiced as Child A or Child E in the use of such software, and did not seem to be frustrated or confused with the demands placed upon her. This is quite different to the response of Child D who found the demands of Myst confusing from the onset and repeatedly clicked in a random manner as she stated clearly '*I don't know what to click on*'. Child D was further hampered by the speed at which she read and therefore found the sheer volume of written content located within the 'books' which were on *Myst* overwhelming.

In terms of the digital native, all of the children had prior experience of ICT and multimedia texts. In some instances, the experience appeared to be comparable to one another, however, as indicated in Chapter Four, merely indicating that they have experience of the WWW, e-mail and word processing does necessarily mean that the children are expert in these facilities. Operation of the mouse and the ability to navigate around the two texts was generally without its problems but there were instances where some individuals felt confused notably Child F with *The Lost Boy* and Child D with *Myst*. Child F estimated that she spent the same amount of time per week playing games yet Child D struggled with *Myst* whereas Child F did not. Clearly, the nature of the games played by these two children at home were different and it may be ventured that Child F had experienced more complex game design and was therefore able to attune herself to the concept of *Myst* more readily than Child D. Similarly, Child A showed clear capability when using either text and prior experience indicated that he had engaged with what may be described as rather sophisticated game design.

To conclude, the six children involved in this research project responded in different ways to the two texts. Prior experiences differ uniquely from one another and as a collective group they cannot be described as digital natives. Nevertheless, there is some indication that some children possess high levels of capability with regard to multimedia texts which may, in part, be attributed to experiences gained through playing computer games. However, being able to navigate, interact with and complete a multimedia text such as a computer game does not necessarily mean that the child is aware of and understands the way in which such texts may be interpreted and examined.

5.6 Conclusion

From the analysis of the data gathered it is now possible to identify four main points which will be discussed in the following chapter. Of the first two points signalled in section 4.4 there has been some re-examination of the existence of the digital native in light of the video data. The final stages of the data gathering process have yielded the third and fourth points.

By drawing upon the data analysed in this chapter the nature of 'reading' multimodal texts will provide an opportunity to consider whether new forms of literacy exist. Linearity, multi-linearity and non-linearity remain problematic conceptual tools largely because there is still uncertainty with regard to an agreed definition of 'non-linearity'. The analysis of each title suggests that there are ways in which multimedia texts such as computer games may provide greater flexibility and choice for the reader when navigating a narrative journey. Children's experience of interacting with the multimedia texts suggests that each title allowed children to engage in the development of narrative. Computer games may therefore be appropriate for school use but equally, multimedia texts designed for school may be suitable for use in the home.

The fourth point involves the use of *MediaCam AV* to record and analyse children's interactions with the two multimedia texts. Examining the various complexities associated with the interactions between a child and a multimedia text has presented methodological challenges. The use of specialised software has offered a unique and highly original solution to these challenges. As such, some discussion with regard to the potential of this method of data collection in generating greater understanding with

regard to children's interactions with multimedia texts will be presented in Chapter Six.

Chapter 6: Conclusion

6.1 Introduction

This chapter comprises three main sections. The first section (6.2) will focus upon the experiences of the children with regard to multimedia text and reconnect with discussions surrounding the digital native. Although the potential for computer games is not disputed, the evidence has shown that the way forward lies in developing a diverse range of texts which may be described as interactive multimedia narratives.

The second section (6.3) will present the conclusions regarding children's interactions with multimedia texts in the light of theories related to 'new literacies'. In so doing, the originality of the selected data collection method involving the use of specialised software will be highlighted.

Section 6.4 considers possible implications with regard to multimedia texts within the primary classroom. In addition to the increased availability of these texts and a curriculum which embraces new or alternate forms of literacy, the practice and the role of the class teacher will also be considered. With the increased availability of multimedia texts in children's lives, teachers will also need to develop their ability to communicate in multimodal forms and be conversant in the vocabulary which defines and reflects new concepts of literacy. There is also much to be gained from the development of interdisciplinary projects where multimedia designers and educators may create a range of multimedia texts.

6.2 Multimedia text in the school: current provision and future potential

The questionnaire analysis clearly indicate that there is a distinct difference between children's experience of multimedia texts at school to those gained at home (see tables 4, 5 and 6 in Chapter Four). It was evident that children accessed a greater number and variety of multimedia texts in the form of computer games when they were at home. By comparison, only one title from the list of programs accessed at school, offered clear, narrative opportunities (*Voices in the Park;* see table 6). This constitutes a significant finding from the research project and suggests that children's experience of multimedia text at school is not only limited but also lacks any connection with the rich and varied experiences gained at home. This does not mean that children should have access to the same texts at school as they do at home but the availability of

various forms of multimedia text would be critical if children were to be provided with opportunities to develop their understanding of multimodal forms of communication.

The suggestion that computer games could be transferred to the classroom to allow children opportunity to engage with, and explore, new forms of text may be of some value. The observations of children's interactions with the game *Myst* suggested that they were all challenged by the game design to varying degrees and engaged in the narrative (see chapter 5). In order to complete the game, it was necessary for the children to interpret the multimodal text and 'read' the various multimedia elements. The process of interpreting, navigating and interacting with the texts as a new form of literacy will be discussed in more depth in section 6.3. However, it was apparent that children were drawing upon prior experience or 'stocks of knowledge' often gained at home in order to operate and understand each of the software titles.

Nevertheless, the observations of children's interactions with the game also revealed that not all were equally interested in, or able to use, computer games such as *Myst*. The experienced players assumed the role of the visitor to *Myst Island* more readily and explored the on-screen terrain rapidly whereas the less experienced players became frustrated and disengaged until assistance was provided by either their partner or the researcher. Those with similar gaming experience seemed to enjoy the experience of *Myst* and worked independently.

Prensky's argument that children are experienced in multimedia due to their engagement in digital games is partly substantiated as some of the children were clearly adept at navigating and interacting with such texts, yet it is also clear that some children were not as experienced or possessed different types of experience. Although it is possible that factors, such as cost or parental influence may prohibit or prevent children from accessing computer games, the list generated by the responses to the questionnaire also indicated that children selected titles according to preference. It could be argued that the children who seemed to find *Myst* confusing might have been more engaged if the software had resonated with their preferred game type thereby providing stocks of relevant knowledge which would help them understand the new and relatively unfamiliar software design. Consequently, the argument for computer games in schools might be valid but it would be inappropriate to suggest that because

all children may have experience of these texts they would all possess equal interest and the necessary capabilities to understand the various concepts and operations of all computer games. Certainly, on closer examination of two children's interactions with the texts and their prior experiences according to their questionnaire responses, the time spent on playing games and the range of games accessed does not necessarily provide clear indicators as to the ease with which they learn how to operate and interact with the selected texts. As highlighted in chapter 4 and 5, this may be due to a variety of reasons according to the individuality of each child.

The digital native argument assumes that experience *naturally* leads to expertise. Although lack of any opportunity to experience ICT would prevent a child from developing the necessary skills, knowledge and understanding, the reverse does not necessarily follow. Although this research project does not seek to foreground individual children's predispositions towards ICT, it does recognise children's dispositions will differ from one another.

The design of *The Lost Boy* did not require the children to take on the role of games player yet in most instances, the children were immersed in the storyline and stated that they had enjoyed the experience of interacting with the text. Similarly, most of the children indicated that they enjoyed their experiences of *Myst.*

Essentially, the argument for computer games in the classroom may partly arise from the lack of multimedia texts generally available for this setting. The strong emphasis on 'traditional literacy' within schools is evident in the paucity of multimedia texts identified by the children (see table 6). *Myst* and *The Lost Boy* are different designs with the latter retaining much of the traditional print-based text in its construct whereas *Myst*, although games-oriented, has forged a connection between narrative and game. With theories presented by Cope & Kalantsiz (2000), Unsworth (2001), Kress (2003), Lankshear & Knobel (2003) and Buckingham (2003), concerning new literacies and multiliteracies gaining wider recognition, the range and variety of texts available within the school also needs to increase in number and diversity. This would require the concept of 'literature' to evolve rather than consider arguments regarding the inclusion of computer games within the school to supplement the limited range of texts currently available, discussion would focus upon the design of texts which may be described as both interactive and multimodal where games are but one example. If

the school is to provide an appropriate curriculum for a media-rich society, the development, availability and use of a range of multimedia texts to support children's knowledge and understanding of multimodal forms of communication is a necessity.

6.3 New literacies

The methodological process of examining children's interactions with two multimedia texts presented a number of challenges. The use of specialised software which captured the mouse, keyboard and the child's reactions was particularly helpful and allowed for a more detailed and thorough analysis of each child's experiences in real time. The use of conventional digital video cameras would have recorded the changing screens and some of the children's responses and actions, but it would have been extremely difficult to detect every mouse click and connect each human response to the corresponding moment of interaction with the text. The software used for this research project, (*MediaCam AV*), has, according to the designers (Netu2), been previously employed to examine usability issues of software and websites. However, it has not been used to examine human-computer interactions with specific focus on multimodality and the development of understanding with regard to new literacies. In addition to the synchronised capture of screen activity and a child's response, it was also possible to pause, slow down and create clips of the recordings. Annotations made directly onto the clips supported the process of analysis where complex layers of meaning required repeated examination. As this constitutes an undocumented method of capturing and analysing children's interactions with multimodal text, the research project offers a new and perhaps highly original contribution to the knowledge and understanding associated with data collection processes in this area.

From the analysis of these data, it was apparent that the children employed a tacit knowledge of multimodal texts and generally navigated through the screens with relative ease (see section 5.3 and 5.4). To do this, the children interpreted iconic and symbolic signs and successfully operated the mouse in order to view successive screens. Although all of the children demonstrated that they understood the way in which mouse clicks on various screen elements could trigger navigational or multimedia content, not all children were equally aware of the demands placed upon them when interacting with the game *Myst*. Essentially, those children who had played computer games which were very different to *Myst* were unaccustomed to the way in

which the player was required to explore the virtual environment and solve puzzles. Nevertheless, when interacting with the multimedia texts, all of the children were able to explain how various multimodal elements conveyed meaning to them.

Although the children demonstrated their abilities to interpret the two multimodal texts, it was evident that they lacked the necessary language to explain what they were experiencing. Unlike print-based literacy which possesses a substantial vocabulary assigned to describing and explaining all aspects of the written language, multimodal literacy is relatively new and is therefore still developing an associated vocabulary which is widely recognised. Such vocabulary will only be available to children if curriculum content is revised to include what is currently described as 'new literacies'. The model presented by Cope & Kalantzis (2000:26) provides a suitable starting point and offers a framework for the exploration and analysis of multimodal communication in its wider sense. Nevertheless, there is still a need for further research in this area to continue to develop an associated literature base so that the phenomena may be discussed and understood in greater depth.

Where interactive multimedia texts, such as games, are concerned, there are additional elements involved in construction and interpretation which need to be considered. When analysing the children's experiences of multimedia texts (see chapter 5 section 5.2) it became evident that an understanding of the software's architecture and the way in which this affects the role of the reader and the construction of narrative also contributes to being literate. This involves the navigational routes which provide opportunities for alternative paths through the landscape of the story and the demands placed upon the reader to perform certain actions in order to advance through the narrative. The apparent blurring of roles associated with author and reader is not a new concept, however, the possibilities of multiple authors and the creation of narrative through the action of the reader is enhanced through the use of interactive software such as computer games. The many routes generated by each child through *Myst* are evidence of the varied experiences resulting from the navigation of software.

Myst and *The Lost Boy* were similar in many respects; each was constructed from a series of still images with occasional use of animation incorporated onto a screen. Both texts contained interactive elements such as sound/animation which were activated by the click of the mouse. The web-like structure of *Myst* created an illusion

of moving within a three-dimensional environment, whereas the arrangement of *The Lost Boy* was essentially linear and reproduced the structure of a print-based book upon the computer screen. This was reinforced by the presence of bookmarks and chapters, both of which are terms associated with print-based literature. By contrast, *Myst* possessed none of these and the children were required to explore the architecture of the text as if they were placed within an unknown geographical location. Interactive elements were highlighted in *The Lost Boy* yet in *Myst* they were located through exploratory clicks of the mouse.

Although creators of *The Lost Boy* claimed that this was a non-linear text, examination of the structure and of children's experiences indicated that it was clearly linear. Even when considering Aarseth's perspective of non-linearity (1997), the design really offered one main path through the various screens with limited freedom to view these in an alternative order. This resulted in each child having a similar experience when they followed the designated route and consequently very little difference between the navigational paths of the children. *The Lost Boy* possessed a clear structure with visible signposts directing the navigational route for the children.

Myst, by comparison, allowed freedom to generate an individual route through the various navigational choices offered at almost every screen. Despite this, *Myst* does not offer a non-linear experience of a text. Apart from the very end, all of the screens are visited to solve puzzles and advance to other islands. There are no screens left unvisited but, as indicated earlier, there are individual routes generated by each child's navigational decision-making. As demonstrated from the children's documented routes, the number of possible permutations is considerable and the likelihood of one child following the same route as another is therefore very small. This does not, however, constitute a non-linear text as defined by Aarseth (1997). It could be argued that narrative generated from navigational freedom such as this is not entirely linear yet cannot be described as non-linear. Essentially, it presents itself as a geographical map where various routes can be navigated with some sense of freedom although the landscape is fixed. This may give the reader/player the feeling that their progress through the narrative is confusing, chaotic, and haphazard. *Myst* has a sense of operating in real-time as if everything were happening in the present. The narrative arises as much from the child's experience as it does from their interpretation of the text. All texts are subject to individual interpretation but in the case of *Myst*, the

addition of interaction and navigation introduces additional elements which culminate in greater variation of experience between one child and another. Nevertheless, the resulting narrative arising from each child's experience of the text is linear in the same way as the retelling of a day's events forms a linear structure.

Interaction in the case of *The Lost Boy* required less mouse activity as signposting was clearly visible and the 'mystery' is solved through the interpretation of given content rather than the location of hidden content. The necessity to explore the screen was therefore diminished although this did not prevent the children from making exploratory clicks when first faced with opening screens of *The Lost Boy*. Clearly, the role of the children was similar to that of a reader of a print-based book with screen advance replacing the page-turning. There was little agency involved as the narrative would not change as a consequence of the reader's actions, yet the children became immersed in the text and sought to solve the mystery of *The Lost Boy*.

The multiple hierarchical problems presented by *Myst* unlocked additional content and, although this did not affect the story contained within the design, it did affect the individual experience of each child and consequently shaped their narrative. The design of *Myst* demanded that the child interacted with screen elements in order to satisfy the logic which allowed access to additional content. This provides the illusion of agency as the design of the story is unaltered by the child's action but it cannot unfold without the reader solving the various puzzles. The design of *Myst* also requires that the children immerse themselves in the story in order to find the solution to the various puzzles. However, for some children, the concept of a story which is 'played' was an unfamiliar and confusing experience.

To conclude, neither design provided non-linear navigational routes. Although the design of *Myst* provided more freedom to move through the various screens, there were no unchartered routes. Ultimately, the programming of both pieces of software was fixed and offered no opportunity for the children to affect or determine the unfolding story. Nevertheless, the personal experiences of the children were different, particularly so with regard to *Myst* which allowed greater freedom in the exploration and navigation of the screens.

Furthermore, although this data supports the arguments regarding the existence of narrative in computer games, it is clear that this genre cannot form the only source of

multimedia texts. *The Lost Boy* was not designed as a game yet the children indicated that they enjoyed using it. Just as paper-based literature provides opportunities for children to immerse themselves in a fictional landscape, so do multimedia texts which retain some of the design features of a book. Notions of intertextuality and the increasing array of texts available provide connections between print, cinema and interactive multimedia such as games. As evidenced in the list of multimedia titles accessed by children when at home, there are instances where computer games have been based upon films and books. Nevertheless, the potential of ICT in terms of multimedia texts could be applied more widely to encompass a wider range of literature. Indeed, there are an ever-increasing range and variety of multimedia texts which provide alternative methods of engaging children in the development of narrative. Further research to examine a wider range of titles and the experiences of children using *MediaCam AV,* or similar software, would be invaluable in developing greater understanding of the relationship between a 'reader' and a multimedia text.

6.4 **Possible implications for the primary setting**

Clearly, the number and variety of multimedia texts available for schools needs to be increased. At present, with the focus firmly placed upon typographic text, examples of on-screen interactive multimedia texts are extremely limited. Although the design of *Digitexts* has addressed this issue and constitutes one example, this does not provide sufficient variety for children, particularly when the home context is often rich in interactive multimedia software such as computer games. Furthermore, the design of multimedia texts would need to provide children with opportunities to develop their ability to read and interpret multimodal forms of communication and allow for differences in children's ability and interest in order to cater to individual preference. Effectively, a range of multimedia texts is required and this may include computer games.

The development of multimedia texts may provide greater variety and therefore choice for children within the classroom setting but without changes in perceptions of 'literacy' the use of such texts in school may be inhibited. This may be addressed by changes in the curriculum whereby references to multimodal forms of communication are clearly stated within the Programmes of Study for English and children are provided with opportunities to examine and understand the way in which multimodal

text is constructed and interpreted. As discussed in chapter 2, section 2.2, the more challenging reconfiguration requires a cultural shift so that shared understandings of literacy include the ability to examine, interpret and construct post-typographic text. To achieve this, the development of a professional knowledge base through continued research into the production and interpretation of multimodal forms of communication is essential. Unlike 'traditional' literacy, the necessary frameworks, language and theories associated with multimodal literacies are relatively new. A more substantial theoretical foundation would greatly assist the development of pedagogies related to literacy which teacher's might acquire through professional learning.

The use of computer games in the primary classroom is not a new idea and clearly, the children involved in this research project had used some games which supported their understanding of literacy and numeracy. Notwithstanding these examples, the range and diversity of computer games in the classroom are extremely limited. Yet the technology and design of computer games offer a rich and varied range of texts which incorporate narrative and shift the boundaries associated with the role of the reader and the author.

Essentially, there appear to be advantages to including games technology as part of the school curriculum yet there are a number of obstacles which need to be overcome in order to facilitate this change, The construction of the curriculum limits the necessary time needed to engage in the games but their design could also be altered to accommodate the time constraints of the school curriculum. One hour is approximately the time allowed for a single lesson within the school context. Whereas *The Lost Boy* could be included and completed within two hours, *Myst* would require a great deal more time and this would clearly present problems for a school curriculum. The teacher would also need to invest substantial time in gaining familiarity with the range and diversity of available literature to develop appropriate plans which would facilitate children's learning when interacting with the multimedia texts. The teacher's knowledge and understanding of texts should therefore embrace not only paper-based literature but also games technologies and other interactive narratives. The ability to discuss children's understanding of multimodal communication in order to empower children in their ability to critically engage with the increasing array of texts assumes that children and teachers have shared experiences. Children's discussion will traverse an increasing range of texts including

film, computer game and book, generating a rich tapestry of intertextuality. With the advent of multimedia texts and media in general, the status of the school as an institution conserving and reproducing cultural heritage is weakened. Literacy as the process of encoding and decoding typographic text is no longer viable as post-typographic forms of communication are also pervasive in the 21st century. Essentially, teacher's experiences, curriculum construction and the range of texts available need to respond accordingly.

Children's perceptions towards the use of computer games in the school context needs to be examined in greater depth and would constitute an area for further research. Additionally, examination of teacher, parent and software designer perceptions could also be productive in ascertaining the potential of computer games as a means of supporting and enhancing learning with regard to literacy. Although the constraints of the school setting, such as the structure of the school day, are acknowledged as challenges to the educational use of computer games (Egenfeldt-Nielson 2006) attitudes may be a more significant barrier to their integration. Unless we explore and address the world view of those involved in formal education, reproduction, as theorised by Bourdieu (1977) will occur in the teaching of primary literacy.

Appendices

Appendix A

Kingston University
School of Education
Kingston Hill
Kingston Upon Thames
Surrey
KT2 7LB
[date]

Dear Parent/Guardian,

As a Lecturer at Kingston University, I am undertaking a research study, into the way in which children interact with multimedia stories, and would like to involve children in the evaluation of such stories.

I have previously taught in primary schools for ten years and now work within the Kingston University, School of Education, and specialise in the use of information and communications technology for teaching and learning. For some years, I have been particularly interested in the design and development of multimedia stories for children for example story books and adventures. In order to gain a better understanding of children's viewpoints, I would like to ask your child to complete a questionnaire which will help me to collect data from my targeted group of Year 5 children.

The questionnaire will ask the children to list the range and variety of multimedia they interact with, both at school and at home. It will also provide opportunity for the children to offer their ideas and understandings toward multimedia stories, in addition to some of the more 'traditional' formats of text such as books.

Following this initial questionnaire, I would then like to select six children from the year group to observe their interactions with multimedia within their school environment. This will involve three, one hour sessions over a period of two months with the children working at the computer. The software I will be using is suitable for children aged 7 years and above. To help me capture the events I will use video cameras and a voice recorder. All data will be used specifically for the purpose of my doctorate study and will be destroyed by January 2011 or upon gaining the doctoral award. Should any images or sound files be required for

publication, I would contact you and request permission. Anonymity will be maintained throughout and I will provide you with a summary of the research results upon completion.

The initial questionnaire will need to be returned to school by [date] having been distributed to the Year 5 children on [date] if you agree to your child being included within the study.

I would be extremely grateful for both the children's help with this project and your own permission for your child to be included. Completing the permission form below and returning it to your child's teacher will enable me to decide whether I can move forward with the study.

Yours faithfully
Ruth Wood
Senior Lecturer ICT in Education
Kingston University

Permission slip for involvement in multimedia research.
Please delete as appropriate

- I do/do not give my permission for my child to complete the questionnaire.

- I do/do not give my permission for my child to participate in the later activities which involve three, one hour sessions.

Child's name_____

Signed_____ (parent/guardian)

Please return this slip to your class teacher.
Many thanks

Appendix B

Questionnaire: multimedia stories/games

Name_____ Age___ Boy ☐ Girl ☐

1) Do you use a computer at home? Yes ☐ No ☐

2) If Yes, what do you use the computer for? (for example, word processing, e-mail, research on the Web, playing games)

3) If you use multimedia (games, stories) on the computer, please write down the names of the programs below.

4) Do you play games on anything else?

Playstation		Sega Dreamcast		Mobile Phone	
Game Cube		NINTENDO DS		None	
Xbox		Game Boy		Other(s)	

5) What games do you play on these?

6) How much time **each week** do you use multimedia games/stories like these? (please tick the box which you think is closest to the time spent)

Less than 1 hour		1-2 hours		2-4 hours		4-8 hours		More than 8 hours	

7) In general, how would you describe these games/stories? (Tick all the boxes which best describe how you feel. Add any words which you feel describe these games/stories to the list using the empty boxes.

boring			difficult	
exciting			challenging	
entertaining				
interactive				
easy				

8) What kinds of multimedia games or stories have you used on the computer at school? Describe them below and give the names of any that you can remember.

9) In general, how would you describe these stories/games? Add any words which you feel describe these games/stories to the list using the empty boxes.

boring			difficult	
exciting			challenging	
entertaining				
interactive				
easy				

10) Which of all the multimedia titles do think is the best? Explain why.

Why?

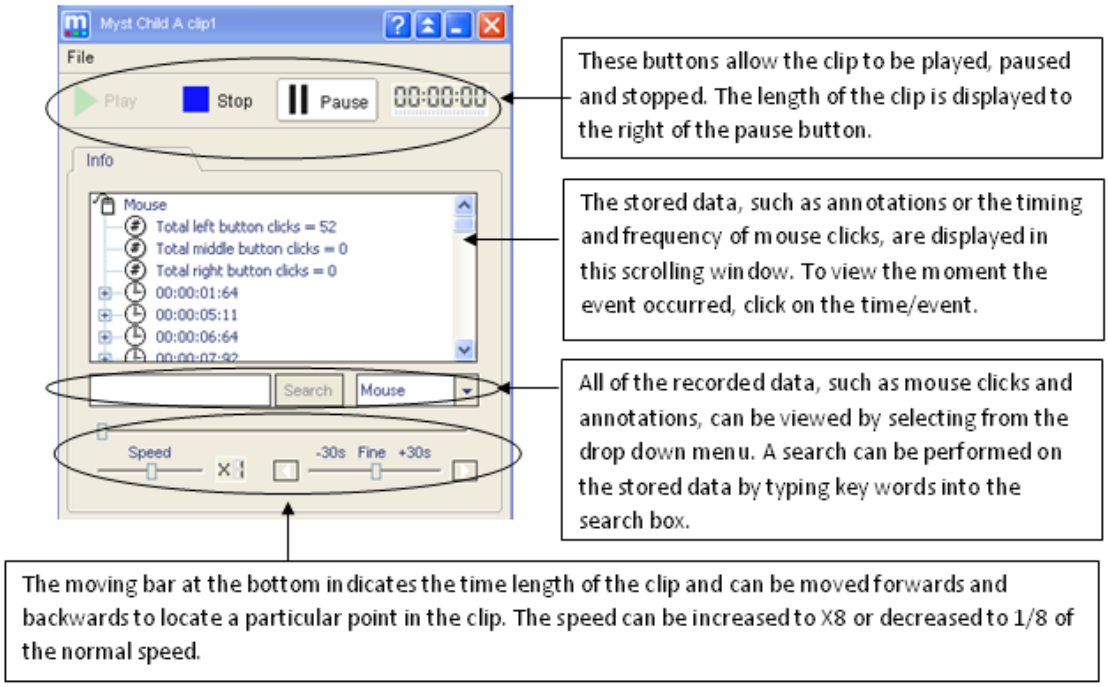
11) In the box below, add anything else which you think will describe and explain your experience of games/stories at home or at school.

Appendix C

Guidance on accessing digital video recordings from the USB memory stick located in appendix D.

The attached USB memory stick contains a read-only copy of the thesis, two folders with the relevant video clips, *MediaPlay installer* and a folder with the necessary files for *MediaPlay*. To install *MediaPlay*, double click on the icon of the installer and follow the instructions. *MediaPlay* will be added to your programs and can be uninstalled by accessing control panel/add or remove programs.

The thesis has been saved in two formats, as a Word document and as an Adobe PDF file. When viewing the thesis through *Word*, the hyperlinks will be active and the associated video clips will be activated when the control key is pressed at the same time the left mouse button is clicked. The video clips will be played using *MediaPlay* which has the following controls. If the thesis is viewed as a pdf file, click on the link with the left mouse button and then select 'Allow'. If you are then offered the choice of 'save', 'run' and 'cancel', first deselect the tick box below these buttons and then select 'run'.



Appendix D

USB memory stick containing *MediaCam AV* player, thesis in PDF format and linked *MediaCam AV* video files (These may be accessed by using the hyperlinks provided within Chapter Five of the thesis). Please note that a CD ROM has replaced the USB memory stick for the hard bound copy of the thesis. The CD ROM is located on the inside of the rear cover.

Mediaplay will need to be installed in order to view the files (see instructions located in appendix C). *Mediaplay* is PC compatible and cannot be installed on a Macintosh platform.

Please note that the webcam video of the children's faces is not available on the video clips to ensure anonymity and confidentiality of the children involved.

Appendix E

Abstract for the conference paper presented **at EDULEARN10,** the annual International Conference on Education and New Learning Technologies, Barcelona (Spain), 5th-7th of July, 2010.

AN EXAMINATION OF CHILDREN'S EXPERIENCES OF MULTIMEDIA TEXT WITHIN THE SCHOOL AND THE HOME: IMPLICATIONS FOR PEDAGOGY

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This presentation will report on a research project which focuses upon children's experiences of multimedia text within the school context. It will engage in debates surrounding the existence of 'digital natives' (Prensky, 2001b, 2006:28) and the emergence of 'new literacies', (Lankshear & Knobel, 2003) both of which have arisen from the rapid development and integration of ICT within our society. In the case of the 'digital native,' children are described as being naturally adept in the use of ICT having been surrounded by digital technologies since birth. Similarly, opportunities to communicate in multimodal forms have been enhanced and increased through the existence of ICTs which, in turn, has given rise to debates centred on what it is to be 'literate' and arguments for 'multiliteracies' (Cope & Kalantzis 2000) or 'new literacies' (Lankshear & Knobel 2003). If children are 'digital natives' and communicate in different ways there are implications for the school curriculum and for pedagogy.

There now appears to be a greater digital divergence between the home and the school context. Proponents of the 'digital native' debate would argue that whereas ICTs have changed the way we live, the school, by comparison, has not embraced the use of ICT and changed the way teachers teach or the way children can learn (Prensky 2001a: 66-67). Despite the existence and popularity of digital video games in the out-of-school context and a growing interest in their educational value, there is little evidence that these have found a place within the primary school curriculum. As forms of multimodal text, digital video games would also provide children with opportunity to develop their ability to 'read' post-typographic forms of literature.

Although Prensky's argument is attractive and not without its supporters there is a need for more research in order to examine critically the claims made. There is an assumption that all children are adept in the use of ICT because they have all been born into an ICT-rich culture, yet there is little in the way of empirically-based research which would support or contradict this assumption. Similarly, video games are beginning to gain credibility as educational resources for the classroom (BECTA 2002, McFarlane, Sparrowhawk & Heald 2002, Squire 2007).

The analysis of data collated form questionnaire responses collected from children in one primary school in England suggests that the home contest provides access to a wide range of multimedia texts in the form of games technologies. By comparison, children rarely have opportunity to engage with multimedia texts within the school context. A focus group discussion provided opportunity to examine the argument for

the use of computer games within the school from the children's perspective. The children's responses suggest that, despite the clear difference in their experiences of multmedia text between home and school, they do not regard the computer game as an appropriate resource for the classroom setting.

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