The internet as a learning tool for effective project based learning in the teaching of the geography primary curriculum

The Internet as a Learning Tool for Effective Project Based Learning in the Teaching of the Geography Primary Curriculum

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Declaration

I hereby declare that this is entirely my own work and that it has not been submitted for the award of any degree at any other university.

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Abstract

The purpose of this study is to examine the effectiveness of the Internet, as a resource for Project Based Learning (PBL) in the teaching of the Geography Primary Curriculum. We can clearly see the influence of new technology on society. Over the past two decades there has been a massive transformation in the way we access, research, process and transfer information. The Internet is a positive resource, with the power to transform schools and revolutionise children's learning. The Department of Education and Science have shown their support for the use of the Internet through the increased availability of Broadband in Primary Schools. They have also provided increased opportunities for teacher's professional development in the use of the Internet for teaching and learning.

This research study will involve 6th class students from a Dublin Primary School, to use the Internet to search for information for a Geography project. This project will be based on the strand Human Environments and the strand unit; People Living and Working in a Contrasting Part of Ireland and People and Other Lands, from the Geography Primary Curriculum. The three countries involved in this research will include the United Kingdom, Japan and America. Students will participate in this research, to compare learning outcomes from the Internet to traditional teaching methods. The participants will be divided into a control group and a study group. The control group will be taught about the countries being used in this study using traditional methods for example books, while the study group will use the Internet to learn about the same countries. Qualitative analysis will be conducted in the form of questionnaires, semi structured interviews, focus groups and an observational checklist. Both groups will undertake a pre test and a post test and a quantitative evaluation will be made to compare the results.

Chapter 1 Introduction

1.1 Introduction

The Internet offers unprecedented opportunities to education and constitutes a space for students to communicate, work, spend leisure time and learn (Mioduser, et al, 1999). It is also one of the most powerful resources available to educational researchers (Fetterman, 1998). The aim of this study is to examine the effectiveness of the Internet as a resource for Project Based Learning (PBL), in the teaching of the Geography Primary Curriculum. The project will be accomplished through retrieving information from the Internet. Online searching of the World Wide Web (WWW) has become a routine activity for identifying and accessing information on a wide variety of topics (Nuckles and Bromme, 2002). The research involves 6th class students from a Dublin Primary School, using the Internet to search for information for a Geography project. This project is based on the strand Human Environments and the strand unit; People Living and Working in a Contrasting Part of Ireland and People and Other Lands, from the Geography Primary Curriculum. The research methodologies used will be of a qualitative and quantitative nature.

1.2 Background

Information and Communications Technology (ICT) has become an integral and accepted part of everyday life. The creative use of ICT in education has the capacity to increase the quality of student's lives, by enhancing teaching and learning. The Primary School Curriculum (1999) promotes the use of ICT, to enhance teaching and learning across the curriculum (NCCA, 2004).

Since the introduction of the Primary School Curriculum (1999), the Department of Education and Science has announced a rise in ICT funding in schools with accompanying policy documents. In 1996 a report by the International Data Corporation (IDC), ranked Ireland 23rd in the world in terms of "preparedness for the information age." The response to this report was a three year investment of £40 million with the launch of *Schools IT 2000* in 1997 (DES, 1997). The report also outlined a framework, which led to the establishment of the National Centre for Technology in Education

(NCTE) and the National Policy Advisory and Development Committee (NPADC).
In 2000, the NPADC commissioned Price Waterhouse Coopers to undertake a review of *School IT 2000*. This evaluation led to the publication of a second ICT three year action plan, which was entitled *the Blueprint for the Future of ICT in Irish Education* (DES, 2001). This provided €108 million for investment in computer infrastructure and support services.

One of the most recent initiatives in Ireland was the provision of Broadband to all Irish schools. In 2004 an investment of €18 million was announced with the launch of *Schools Broadband Programme*, to fund the provision of Broadband to schools. Broadband technology increases the quantity, quality and efficiency of resource access, not only freeing time but providing a richer set of materials for scholarly activities (Underwood, et al, 2005). A report in 2006 found Ireland lagging behind other European countries in terms of ICT integration in classrooms. Following this report, in 2007, a planned investment of €252 million was announced under the *National Development Plan*.
It became evident that in a very short period, World Wide Web (WWW) technology increasingly fulfilled more and more educational functions in schools (Mioduser and Nachmias, 2002).

1.3 Relevance and Significance

The motivation for this study came from a desire to make the teaching of the Geography Primary Curriculum more relevant and interesting to the students. The Internet is becoming a common and increasingly available technology in Primary Schools. The author wants to adopt an educational instruction, that will firstly engage the students with the subject and secondly at the same time, free those from traditional teaching based lessons using textbooks and teacher centred didactic style of learning. The educational instruction that will be used in this research is Project Based Learning.

Project Based Learning offers an engaging instructional method, to make learners active constructors of their own knowledge (Grant, 2002). It enables the active involvement of the students, as well as practising teamwork with cross-curricular links. The Primary role of the teacher in a Project Based Learning environment is that of a facilitator; one who manages the setting and assists students in developing an understanding of the material or subject at hand (Blumenfeld, et al, 1991; Marx, et al, 1997). In an Internet based learning paradigm, the students are encouraged to become active learners and explore the resources available to them. As the students actively participate in their learning experience, they develop independent learning skills, for example, where and how to find appropriate information. This is in line with the learning theory of constructivism, which puts the student at the centre of learning (Piaget, 1969; Bruner, 1962, 1979; Vygotsky, 1962, 1978; Dewey, 1915, 1962).

1.4 Research Question

The aim of this study is to examine the effectiveness of the Internet, as a resource for Project Based Learning in the teaching of the Geography Primary Curriculum. The following questions are hoped to be addressed in this study:

- Is the Internet an educational resource from which children in a classroom setting can retrieve relevant and helpful information for project work, in the subject of Geography?
- Can students learn factual information more effectively from the Internet than traditional teaching methods?
- What are the study group participants' attitudes towards using the Internet for Project Based Learning?

1.5 The Setting

This research aims to determine if students who learn Geography through Internet project work will learn the subject matter, content and related skills, more efficiently than students who learn the same material through traditional teaching methods and do not have the benefit of using the Internet. The study will take place over the school year 2009/2010. The case study will take place in medium size Senior Primary School in North Dublin with a student population of 222.The school has a walking Principal and 14 full time Teachers; 9 Mainstream Teachers, 4 Resource Teachers, including 1 part time Resource Teacher, 2 Special Needs Teachers and 4 Special Needs Assistants (SNA). The study group and the control group for this research will be composed from 6th class students, from Scoil Chaitríona Cailíní. The student's average age is 11 and all participating students are female. The students come from a mainly disadvantaged background and it has a disadvantaged status within the Department of Education. The scope of this research will encompass Mainstream Teachers, Resource Teachers, Special Needs Assistants and 5th and 6th class students.

1.6 Research Methodology

The research approach selected will be a mixed method case study, incorporating a combination of qualitative and quantitative research methods. The qualitative data collection tools will include (1) pre and post questionnaires, (2) semi structured interviews with adult participants, (3) focus group sessions with teachers and students and (4) observations using an observation checklist.

Informed consent will be obtained from all participating students (Appendix A). The control group will be taught about the countries being used in this study, using traditional methods, while the study group will use the Internet to learn about the same countries. The two groups will attempt the same multiple choice pre exam (Appendix C) and the results will be assessed, to determine if any significant difference between the two groups is identified. The quantitative research will incorporate a statistical comparison of the two groups, to ascertain which method of teaching will be most effective.

1.7 Structure of Thesis

Chapter One introduces the study and establishes the context of the research. It outlines the author's aim for the study and reasons for choosing her research topic. The setting, the participants and the research approaches are also discussed.

Chapter Two reviews the published literature available on the Internet as a learning tool for Project Based Learning, in teaching the Geography Primary Curriculum. Three areas of research will be highlighted:

- How the Internet has developed and how the rollout of Broadband Internet access has been dealt with on a worldwide basis. Policies introduced in Ireland, America, Sweden and the United Kingdom will be outlined.

- The use of the Internet in education, its advantages, limitations and the applications it offers.
- The final section will explore the learning theories such as Behaviourism, Constructivism, Cognitive Constructivism and Multiple Intelligence. It will also investigate Project Based Learning as a teaching methodology, using the Internet.

Chapter Three focuses on the research questions which are to be addressed and describes the methods that are most appropriate for this research. It also outlines the rationale of the Geography Primary Curriculum and the importance of informed consent in this particular research. A case study methodology will be used and the data collection tools used will include pre and post questionnaires, direct semi structured interviews, focus group sessions with teachers and students, observation using an observation checklist and pre and post testing.

Chapter Four analyses the data and findings gathered during the course of this research. Both quantitative and qualitative results will be presented. Statistical analysis will be performed between the study group and the control group. Details of the study group participants' responses to the teaching of Geography through the Internet will also be described.

Chapter Five provides discussion on the key findings outlined in the previous chapter Presentation of Key Findings. Significant issues are organised under relevant headings and comments from the observers during the semi structured interview will be highlighted. This chapter will also examine whether the aim of the research have been achieved.

Chapter Six concludes the study, combining the findings of this investigation with the research outlined in the literature review and states the consequences of such findings and the limitations of the research. Conclusions will be formed and recommendations for further work in this area suggested.

Chapter 2 Literature Review the Internet in Schools

2.1 Introduction

The rapid development of the Internet since 1957 has influenced governments all around the world to invest heavily in promoting Information and Communications Technology (ICT) in education. In the last decade, two Irish government policies for ICT in education have been published and implemented: *Schools IT2000, A Policy Framework for the New Millennium* (DES, 1997) and *A Blueprint for the Future of ICT in Irish Education* (DES, 2001). The Primary aim of this study is to evaluate the effectiveness of the Internet as a learning tool for Project Based Learning, in teaching the Geography Primary Curriculum. It was necessary to examine four areas in order to address the aim of this research.

Section one aims to highlight the history behind the Internet, which will then lead into the development of ICT in education, giving particular attention to the development of the Internet in schools. This will be examined in four different countries: Sweden, United States of America, the United Kingdom and Ireland. The United States of America began its ICT campaign when it launched *Technology Literacy Challenge* (US Department 1996). This was followed by the national action strategies of Sweden: *Tools for Learning – A National program for ICT in Schools* (ITiS, 1997) and the United Kingdom, *National Grid for Learning initiative* (DfEE, 1997a). The Irish government also launched its first ICT policy in 1997.

The next section aims to explore the use of the Internet in education. It will focus on the advantages linked with the Internet and the applications it offers. The advantages of a Broadband connection will also be outlined. The limitations associated with the Internet will be highlighted, along with information about the requirement of an Acceptable Usable Policy (AUP) in schools, under the advent of the School Broadband Programme.

The final section will explore the learning theories including Behaviourism, Constructivism, Cognitive Constructivism and Multiple Intelligence, in the context of the subject matter being investigated in this research.

2.2. History of the Internet

The Internet is a major technological innovation of the 20th century (Castells, 1996). Technology has significantly improved in the last decade and the Internet is regarded as a fundamental tool for education, business and entertainment. The World Wide Web (WWW) is the most widely used service of the Internet, accessed through a web browser, for example, Internet Explorer or Netscape (Shannon, online). However, what we take for granted today was only a vague idea fifty years ago.

1957 marked a big change in technology and the start of the invention of the Internet. On October 4th 1967, the first long distance computer network was created by the US Government in response to Russia launching the satellite Sputnik 1. In order to secure the Americans' lead in technology, they founded DARPA (The Defense Advanced Research Project Agency). DARPA planned to create a large scale computer network, in order to accelerate knowledge transfer and avoid duplication of already existing knowledge. This research became known as the ARPAnet. It was also created to share military research across computer networks. (Leiner, et al, 2003)

Tomlinson, a computer programmer, implemented an Email system in 1971. This software was used for exchanging electronic messages across the ARPAnet and this marked the invention of Email. This was the first system where it was possible to send mail between users on different hosts connected to the ARPAnet. To achieve this, the @ sign was used to separate the user from their machine. The @ sign has been used in Email addresses ever since its implementation in 1971 (Tomlinson, online).

In 1975, the Internet established a standard protocol for all its activity. This was called Transmission Control Protocol/Internet Protocol (TCP/IP). All computers using the Internet had to exchange data using TCP/IP. The Internet's data transfer method or protocol called hypertext transfer protocol (http), was designed to run over or in conjunction with TCP/IP. This protocol became very popular and is still used today for exchanging packets of information across large networks **(**Howe, 2007).

Throughout the 1980s the Internet was still text based and was difficult to navigate. However, in 1991 Tim Berners-Lee of CERN which is The European Organisation for Nuclear Research in Switzerland, developed The World Wide Web or WWW. The WWW is one of the protocols that lets you link to many sites on the Internet. Within the page are links to related pages and other web sites. This system of embedding links in the text on a page is called hypertext (Howe, 2007).

The first Internet browser, Mosaic, was released in 1993, after being developed by the National Centre for Supercomputer Applications (NCSA) (Vossen and Hagemann, 2007). The development of the World Wide Web Consortium (W3C) followed in 1994. The aim of the W3C was:

> *"to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability."*
>
> (CERN, 2008, online)

In 1995 the Internet Explorer web browser was released. The Internet represents one of the most successful examples of sustained investment and commitment to research and development of information infrastructure worldwide (Leiner, et al, 2003).

The researcher will now explore how the Internet was developed in America, Sweden, the United Kingdom and Ireland.

2.2.1 America

The U.S. Department of Education, in its report *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge* (1996), described computers as "*the new basic*" of American education and the Internet as "*the blackboard of the future.*" McGrath and Baron (1998) point out that former President Clinton, in his 1996 State of the Union address, reiterated the need for teacher training on Internet based computer technology: *"Our challenge is to provide Americans with the educational opportunities we'll all need for this new century. In our schools, every classroom in America must be connected to the Information Superhighway with computers and good software and well trained teachers."*

The U.S. Department of Education envisioned a 21st century where all students would be technologically literate. The challenge was placed on the nation as a whole, with responsibility for its accomplishment shared by local communities, states, educators, the private sector, parents and the federal government. Four concrete goals were defined:

- All teachers will have the training and support they need to help students to learn how to use computers and the information superhighway
- All teachers and students will have modern multimedia commuters in their classrooms
- Every classroom will be connected to the information superhighway, for example, the Internet
- Effective software and on-line learning resources will be an integral part of every school

(Riley, et al, 1996)

Turner (2007) reported that in 2004, President Bush, set a clear goal for high-speed Internet access in the United States:

"We ought to have a universal, affordable access for Broadband technology by the year 2007."

The President clearly called for not only universal access by 2007, but more importantly he wanted Broadband to be affordable.

In 2006, Wells and Lewis carried out research on *Internet Access in U.S. Public Schools and Classrooms: 1994–2005* on behalf of The National Centre for Education Statistics (NCES). This publication was a national representative survey of public schools to gauge the changes in computer and Internet availability. It found that 100 % of public schools in the United States had access to the Internet in 2005, compared with 35% in 1994. In 1996, dial-up Internet connections (a type of narrowband connection) were used by about three quarters (74 %) of public schools (Heaviside, Riggins, and Farris, 1997) whereas in 2001, 5% of public schools used a dial-up connection (Wells and Lewis, 2006). In 2005, a report by Wells and Lewis revealed that 97% of public schools with Internet access used Broadband as their connection method.

83% of public schools with Internet access indicated that their school or school district had offered professional development to teachers on how to integrate the use of the Internet into the curriculum. This report also revealed the ratio of students to computers. In public schools the ratio was 3.8 to 1, a decrease from the 12.1 to 1 ratio in 1998, when it was first measured. The 2005 ratio of 3.8 to 1 represented a decrease from 2003, when the ratio of students to computers was 4.4 to 1.

Technology has no doubt become an integral part of education enabling students to access information rapidly and visually (Smith, 2002). The role of the classroom teacher is the crucial factor in the full development and use of technology in schools (Trotter, 1999). Continued success will take nothing less than innovative and enterprising leadership through educators and persistence to ensure that American children meet the future with a wealth of opportunities along with the skills and knowledge of technology (Riley, et al, 1996).

2.2.2 Sweden

The use of computers in Swedish schools dates back to the early 1970s. The ICT developments in Swedish schools can be described in terms of four waves. The first wave began in the 1980s, when computers and computer software were introduced in schools. The second wave started in 1988 and ended 1991. During these years, enhanced production and software use were targeted. Within the years 1992 and 1996, very little school development in regards to computing took place and no extra national money was spent on computers in schools. The third wave took place when the Government created *The Foundation for Knowledge and Competence* in 1994. The Foundation's main task was to promote IT-use in schools (Jedeskog, 1999).In spring 1998, the Government submitted a report to the Parliament, *Tools for Learning – A National program for ICT in Schools* (ITiS) (Ministry of Education and Science, 1997). This was seen as the fourth wave. All the municipalities (local authorities) in Sweden were offered the opportunity to participate in the programme, which was to be implemented over a three year period from 1999-2001.

The Swedish government set the accessibility objective that every household, business and school, regardless of location, should have access to IT infrastructure with high transmission capacity, making Sweden the first country with "an information society for all" (MIECS, 2000). With respect to Broadband, Sweden was one of the first movers in this field (Eskelinen, et al, 2008). The Government realised that the in-service training for teachers was something that was left out during the first three waves. Therefore, the fourth wave consisted of seven components, in order to improve this situation:

- In-service training for 60,000 teachers
- A multimedia computer for participating teachers
- State grants to improve the school's accessibility to the Internet
- E- mail addresses for all teachers and pupils
- Support for developing the Swedish Schoolnet and the European Schoolnet
- Special measures for pupils with special needs
- Awards for excellent pedagogical contributions

(Jedeskog, 1999)

Initially the government's investment was to be used to provide Internet access for schools which did not have Internet connections and to improve access for those schools with very low capacity. Secondly, the investment was used to increase capacity of existing connections. It was also used for measures that increased accessibility by other means, for example, through the expansion of local area networks. Within the framework of ITiS, all pupils and teachers were to have their own Email address by 2001 (International Labour Organisation, 2005). Within the Swedish school system, approximately € 4,000 has been spent per Swedish teacher or approximately €500 per Swedish student, on computers and computer use from 1984 to 2001 (Jedeskog, 2007).

2.2.3 UK

"This technology is revolutionising the way we work, the way we do business, the way we live our lives. Our job is to make sure it is not the preserve of an elite – but an Internet for the people."

(Blair, 2000, online)

The United Kingdom (UK) has invested heavily in Information and Communications Technology (ICT) for use by teachers and students. Substantial sums of money have also been spent by Local Educational Authorities, and schools themselves on ICT equipment and resources (Higgins, 2003). The Government's vision, set out in the *National Grid for Learning initiative (NGfL)* consultation document published in 1997, was a co-ordinated, nationwide drive towards widespread ICT use in UK schools (DfEE, 1997a). This government initiative was used to lift educational standards in the UK, by making the most of technology change and in training students to develop new skills and providing them with opportunities. The NGfL was developed with an investment of £700 million, and it hoped to connect every one of the UK's 30,000 schools to the Internet by 2002. BECTA, Bringing Educational Creativity To All, is the Government's leading agency for Information and Communications Technology (ICT) in education, covering the United Kingdom. It was established in 1998 through the reconstitution of the National Council for Educational Technology (NCET).

It was proposed that "in-depth teacher training in the subject specific use of ICT would be supported through action envisaged under the National Lottery," Department for Education and Employment (DfEE, 1997b). This signalled the launch of the *New Opportunities Fund* (NOF, 2000) a training programme in ICT for teachers. The NOF programme, which ran from 1999 to 2003, aimed to make every United Kingdom teacher competent in the classroom uses of information technology (Conlon, 2004). Schools continued to invest in ICT and in 2001, 30% of Primary Schools indicated good pupil access to the Internet (BESA, 2008). The Government's Broadband strategy included working with the Broadband Stakeholder Group (BSG) on its policy formulation on Broadband. The BSG was set up April 2001 as an independent advisory body to the Government, whose remit was to inform and stimulate the development of the Government's Broadband strategy. The Government fully supported the strategic approach adopted by the BSG and has drawn heavily on their recommendations, in the formation of its own Broadband strategy.

In February 2001, the Government published, *UK online: the Broadband future,* which encouraged users to connect to the Internet more often (Office of the e-Envoy, 2001). The paper set a new target for the UK, to have the most extensive and competitive Broadband market in the G7. G7 countries include Canada, France, Germany, Italy, Japan, the UK and the United States and also within Sweden, Ireland and Australia. The goal was to have significant increases in Broadband connections to schools, libraries, further education colleges and universities by 2005 (Postnote, 2002).

In a recent report from the British Educational Suppliers Association (BESA) (2008), more than 2.3 million networked computers are currently in place in the UK, of which over one million are in Primary education, with the typical Primary School having 47 networked computers in operation. 72% of Primary Schools recorded ownership of wireless networking technology in 2008. In addition, 7% of Primary Schools intended to commence the use of wireless networking in April 2009. 85% of all Primary School computers had Internet connection. By the end of 2009, it was hoped that every Primary School would have 50 Internet connected computers (BESA, 2008).

2.2.4 The Internet in Ireland

2.2.4.1 Schools IT 2000

In 1997, the International Data Corporation (IDC) ranked Ireland in the third division (position 23 of 53) in respect to the country's preparedness for the Information Society.

> *"Recognising that Ireland was lagging significantly behind its European partners in the integration of ICT into first and second level education, the Irish Government's 'Schools IT 2000' initiative was launched…to address the balance in the area of education."*
>
> (Freeman, et al, 2001, p.9)

The Department of Education and Science (DES), launched its first Information and Communications Technology (ICT) policy document known as *Schools IT 2000, A Policy Framework for the New Millennium* in 1997 (DES, 1997). This was a three year project to integrate ICT into teaching and learning in Irish schools (NCTE, 2006). The Government announced a commitment to spend £55 million in technology for Irish Primary and secondary schools. The funding for the initiative was £40 million and an additional £15 contribution from Eircom, Ireland's former state telecommunications organisation. All schools were supplied with at least one multimedia computer and an Internet phone line connection, with an hour a day free Internet use. Funding was also set aside for the training of teachers in new technology. The National Centre for Technology in Education (NCTE) was established by the DES, as part of the *Schools IT 2000* programme in 1997.

The NCTE was primarily responsible for the initial introduction of ICT into Primary Schools, through the provision of resources and training. Training programmes including Phase One, Introductory Course and Phase Two, ICT in the Primary Curriculum were offered to teachers through the network of Education Centres throughout Ireland. Mulkeen (2003) states, 84% of Primary teachers had attended at least one of these courses by the end of 2000.

The training was offered under three specific initiatives:

- Technology Integration Initiative (TII)
- Teaching Skills Initiative (TSI)
- Schools Support Initiative (SSI)
    - Scoilnet: Dedicated website for schools and teachers
    - School Integration Project: Various ICT projects in selected schools

(NCTE, online)

From the beginning of this initiative, the Government wanted to ensure Primary student Teachers once qualified, were prepared fully to integrate ICT into their teaching. The National Council for Curriculum and Assessment (NCCA), a government agency, has the responsibility for devising the National Curriculum for Primary and secondary schools in Ireland and promoting the use of ICT in learning and teaching (O'Grady, 2007).

2.2.4.2 The Technology Integration Initiative (TII)

NCTE's Technology Integration Initiative (TII) was set up to promote and support the integration of a high quality ICT infrastructure into learning and teaching for schools (NCTE, online). Schools were empowered to plan their own approach to technology integration and were funded to purchase their own hardware and software. The contribution of Eircom to the initiative brought about a situation whereby Irish schools had almost 100% connectivity to the Internet.

2.2.4.3 The Teaching Skills Initiative (TSI)

The professional development of teachers had been identified internationally as the Primary factor in enabling effective integration of technology into schools. *Schools IT 2000* state that training is:

“aimed at developing practical experience in using the computer and associated technologies…will also focus on the use of the Internet and on introducing selected relevant educational software.”

(DES, 1997, p.39)

Between March 1998 and December 1999, a total of 55,000 training places had been taken up by Primary and post-Primary teachers from around the country. There are approximately 45,000 teachers in Ireland. Training courses focused mainly on ICT skills, awareness training and pedagogical skills. Vast numbers of Irish teachers were willing to avail of ICT training in their own time (Phelan, 2000).

2.2.4.4 Schools Support Initiative (SSI)

Under its Schools Support Initiative (SSI), the NCTE operates Scoilnet, which is the national Internet portal for ICT in Irish Education (www.scoilnet.ie). It provides a central resource to teachers, pupils and parents. It offers access to a growing repository of advice, information, evaluated and categorised web sources, software and multimedia resources, for use within the teaching and learning sector (DES, 2009). Scoilnet was developed through a strong partnership between the Department of Education and Science (DES), NCTE and Intel Ireland (Phelan, 2000). By 2001, 53% of Primary principals and 63% of Primary teachers had used Scoilnet between once a month and every few months. Two thirds of them found Scoilnet useful (NPADC, 2001). The number of visitors to Scoilnet continues to increase, with the total traffic recorded rising from 1 million visits in 2006, 1.23 million visits in 2007, 1.75 million visits in 2008 to 1.9 million visits in 2009 (DES, 2009).

Other initiatives put in place by the NCTE included School Integration Projects (SIPs). The Schools Integration Project (SIP) piloted 75 projects in 370 schools, ranging from software use to Internet and Email programmes (Blamire, 2002; Mulkeen, 2004). The aim of the SIP was to identify policy, training and support models, pedagogical strategies and classroom resources for ICT adoption in Irish schools (DES, 1997). One in ten Primary principals confirmed that they are part of the Schools Integration Project and 77% of them stated that they are satisfied with the progress of the initiative (NPADC, 2001). Many of the SIP pilot projects were successful in showing that greater curricular use of ICT is possible. However, the schools involved in these projects tended to be schools which made use of ICT before the projects began or schools which were involved in other non-ICT projects, suggesting that it was mainly progressive or innovative schools who participated. Mulkeen (2003) points out that the success of projects in innovative schools does not automatically indicate that the same results can be replicated in all schools.

A survey was carried out by the Policy Advisory and Development Committee (NPADC) in June 2000 for the Department of Education and Science, on the implementation of *Schools IT 2000*. The main conclusion was that while achievements had been made in the area of infrastructure, it concluded there were three fundamental issues that needed to be addressed. Firstly, it emphasised the need for more training, particularly on the pedagogical uses of ICT in the classroom. This training should be an integral part of all in-service training courses and where possible, on an in school basis. The second fundamental issue was the need for more funding and a requirement for new equipment and computers. It also outlined the areas of maintenance, repair and renewal of existing ICT equipment on an annual basis and the requirement of support services. On infrastructure, the report noted an average of 15 computers per Primary School, which is a pupil to computer ratio of 19.6:1 and that over 79% of Primary pupils had access to the Internet. Thirdly, there was a need for more technological support and to encourage the use of ICT in the classroom. This included the further development of resources and support mechanisms such as educational software, digital resources and the continued development of Scoilnet (NPADC, 2001).

2.2.4.5 Stage Two of Government ICT Initiative

The *Blueprint for the Future of ICT in Irish Education*, a 3 year strategic action plan from 2001 to 2003 was published in 2001, as a follow up to *Schools IT 2000*. It provided a large investment of €78.72 million for capital grant aid in infrastructure and Broadband. Another €29.2 million was set aside for support services including teacher training to:

> *"build on the exceptional progress which has been made over the past four years in integrating ICTs into every school in the country."*
>
> (DES, 2001, p.4)

However, there was little guidance in the Blueprint as to what kind of training this should be and no promise of more pedagogically based training. The plan merely mentioned building on and developing skills and providing training devised to meet specific needs identified by teachers themselves, without providing any plan for the delivery of this training (DES, 2001). For the first time, this policy acknowledged the key role of the principal in the successful use of ICT in schools. Principals were given the opportunity to develop individual ICT plans designed to meet the infrastructure and training needs of their particular schools (DES, 2001). While a new scheme of innovative ICT projects was mentioned, there was no detailed plan for this. Other aspects referred to within the report, were priority for special needs students, the development of ICT school plans and education web resources and collaboration with Europe. However, once again, there was little detailed planning for how these issues were to be handled in practice. There has been no overall review of this plan so little can be said about its impact (DES, 2001).

2.2.4.6 Schools Broadband Programme

In 2004, the Department of Education and Science, the Department of Communications, Marine and Natural Resources and the Telecommunications & Internet Federation (a grouping within IBEC) culminated in an agreement to establish an €18 million joint IBEC Telecommunications Industry Federation /Government fund. This was called the Schools Broadband Programme. The main aim was the provision of high-speed Broadband connectivity to all Primary and post Primary Schools nationwide, over a 3 year period. This access represented an essential element in the Department's strategy to integrate ICT into teaching and learning. It enabled teachers to expand the range of educational activities undertaken in class and to access the extensive range of digital content available online. The overall investment in the Schools Broadband Programme has amounted to €34m from the initial set up in 2005 to the end of 2008 (DES, 2009). The Technology Integration Initiative (TII) coordinated with the Schools' Broadband Programme, in the coordinating and implementing of the rollout of Broadband into Irish Primary Schools (Phelan, 2000). The goal of the Schools Broadband Programme was to provide all first and second level schools with a high-speed managed Broadband connection and additional centrally managed services (NCTE, 2006).

Each school was to be connected to the network via a Broadband connection and router. It was installed and located in the school by a Broadband service provider, under contract to the Department of Education and Science (DES). The connection from service providers and centrally managed services were being provided by HEAnet, Ireland's National Education and Research Network. Each school was allocated a service provider and appropriate technology, based on the outcomes of the awarded tender. Following the Broadband tender award process by the DES in 2004, six service providers were successful and were each awarded a list of schools to connect to the Broadband network (DES, 2004). The successful service providers were BT, Digiweb, HSData, Irish Broadband, Last Mile Wireless and Smart Telecom. The contract to install and test the Broadband router equipment in schools was awarded to Eircom. HEAnet provided a dedicated Schools Network Operations Centre (NOC), which delivered technical support to the National Centre for Technology in Education (NCTE), which managed a Schools' Broadband Service Desk on behalf of the DES. By the end of 2006, 96% of schools had been provided with Broadband through the programme (NCTE, 2006). A progress report in January 2008 found that 98% of all Primary and secondary schools now have Broadband access (Irish Examiner, 2008).

2.3 Broadband

In technical terms, 'Broadband' is a high speed Internet connectivity service, typically available through cable modems and DSL (Digital Subscriber Lines) at an affordable price and is on always communication service (Forfás, 2005). The introduction of Broadband:

> *"represents a major systemic change to traditional methods of teaching, learning and administration and it can transform the learning experience for students as it can expose them to a range of exciting and innovative learning content"*
>
> (BSG, 2003, p.3)

Three emergent properties of Broadband are significant according to Rennie and Mason, (2005):

1) Much faster data transfer
2) The ability to transfer more complicated data with great fidelity
3) The advantages of the network being always being on

In 2004, the Irish government, in conjunction with the Telecommunications Industry Federation, launched a dedicated centrally managed Broadband network and help desk for all schools (NCTE, 2004). Progress has also been achieved in relation to networking. The 2005 NCTE census found that 45% of computers in Primary Schools were networked. However, a large proportion of schools indicated in their comments on the census form, that they were in the process of networking the school, in preparation for the installation of Broadband (Shiel and O'Flaherty, 2006). 82% of schools indicated that developing a school computer network was a priority. At Primary level, a greater percentage of computers in large schools (58%) than in small schools (32%) were connected to a network and had Internet access (52% vs. 40%). At Primary level, more computers in disadvantaged schools (50%) than in nondisadvantaged schools (44%) were networked, while marginally more computers in nondisadvantaged (46%) than in disadvantaged schools (43%) had Internet access (Shiel and O'Flaherty, 2006).

Although Broadband up take in Ireland is increasing, up take in other countries is also growing and as a result, Ireland's relative performance has not improved. At the end of Q2 2005, Ireland ranked 25th out of the 32 countries for Broadband up take (Forfás, 2005). According to a report, education is regarded as a key driver of Broadband take up (Forfás, 2005).

2.3.1 Benefits of the Internet

The Internet is a medium that carries multiple forms of information that provide numerous ways of representation including textual, visual, abstract, musical, social and kinaesthetic (Brown, 1999a). The Internet's inexpensive access and economical infrastructure contribute to the widespread use of the technology (Duchastel and Turcotte, 1996). The Internet is a very capable instrument of education that offers the utmost convenience to students, while offering endless possibilities for innovative teaching (Applebome, 1999). There are many advantages of the Internet including its remarkable range of resources, the possibility of longlife learning, communication benefits and a motivation option for learning.

2.3.1.1 Resources

The Internet has been welcomed by educators as a great tool for use in the classroom or to create virtual classrooms (Sharma and Maleyeff, 2003). It is brimming with possibilities for educators and one of the biggest advantages for teachers is the abundance of valuable resources which can aid in the development of lesson planning (Strickland, 2003; Lemon, 1997; Wilson and Marsh, 1995). Broadband technology increases the quantity, quality and efficiency of resource access, by providing a richer set of materials for scholarly activities (Underwood, et al, 2005). Search engines like Google and Yahoo can be used to retrieve and access information on numerous subjects. Websites provide educational activities and courses for all class levels in a large number of Primary curriculum subjects (Hackbarth, 1997; Khan, 1997). The information rich environment provided by the Internet is the technology push that promises to radically change teaching and learning in schools (Duchastel and Turcotte, 1996).

2.3.1.2 Longlife Learners

The Internet is increasingly, a place to learn (Berenfeld, 1996; Sherry, 2000) and to enable people to become aware of and develop their learning potential (Gray, 1999). The fastest growing and most versatile part of the Internet is the World Wide Web (WWW) which allows learners access to enormous learning opportunities, including access to a wealth of data and information on a seemingly endless range of subjects (Gray, 1999). One of the key aims of the Internet is empowerment of the individual in terms of lifelong learning (Lallana, 2003). This is emphasised in the Irish Government's action plan for implementing the Information Society, where it is stated that:

> "…*developing the concept of life long learning, of extending access to the formal educational infrastructure to those outside the formal education process and of identifying further options to introduce new learning possibilities for the population in general*."
>
> (Government of Ireland, 1999, online)

The ability to utilise resources on the Internet will give students the skills needed for future lifelong learning (Dyrli, 1994; Eisenberg, 1996).

2.3.1.3 Communication

The Internet has dramatically changed the way people communicate. It gives individuals the ability to communicate directly, easily and inexpensively across time and space (Teich, et al, 1999). It provides schools with a new means of communication (NCCA, 2004), including communication among teachers but also between teachers and students (Underwood, et al, 2005). In a survey carried out by Becker (1998), the value of the Internet was considered with respect to the importance of a teacher's computer station with Electronic-mail (Email) access. Almost half of all teachers saw this resource as "essential" for teaching and nearly 90% reported that they would consider Email access as either valuable or essential. Negroponte, Resnick and Cassell (1997) state, the Internet will allow new ''knowledge building communities'' in which children and adults from around the globe can collaborate and learn from each other.

2.3.1.4 Motivation

The Internet is a dynamic, changing and growing source of multimedia resources that connect students to real world events. BECTA (2001) points out that many educational websites are no longer text only. They now incorporate the full range of modalities from still to dynamic images, including video and high quality audio, with an emphasis on natural speech and sound as opposed to synthesized speech. These multimedia and interactive websites are engaging and motivating because they deviate from the traditional textbook. The Internet also adds variation to lessons and helps to keep students focused by seamless transition from website to website (Underwood, et al, 2005). McIntyre and Wolff (1998) noted that:

> ``*One of the powers of interactivity in a Web environment is the capability to engage by providing rapid, compelling interaction and feedback to students.''*
>
> (McIntyre and Wolff, 1998, p.257)

Neorman and Spohrer (1996) comment that engagement is also enhanced by problem based presentation of educational material. They believe that an engaged student is a motivated student.

2.3.2 Web 2.0

Web 2.0 is a term coined by O'Reilly Media in 2004. Web 2.0, sometimes referred to as the "read or write Web" provides online users with interactive services, in which they have control over their own data and information (Madden and Fox, 2006; Maloney, 2007). Web 2.0 is supposedly a second upgraded version of the web that is more open, collaborative and participatory (O'Reilly, 2005). Web 2.0 platforms are seen to have an emerging role to transform teaching and learning (Alexander and Levine, 2008). Web 2.0 tools are characterised by ease of use, rapidity of deployment and making possible powerful information sharing spaces to improve collaboration between learners (Boulos, et al, 2006). The most common tools of Web 2.0 include wikis, social networking sites, blogs and podcasting.

2.3.2.1 Wikis

A *wiki* (What I Know Is) is a webpage or set of webpages that can be easily edited by anyone who is allowed access (Ebersbach, et al, 2006). The most well known example is the online encyclopaedia Wikipedia (Beer and Burrows, 2007). As wikis are free open source software, no one authorises the creation of wiki pages and everyone is automatically authorised to write, edit and publish (Fountain, 2005). These webpages need to be used with extreme caution, in regards to the retrieval of information.

2.3.2.2 Social Networking Sites (SNS)

Social software has emerged as a major component of the Web 2.0 movement, where users are connected to and collaborate with each other in a variety of group interactions and distribution of shared content (Shirky, 2003; Pettenati and Ranieri, 2006a). The web has always supported some forms of social interaction, for example, computer conferencing, Email and LISTSERVS. Social Networking Sites (SNS) are perhaps the most socially significant of the Web 2.0 applications (Beer and Burrows 2007). Alongside the prominent *MySpace* and *Facebook* applications are more specialist social networking sites, such as the child orientated *Bebo* space and the mobile phonebased *Twitter* application. Each of these social networking sites have three defining characteristics:

- A Profile: A profile includes an identifiable handle (either the person's name or nickname) and information about that person.

- Participants have the ability to list other profiles as “friends” or “contacts” or some other equivalent.
- Participants can leave comments (Boyd and Ellison, 2007).

2.3.2.3 Blogging

Much attention has also been given to the online dissemination of self produced content through weblogs (Selwyn, 2007). Blogs (abbreviated from weblogs) are often called online diaries which enable users, without requirement of any technical skill, to create, publish and organise their own web pages that contain dated content, entries, comments or discussion in chronological order (Alexander, 2006; Castenade, 2007).

2.3.2.4 Podcast

The term podcast is constituted of the words of iPod, which is a portable digital audio player from Apple (Petter, et al, 2005). Podcasting refers to the distribution of audio or video files in digital format. These resources can be manually downloaded from the Internet or distributed automatically to subscribers. These files can be accessed directly from the desktop or transferred to a portable media device such as an MP3 player to be listened to 'on the go' (McGarr, 2009).

2.3.3 Limitations of the Internet

As with every technology, the introduction of the Internet will lead to certain undesirable or negative consequences (Tenner, 1996). However these can be managed and improved through the curriculum. There are certain limitations of the Internet including Internet safety, copyright and virus threats. These limitations can be managed in schools by putting an Acceptable Use Policy (AUP) in place (Siau, et al, 2002).

2.3.3.1 Internet Safety

Among the risks is the access of inappropriate information such as pornography and very personal or racist writings, which can be accessed both by accident and with a deliberate intent to view. Children are also perceived to be at risk from approaches by strangers, particularly in web based chat rooms (Wishart, 2003). Mason, et al, (2000) argue that online advertising can also be problematic for young people who have difficulty discriminating between content and advertisements. Young people often lack critical evaluation or judgment skills to discern good from bad or what is safe from what is a risk (Mason, et al, 2000). Consequently, Wishart (2003) recommends that a means of filtering or monitoring Internet access for children is required both at school and at home.

2.3.3.2 Copyright

Both teachers and students have begun to use the Internet to find information on a variety of subjects. However, the Internet has a huge and often contradictory or spurious amount of information available to the user. This information may conflict with highly regarded offline sources such as published textbooks. Therefore, there is a problem in judging the credibility, since appearance and immediacy can create the illusion of accuracy. Sharma (2003) reports that the Internet makes it easier to indulge in unethical behaviours such as copying paragraphs of material from various web sites and putting them together for a class project. Sharma (2003) also suggests that students may begin to view the computer and by extension, the Internet, as a source of all answers.

2.3.3.3 Virus Threat

A computer “virus” is a program which disrupts the normal functioning of the computer system. Computers attached to Internet are more prone to virus attacks and they can end up crashing the hard disk. A virus can spread throughout a computer system, using the authorisation of every user to infect their programs. Every program that gets infected may also act as a virus and the infection can multiply (Cohen, 1987). The best method of virus protection is prevention. There are certain ways of prevention including: not opening unknown files or attachments and installing anti-virus software on the computer.

2.3.3.4 Acceptable Use Policy (AUP)

Teachers and pupils should be aware of the issues surrounding the use of the Internet in education (BECTA, 2001). The Internet is vast and to a certain extent unregulated. This is also common with other communication media and therefore is a concern that it can be abused. However, the existence of undesirable material is not a valid reason to avoid the Internet (BECTA, 2001). Internet access in schools should be designed for student use and should include a filtering system, which is appropriate to the age of the students.

Internet access needs to be managed properly and professionally and this can be achieved by putting An Acceptable Use Policy (AUP) in place (Siau, et al, 2002).

An AUP is a document which addresses all rights, privileges, responsibilities and sanctions associated with the Internet. This document should be signed by students and their respective parents (NCTE, 2008). It identifies the school's strategy on promoting the safe use of the Internet and it details the ways in which the Internet can be used. It should address all aspects of Internet usage at school, for example, browsing the World Wide Web, using search engines, downloading, publishing material, Email and chatrooms (Webwise, 2009; BECTA, 2001). Filtering software is often used in order to minimise the risk of exposure to inappropriate material. Therefore it is essential that every school has an Acceptable Use Policy for the purpose of connecting to the Schools' Broadband Network and that the policy should be strictly implemented, by both students and teachers (NCTE, 2008).

2.3.4 Applications Offered by the Internet

There are many applications offered by the Internet including Email, File Transferring Protocol (FTP), webquests, search engines, audio & video conferencing, LISTSERV and newsgroups. These different applications will now be discussed.

2.3.4.1 Electronic Mail

Electronic mail has been one of the most prominent uses of networking since the first networks were devised in the early 1960s (Anderson, 1996). The lack of formality and the ease of Email makes it an ideal medium of communication for the vast majority of Primary School students. Email is primarily a text based communication facility that enables users to communicate without delay. Email can also be used to send attachments in different formats such as pictures, text, sound and multimedia (NCCA, 2004).

2.3.4.2 File Transferring Protocol (FTP)

Another application that is suitable for use in Primary School classrooms is FTP (File Transfer Protocol). It is a simple and secure method of the transfer of files between two computers on a network over the Internet (Pallan, 1995). FTP consists of two parts: The client and the server. The FTP client is a program on the computer you are using or are logged in to, while the FTP server is a program on a remote computer that you want to connect to. Examples of FTP include, transferring files between your computer and your web space, the transfer of software or files to your computer from known Internet sites and FTP is used to place webpages on a server (CIRCA Network Services, 1997).

2.3.4.3 Webquests

A Webquest is a learning activity used by teachers and pupils. The Webquest model was developed in 1995 by Bernie Dodge and Tom March at San Diego University and is defined by Dodge and Marsh (2000) as:

> *"an inquiry oriented activity in which most or all of the information used by learners is drawn from the Web."*
>
> (Dodge and Marsh, 2000, online)

Webquests consist of a challenging task, scenario or problem to solve, that requires students to synthesis information using the World Wide Web. They are designed to engage learners through the use of the web and to use their time well at their own level of ability and pace (Yoder, 1999).

2.3.4.4 Search Engines

A search engine is a software program that searches for information easily and quickly on the World Wide Web. The search is based on the words that are defined as the search terms (Fetterman, 1998). Search engines look through their own databases of information in order to find the defined search term. The search engine uses software programs called "spiders" to "crawl" web pages in advance, to build local copies and indexes of the pages. This local index is then used later to identify relevant pages and to answer users' queries quickly (Ntoulas, et al, 2004). The information may consist of web pages, images, information and other types of files such as FTP. While each search engine, for example Google, Yahoo! Dogpile, have different approaches to data gathering, they all perform three core functions:

- Accepting the user inputted query, checking to see if the query is misspelled and to recommend more popular or correct spelling variations.

- Checking to see if the query is relevant to other search databases and placing relevant links from that type of search query to the regular search results.
- Gathering a list of relevant pages for the search results. These results are ranked based on page content, usage data and link citation data (Wall, online).

2.3.4.5 Audio & Video Conferencing

Videoconferencing, as described by the National Centre for Technology in Education (NCTE) in Ireland, describes a system whereby:

> *"two or more participants, based in different physical locations, can see and hear each other in real time using special equipment"*
>
> (NCTE, 2003, p2)

This special equipment may include telephones, televisions, computers, conferencing software, collaborative software, file sharing, headsets, the Internet, or any combination of these equipments and tools. The ultimate goal is to make the meeting as realistic as possible, so that all parties can have audio or visual communication (Valentino, 2005).

Videoconferencing can be used for whole class teaching, individual or group work. It is an excellent medium for collaboration between schools (both locally and worldwide) as it provides an opportunity to develop speaking and listening skills (NCTE, 2003). Videoconferencing is able to make learning more accessible to those children who find recording and reading information more difficult (Global-leap, 2004).

2.3.4.6 LISTSERVS

LISTSERV or discussion group was the first electronic mailing list software application. It consists of a set of group Email addresses, in which the sender can send one Email which will reach a variety of people. One advantage of using LISTSERVs from a teacher's perspective is that they do not require all participants to be present at one time in order to discuss a topic (Alexander and Newsom, 1998; Loiselle, St-Louis and Dupey-Walker, 1998). Another major advantage of LISTSERV discussion groups is that they allow teachers to overcome the isolation that is part of the school organisation (Loiselle, St- Louis and Dupey-Walker, 1998; Russett, 1994). Subscribing to a discussion group permits the exchange of information among professionals, who are interested in a certain subject in a very effective way. Teeter (1997) found that teaching subjects on the Internet using a LISTSERV had many benefits. These included, higher student motivation, exposure to extended resources and improved quality of discussions and written assignments.

2.3.4.7 Newsgroups

A newsgroup is a forum similar to a bulletin board for the sharing of information. It is an on going public discussion about a particular topic, open to all people who have subscribed to that newsgroup. Newsgroups are transmitted over the Usenet network, which is the name of the Internet technology that supports newsgroups. Originally, Usenet had eight categories of newsgroups, depending on what was being discussed, these include: Comp (computers), humanities (arts and culture), misc (miscellaneous), news (news and current events), rec (recreational), sci (science), soc (social) and talk (general discussion) **(**Leu, et al**,** 2004).

Now there are thousands of newsgroups in hundreds of categories. Newsgroups have titles that usually begin with a three or four letter prefix followed by a dot (.) for example alt., soc., and comp. People can enter and leave news discussions easily and at will. There are many news or support groups to which teachers can subscribe, allowing the facility to swap ideas with teachers all over the world. Most require the completion of an online form or questionnaire, after which regular Emails will be received. Most education newsgroups provide links to interesting articles on various aspects of education or to innovative lesson plans and websites.

2.4 Learning Theories

Learning Theory is a discipline of psychology that attempts to explain how humans and animals learn. Research on learning has shown that students learn differently and that they process and represent knowledge in different ways. It is possible to diagnose a students' learning style and that some students learn more effectively when taught with preferred methods (Riding and Rayner, 1997; Rasmussen, 1998). Although, to some extent, "no current learning theory comes close to being complete" (Bork, 1985, p.86). There are two principal families of learning theories for instructional design used in the classroom, the behaviourism theory and the constructivism learning theory. The latter encompasses the philosophies of cognitive constructivism and that of social constructivism. However in 1983, Howard Gardner introduced a learning theory of Multiple Intelligence (MI) for consideration (Gardner, 1983). All the above mentioned theories will now be discussed.

2.4.1 Behaviourism

The behaviourist school of thought, influenced by Thorndike (1913), Pavlov (1927) and Skinner (1938), postulates that learning is a change in observable behaviour caused by external stimuli within the environment. This school of thought therefore, looks at overt behaviours that can be observed and measured (Good and Brophy, 1990). The behaviourist school of thought sees the mind as a clean slate (*tabula rasa*) and behaviour is shaped through positive reinforcement or negative reinforcement.

A very influential behavioural approach to learning was in the work of Skinner (1938). The central notion of Skinner's work is that the actions of animals and human beings depend wholly on rewards and punishments (Pellone, 2001). According to Pellone (2001), the behaviour of the student is mainly determined by the behaviour of the teacher and it is the teacher that has the knowledge and will communicate it to the students. A teacher who respects the importance of the behavioural theory of learning tells students whether or not they have given the correct answer - feedback, praises them for giving a correct answer - positive reinforcement, or prompts the ones who may need a hint to answer a question - cueing. In these examples, "feedback, positive reinforcement and cueing" (Favaro, 1986, p.17) are all central concepts in the behavioural learning theory. The limitations of the behaviourist theory lie in that it deals only with changes in observable behavior, ignoring the possibility of any processes occurring in the mind (Mergel, 1998). Behaviourism holds the view that humans are nothing more than machines that respond to conditioning. Being manipulative, it seeks not only to understand human behaviour, but to predict and control it (Sun-Kyung, 2001).

Traditional teaching is usually centred on Behaviourism, where teachers dominate the classrooms and the teacher is the information giver. A much heralded alternative is to change the focus of the classroom from teacher dominated to student centred, using a constructivist approach (Yager, 1991).

2.4.2 Constructivism

Constructivism is derived mainly from the works of Piaget (1969), Bruner (1962, 1979), Vygotsky (1962, 1978), Dewey (1915, 1962) and Papert (1980). Constructivists believe that the learner is the centre of the learning, constructing their own knowledge and teachers are the facilitators for the students' learning rather than the instigators (Sandholtz, et al, 1997; Duffy and Cunningham, 1996). In the knowledge constructed classroom, the students work together, sharing the process of learning not only with their peers but with parents and others (Sandholtz, et al, 1997).

Papert (1980) expressed ambitious aims for classroom computers. He wanted education to provide the learner with appropriate tools to take ownership of their learning process. He understood the importance of digital media and how it could be used to enable children to learn better within a constructivist learning environment. He believed that in order for children to assemble and modify their ideas, the traditional tools such as pencils, copies and texts were inadequate. He felt that computers were the appropriate tool to enable the learner to take control of the learning process. A complementary relationship exists between technology and constructivism, the implementation of each one benefiting the other. Recent attempts by educators to integrate technology in the classroom have been within the context of a constructivist framework (Nanjappa and Grant, 2003).

El-Hindi (1998) believes that learning through the Internet is very compatible with constructivism. Constructivism assumes that learners are active and curious and the process of knowledge construction on the Internet is in keeping with these paradigms (El-Hindi, 1998). The Internet is a powerful resource to support learners' natural curiosity. The Internet rethinks the idea of the teacher as the sole source of knowledge, by providing a vast world of information. By using the Internet, teachers can focus less on being the centre of learning and allow for more discovery on the part of the student. Instead of being passive recipients listening to their teachers, students can devise their own ways of gathering information. Effective use of the Internet can help teachers move toward facilitating constructivist learning environments (El-Hindi, 1998).

2.4.3 Cognitivism

Many educational psychologists such as Piaget (1969) and Dewey (1915, 1962) found the behavioural approach unsatisfactory within areas, such as problem solving and learning strategies. They developed a cognitive approach that focused on mental processes rather than on observable behaviour. They became more concerned with what was going on inside the brain. Cognitive theorists see learning as an internal process and contend that the amount learned depends on the processing capacity of the learner, the amount of effort expended during the learning process, the depth of the processing, and the learner’s existing knowledge structure (Ausubel, 1974; Craik and Lockhart, 1972; Craik and Tulving, 1975).

Sensations are received through the senses into the sensory store before processing occurs. The information stays in the sensory store for less than one second (Kalat, 2002); if it is not transferred to working memory immediately, it is lost. The amount of information transferred to working memory depends on the amount of attention that was paid to the incoming information, and on whether cognitive structures are in place to make sense of the information (Anderson and Elloumi, 2004). After the information is processed in working memory, it is stored in long-term memory. Information transferred from short-term memory to long-term memory is either assimilated or accommodated in long-term memory. During assimilation, the information is changed to fit into existing cognitive structures. Accommodation occurs when an existing cognitive structure is changed to incorporate new information (Anderson and Elloumi, 2004).

Laird (1985) believes that effective learning occurs when the senses are stimulated. Online instruction allows learners to use their sensory systems to register the information in the form of sensations (Anderson and Elloumi, 2004). Laird quotes research that found that the vast majority of knowledge held by adults (75%) is learned through seeing. Hearing is the next most effective (about 13%) and the other senses - touch, smell and taste account for 12% of what we know.

Cognitive psychologists believe that learning will occur if student are hands on and not by listening or remembering what they have been told by the teacher. The role of the teacher therefore is to provide the necessary resources and to guide learners as they attempt to assimilate new knowledge to old and to modify the old to accommodate the new. Resnick and Kloper (1989) suggest that the teachers role is to:

> *"stimulate and nourish students' own mental elaborations for knowledge and to help them grow in capacity to monitor and guide their own learning and thinking."*
>
> (Resnick and Kloper, 1989, p.4)

2.4.4 Multiple Intelligence Howard Gardner

Gardner's Multiple Intelligence (MI) theory was introduced in 1983 and it provided a new way of looking at intelligence. This theory defines intelligence as:

> ``*the capacity to solve problems or to fashion products that are valued in one or more cultural settings.''*
>
> (Oliver, 1997, p.32)

Howard Gardner's theory of multiple intelligences sets out eight different clusters, including Verbal Linguistic Intelligence and Logical-Mathematical Intelligence, Visual-Spatial Intelligence, Musical-Rhythmic Intelligence and Bodily-Kinaesthetic Intelligence, Interpersonal Intelligence and Intra-Personal Intelligence and Naturalist Intelligence. It provides a way of viewing human capacity which offers a wider range of entry points to genuine understanding (Gardner, 1983). Each intelligence has its own unique characteristics, tools and processes that represent a different way of thinking, solving problems and learning (Kelly and Tagney, 2003). Everybody has a profile of these eight clusters, determined partly by our genes and neural networks, but they are found in different combinations and degrees, influencing the ways in which we best develop and demonstrate understanding.

Most education is currently organised around two of these intelligences: Logical-Mathematical Intelligence and Verbal Linguistic Intelligence, but education for all must be able to nurture and employ the full range in order to reach its maximum potential (Bentley, 2000). The student encounters the daily experience of all eight intelligences through practical hands on experience that appeals to all five senses. Learning occurs because each person possesses all intelligences (Oliver, 1997) and they are an active involved learner. According to Armstrong (1994), most people can develop each intelligence to an adequate level of competency. MI theorists believe that the learning process is different for each learner and is based upon their individual perspective and experience.

The use of the Internet provides opportunities for the exploration and expansion of the students' multiple intelligences (Armstrong, 1994). MI theory can be used as a basis for selecting websites for use in the classroom including mathematics and science sites (Logical-Mathematical Intelligence), sites for downloading music or to use music to gain attention or interest (Musical-Rhythmic Intelligence), sites that specialise in nature (Naturalist Intelligence) and sites that offer self development (Intra-Personal Intelligence). Students develop a sense of direction (Visual-Spatial Intelligence) by navigating through websites and downloading images and students who use the computer require eye hand coordination through contact with the keyboard, mouse and other devices (Bodily-Kinaesthetic Intelligence). The computer encourages cooperative learning in any subject area which is ideal for Project Based Learning. Websites that provide chat rooms and other chances for interaction can develop the Interpersonal Intelligence. Finally the use of computers can help teach language, writing, editing and rewriting skills (Armstrong, 1994; Rosen, 1997).

2.5 Project Based Learning (PBL)

To improve instruction within Primary Schools, it is necessary to make a shift from traditional pedagogies, for example, behaviourism that are teacher centred to a social constructivist paradigm where students are encouraged not only to work individually to solve relevant problems but also to work collaboratively with their peers through student centred learning activities (National Research Council, 1996). Benefits from learning by doing have long been recognised and the roots of the idea go back to Constructivist theorists including Dewey (1915, 1962), Piaget (1969), Bruner (1962, 1979) and Vygotsky (1962, 1978).

Project based instruction is one example of such learning, where the focus is on students investigating authentic problems (Krajcik, et al, 1994). Project Based Learning (PBL) is an instructional method centred on the learner and affords learners the opportunity for in-depth investigations of worthy topics (Grant, 2002). PBL places a “project” as the central focus and can be described as an authentic, ill-structured problem (Savery and Duffy, 1995) which requires the creation of an artefact of learning (Blumenfeld, et al, 1991) by way of a solution.

Successful project work involves students with varying levels of knowledge and prior experiences working together in small groups towards a common goal (Lou and Macgregor, 2004). Collaboration among students promotes participation and the mutual development of knowledge (Salomon, 1993). The students are responsible for one another’s learning as well as their own, which requires group interdependence, motivation, persistence and flexibility (Abrami, et al, 1995). As the learners move along, they are progressing from being a novice towards becoming active contributors to the project (Hug, et al, 2005).

Kozma, (1991, 1994) and Smith and Dillon (1999) argue that it cannot be denied that different media outlets have unique attributes and if used appropriately, they could support student learning in a more effective way. Project Based Learning has increasingly been supported by computer technologies (Barak and Dori, 2005). Krajcik and his colleagues (1994) state that using technology in PBL:

> "*makes the environment more authentic to students, because the computer provides access to data and information, expands interaction and collaboration with others…and emulates the tools experts use to produce artefacts.*"
>
> (Krajcik, et al, 1994, p.488*)*

The use of the Internet for research or producing a website to publish their project results can enhance students' organisational skills, connect them with a real audience and foster a better understanding of the World Wide Web (Isbell, 2005).
In a recent article, Levin and Arafeh (2002) point out that students think of the Internet as an important way to collaborate on project work with classmates. The Internet provides ways of presenting material that differs from how it is presented in class and it is also a resource that is always available, patient and non judgmental (Levin and Arafeh, 2002).

2.6 Conclusion

This research examined four developed countries, to illustrate how ICT in education has become a significant part of education policy and has resulted in substantial expenditure. The introduction of these policies sequentially paved the way for the development of the Internet and this has led to a fundamental change in the manner in which students are learning and retaining knowledge. There is ongoing debate about whether it is the use of a particular delivery technology or the design of the instruction that improves learning (Clark, 2001; Kozma, 2001). The goal of any instruction is to increase learning, therefore it was necessary to highlight how students learn and to consider the benefits of Project Based Learning as the instruction.

Chapter 3 Research Methodologies

3.1 Introduction

The use of technology has not only created new opportunities within the traditional classroom but has also served to expand learning experiences beyond the popular notion of the “classroom" (Wegner, Holloway and Garton, 1997). As technology evolves and technical advances make resources more accessible, the Internet has become a viable medium to facilitate learning. According to Khan (1997) Internet based Instruction utilises the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported. The Internet can be designed to address students' different learning styles, by incorporating a variety of multimedia elements such as text, graphics, audio, video and animation. The Internet can provide instant and unlimited access to online resources, support collaboration and support both novices and experts (Khan, 1997). The overall aim of this study is to investigate if the Internet can be used as an effective resource for Project Based Learning (PBL) in one Senior Primary School. This chapter defines the criteria involved in the study. It focuses on the research questions which are to be addressed, describes the setting, the participants and considers the methods that are most appropriate for this research.

3.2 Research Questions

The research aims to examine if the Internet can be used as an effective resource for Project Based Learning (PBL), in the teaching of Geography in the Primary Curriculum. It focuses on the effectiveness of the Internet in project work, in the teaching and learning of three countries, the United Kingdom, Japan and Australia. The following questions will be addressed:

- Is the Internet an educational resource from which children can retrieve relevant and helpful information for project work, in the subject of Geography?
- Can children learn factual information more effectively from the Internet than traditional teaching methods?
- What are the participant’s attitudes towards using the Internet for Project Based Learning?

3.3 Research Methodology

The researcher decided to use a case study methodology to explore if the Internet is an effective learning tool for Project Based Learning (PBL). Merriam (1998) suggests that the case study design is relevant and useful, specifically when studying educational innovations. The introduction of the Internet for project work is one such innovation. Cohen and Manion (1989) explain that case studies involve the:

> *"observation of the characteristics of an individual unit – a child, a clique, a class, a school or a community."*
>
> (Cohen and Manion, 1989, p.124)

They then state that after such observations and investigations of the subject, case studies aim to establish generalisations that can be applied to a wider audience. Bell (2004) explain that the case study approach is particularly appropriate for individual researchers because it gives an opportunity for one aspect of a problem to be studied in some depth, within a limited time scale. According to Yin (2003):

> *"Case Studies aim to describe, illustrate, explore or explain settings and allow significant opportunities for extensive analysis."*
>
> (Yin, 2003, p.46)

The researcher followed Yin's (2003) five stages in using the case study as a research strategy:

1. Design the case study
2. Conduct the case study: Preparing for the data
3. Conduct the case study: Collecting the evidence
4. Analyse the case study evidence
5. Reporting on the case study

A case study research may yield both qualitative and quantitative data. The information and data for this multi method case study was gathered using five different data collection tools. A critical aspect to a mixed methodological approach was the concept of triangulation. Cohen, et al, (2000) defines triangulation as:

> *"The use of two or more methods of data collection in the study of some aspect of human behaviour."*
>
> (Cohen, et al, 2000, p.12)

As Denzin (1978) points out:

"Triangulation can take many forms, but its basic feature will be the combination of two or more different research strategies in the study of the same empirical units."

(Denzin, 1978, p.308)

In the case study, triangulation has been achieved as the author used five different data collection tools. The data collection tools used include: Pre and post questionnaires, direct semi structured interviews with adult participants, focus group sessions with teachers and students, observation using an observation checklist and pre and post testing.

3.4 The Setting

The research took place in an all girls' school in Dublin which is deemed "disadvantaged" and falls under the DEIS Band II initiative (Delivering Equality of Opportunity In Schools). There is a high absenteeism level in the school and there is only one Broadband connection in each classroom**.** The author located a mobile Internet connection for use in the classroom on a laptop, provided by a Resource Teacher in the school.

3.4.1 Participants

The school has two 6th classes, with forty six students in total. This research is intended for a senior class so the two 6th classes were chosen for the study. Forty four students took part in the research because two students did not provide consented permission. Two groups of twenty two students were created, one as the study group and one as the control group. Twenty two students were part of the study group and were observed over a six-week time scale, using the Internet to complete the Geography project and the other twenty two students were in a control group, using traditional teaching methods to complete the Geography project. Traditional teaching is concerned with the teacher being the controller of the learning environment (Novak, 1998). A focus group of six 5th class students and three Teachers participated in the piloting of all questionnaires, the observation checklist and the pre and post tests. The observers in this research included a 6th class Mainstream Teacher, two Special Need Assistants and two Resource Teachers. They used the observation checklist to observe the students using the Internet, along with the author (Appendix D).

3.4.2 Geography Curriculum

For the purposes of this study, the focus is placed on the strand Human Environments and the strand unit; People Living and Working in a Contrasting Part of Ireland and People and Other Lands from the Geography Primary Curriculum. The researcher has a particular interest in this subject and wants to motivate the students to learn about countries from different continents. This strand is concerned with people who live in different environments, their activities and the environmental features which they have created. National Council for Curriculum and Assessment (NCCA, 1999) states that

> "*Geography enables children to make sense of their surroundings and the wider world by learning about the natural and human elements of local and wider environments.*"
>
> (NCCA, 1999)

The Geography Curriculum is structured to ensure that the children learn about places beyond their immediate experience, from the earliest years in Primary School. A sense of Place is a key element to the Geography Curriculum. Understanding where a place is, what it is like and why, are the major concerns of the subject. The extent to which this strand can be taught is limited by the child's own experience. However some children may be fortunate to have already experienced this strand. The researcher focused on three countries from three different continents. The United Kingdom was chosen because it is also in Europe and is Ireland's closest country. Japan is in the continent of Asia and the researcher was mindful that the children wouldn't be over familiar with it. The third country Australia was selected because it is the only continent that is also a country and is a country to be studied in this year's 6^{th} class Geography book.

3.4.3 Informed Consent

The initial stage of this research involved getting written permission from the parents of the students taking part in the Internet project (Appendix A). Informed consent is a vital part of the research process because the researcher is obliged to protect the participant from risk (Wiersma, 2000). In the case of schoolchildren, Borg and Gall (1983) state that the consent of parents should be obtained. A consent letter was initially sent out to all forty six 6^{th} class students. It was expected that all the letters would not be returned. A total of forty letters returned and these students agreed to participate and cooperate in the research. Following encouragement from the researcher, a further four letters were received. This came to a total of forty four participants.

3.4.4 Pilot Study

According to Bell (2004), all data gathering should be piloted to test how long it takes recipients to complete and to check that questions and instructions are clear. A pilot study principally increases the reliability, validity and practicability (Oppenheim, 1992; Morrison, 1993; Wilson and McLean, 1995). A focus group consisting of six 5th class students and three Mainstream Teachers were canvassed to check the suitability and accuracy of the questions on the questionnaires and the pre and post tests. They were also used to discover if any mistakes existed and to see if any questions needed to be restructured. Some questions were restructured or adjusted from the feedback of the focus group.

3.4.5 Administration

The pre questionnaire was administrated in September 2009. A thirty minute presentation was given to all students and a general explanation of the research and task involved was discussed by the researcher. The control group and the study group completed the pre questionnaire, which was used in order to evaluate the student's use of the Internet at home and in school and to evaluate their computer competency. The pre questionnaire was divided into two main sections. The first section dealt with the computer and Internet in school and the second section focused on the computer and Internet in their home life. This questionnaire also established the student's opinions, attitudes towards the Internet and also their experience of the Internet at home and at school. There were twelve questions in total. A copy of the pre questionnaire can be seen in Appendix B.

An over head projector was then used to provide the students with an introduction to search engines, the skill in finding search engines, how to use refined search techniques to retrieve information and how to navigate websites. They were also shown how to save pictures, insert them into a word document and to copy and paste information retrieved into a word document. The students were then given an opportunity to work through a short activity on the over head projector, which allowed the students to use the Internet to find necessary information. The students will have access to a school printer and the Internet project is to be displayed on a word document.

3.5 Pre Test

A pre test was carried out to determine the level of knowledge that the student possessed prior to completion of the project (Appendix C). Each student from the control group and the study group completed a pre test the day before beginning the Geography Internet project. Cohen, et al, (2000) insist that the pre test must be the same for both groups and of equal level of difficulty. It consisted of thirty questions based on factual information related to the three countries in this research: The United Kingdom, Japan and Australia. A KWLS chart was used to structure the questions for the pre test. The main aim of this pre test, was to establish the children's existing knowledge on these countries. The most efficient way for students to use and explore the resources available on the Internet, is through project centred activities for small groups. Teamwork makes a huge positive difference in the quality of the outcome of any Internet search (Williams and Kawasaki, 1997). The level of computer knowledge and the results of the pre test, were deciding factors for the dividing of the participants within the study group into pairings for the Internet project.

3.6 Internet Project

Following the pre test, the researcher encouraged the children to frame a number of questions about the countries concerned. This aimed to help the children become involved and interested in the content of the project. A KWLS chart was used to help structure questions for the pre test and post test. A KWL chart (Carr & Ogle, 1987; Heller, 1986; Ogle, 1986, 1992) is a popular activity for assisting students in achieving background knowledge, structuring inquiry and summarising learned information (Appendix J). The K column represents what the student already knows about a particular topic and the W column represents what the students want to know. Using the W section: What I want to know; the project questions were devised. The curriculum was also consulted for appropriate questions and a number of suitable questions were provided, in relation to the study of the project related countries. To ensure the validity of each question, the researcher had to collect the answers on the Internet, based on the devised questions on the United Kingdom, Japan, and Australia.

The partipants then enter the L column which represents what they have learned about the topic. Originally Ogle (1986) included two categories of information in the third column: "What I learned and what I still need to learn." Sippola (1995) separated the categories to add a fourth column "what I still need to learn." The first two columns are filled out prior to discussion of the topic. The last two columns are filled out after the class has discussed the topic and completed the Geography project using the Internet.

This project uses the Internet in a focused way, to aid the participants to learn about the countries of the United Kingdom, Japan, and Australia. Students are encouraged to work cooperatively in a meaningful way, to learn about these countries, gather information for their project and present their findings on a word document. Factual information relating to each of the countries including currency, climate, population, capital city and transport links are located by the students using the Internet. The students are given one website on each of the countries of study that contains useful information, but are also prompted to look up additional websites to gather more information.

3.6.1 Logistics

The intention was that the computer be incorporated into the classroom setting in an unobtrusive way. The computer was located at the back of the classroom in the corner so as not to distract other students. According to Woodhouse and McDougall (1986):

> *"The child sees the computer as just another facet of the environment, and integrates it just as easily into a world view."*
>
> (Woodhouse and McDougall, 1986, p.91)

Wellington (1985) suggests in a resource based learning classroom, the computer can fit in just as easily as another resource. A laptop was supplied to the class for the purpose of this research by a Resource Teacher. A mobile Internet connection was installed on the laptop. This extra laptop was hoped to speed up the research process.

There was still a high ratio of pupils to each Internet connection, which restricted access within the six week time frame. A rigid system had to be put in place to ensure equal access for each student. A period of 20 minutes was allocated to each pairing, due to the time frame of the research and also the availability of an observer. Each student in the pairing had 10 minutes control of the computer and the search, while the other student assisted. Each student had to tick their name after their turn on a chart located beside the computer. This provided a record of the number of visits paid by the student to the computer. If students were absent from school, they were allowed extra sessions on another day. Each student averaged two sessions per week.

3.6.2 Observational Checklist

An observation of students whilst using the Internet was carried out, to ascertain the suitability of the Internet as a learning tool for project work with Primary School students. It also discovered deficiencies that arose while the students were using the Internet. According to Bell (2004) and Nisbet (1977), carefully planning and piloting are essential for mastering an observation study. The observation checklist was designed for use when the students were carrying out their project on the Internet (Appendix D). The checklist provided the observer with the facility of ticking boxes on a sheet of paper quickly, while the Internet class was in session. The checklist had a minimum amount of reading therefore allowed the observer to concentrate on the activity being carried out by the student. This also saved time and more children could be observed in a day.

Observation is a term in the field of education and educational research and is open to a wide range of interpretations such as “scrutinising” or “investigating,” to “looking” or “watching.” The kind of watching Sylva, et al, (1980) described is one where there is an expectation of including specific analysis and interpretation of what has been observed. Cohen, et al, (2000) suggested that:

> “*observation methods are powerful tools for gaining insights into situations*”
>
> (Cohen, et al, 2000, p.315)

One advantage of using observation as a research tool, is that it allowed the observer to observe and record actual behaviours and hear language first hand. In a mixed method research project such as this, that also used interviews, the data could be compared with what the participants subsequently said.

The aim of the checklist was to ascertain whether the student was able to locate factual information about the countries of study. The checklist indicated the length of time it took the child to find information and if they required assistance or got distracted by unrelated information.

The students used a kitchen timer to commence their 20 minute Internet session and it was located beside the computer. Two Special Needs Assistants and two Resource Teachers used the observational checklist, while the students were using the Internet. The author also participated in the observation, using the checklist. The observations were carried out over the six week period.

3.7 Post test

The construction and administration of tests is an essential part of the experimental model of research (Cohen, et al, 2000). For this reason the post test was the same for the control group and the study group and tested the same content. The same pre test was administrated as the post test. Some questions may have differed within the wording but were the same level of difficulty (Appendix E). This established if new information was learned from using the Internet and the pre test and post test were statistically compared, using a paired sample t-test. This will be discussed in greater detail in Chapter 4.

3.8 Semi Structured Interviews

In this research project, semi structured interviews were used to gather more detailed information about the use of the Internet in the classroom from the interviewee, than could be gained from using a questionnaire or structured interviews. Kvale (1996) referred to the interview at its basic level as a conversation. The role of the interviewer is one of facilitator, listener and to encourage full responses. Kvale (1996) stated that the key task in interviewing is to understand the meaning of what the interviewee says. The data collected was qualitative. Arskey and Knight (1999) suggest qualitative interviewing is a valuable research method, that allows the researcher to explore:

> *"data on understanding, opinions, what people remember doing, attitudes, feelings and the like."*
>
> (Arskey and Knight, 1999, p.2)

A major advantage of the interview is its adaptability (Bell, 2004). A semi structured approach was adopted for the interviews so as to allow the interviewees the maximum opportunity to express their views. The interviewees comprised of a class one Mainstream Teacher, two Special Need Assistants and two Resource Teachers. Their opinions were sought on how well the students managed the Internet project. Questions were devised but the interviewees were given the freedom to talk about other topics, as this allowed for unexpected issues to arise. Cohen, et al, (2000) suggests that consideration be given to minimising stress for the interviewee. The interview took place after school in a quiet room available in the school. Refreshments and comfortable chairs were provided. This ensured that the pressures of a normal teaching day would not impact on responses.

3.9 Post Questionnaire

The aim of the post questionnaire was to discover and understand the student's underlying attitudes, feelings and motivations in the study group towards the teaching of Geography through the Internet. The study group and the control group completed the post questionnaire. The post questionnaire was constructed with an attitude scale (Appendix I). Five options were provided "strongly agree" "agree" "not sure" "disagree" "strongly disagree". Some questions were presented in a positive manner and others in a negative manner.

3.10 Conclusion

This chapter defined the research approach as a small scale, multi method case study, incorporating a combination of qualitative and quantitative research methods. The data collection tools included pre and post questionnaires, direct semi structured interviews, focus group sessions, observation checklist and pre and post testing. It identified the setting as a North Dublin Primary School and the participants included Mainstream Teachers, Resource Teachers, Special Needs Assistants and forty four 6th class students, divided into a control group and a study group. The Primary Geography Curriculum was the focus of this research because the author wanted to motivated students to learn geographical facts about the United Kingdom, Japan and Australia. The control group used traditional teaching methods and the study group used the Internet, to complete a Geography project. This research took place over a six week period.

Chapter 4 Presentation of Key Findings

4.1 Introduction

The purpose of this chapter is to present the key findings of the research study. Two groups of 22 students took part in the Geography Internet Project. The first group was renamed the control group and the second group the study group. The students were then divided into pairs within their group. The control groups carried out their project using books, classroom materials, the library and traditional teaching methods, where the teacher was the centre of learning (Novak, 1998). The study group used the Internet to search for information for their project. Each student from the study group completed a questionnaire prior to starting the project, that established their attitudes and experience of the Internet in school and at home (Appendix B). The study group and the control group then completed a pre test, consisting of 30 questions based on the countries of study (Appendix C). Following the completion of the projects, each student was given a post test to ascertain their geographical knowledge of the countries in the study. The purpose of the post test, which was multiple choice, was to see if the students could retain a greater understanding of the countries and remember certain geographical facts. The pre test included questions relating to the physical layout of the country, tourist questions and questions about each country's culture and climate. The post test contained the exact same questions as the pre test but some of the questions were positioned in different question numbers and worded differently (Appendix E). There was a significant time difference, approximately 6 weeks, in the distribution of the test so as not to generate related responses.

The first section of this analysis presents statistical tests. These statistical tests were performed to see if differences were observed between the different learning styles. In all cases the t value is the t statistic. The higher the value of t, the more likely it is that the result is statistical reliable. The degrees of freedom (df) take into account the number of independent observations used in the calculation of the test statistic and determines how high a t value is needed, for a test to be statistically. For this paired t test, the degrees of freedom (df) is (22-1) +(22-1) =42 .The p value is the significance of the t statistic.

4.2 Pre Case Comparison of Study Group and Control Groups

A pre case statistical analysis was conducted using the study groups' and the control groups' summer tests. The aim of this was to establish that the control group and the study group were of a similar academic ability and therefore, both samples were taken from the same parent population. The null hypothesis, H^o, stated that there was no significant difference between the means of both groups, with respect to academic ability and therefore, both groups were taken from the same parent population. The alternative hypothesis, H^1, indicated that the control group and the study group were not academically similar and therefore did not represent samples from the same parent population.

H^o: $\mu 1 = \mu 2$

H^1: $\mu 1 \neq \mu 2$

For the two groups, the following table gives the summary statistics from Appendix F:

Total Group-	**Study Group**	**Control Group**
Mean %	43.80	47.59
SD	15.34	20.96
Sample Size	22	22

A comparison of the mean of the pre test scores for the study and control group yield the following results.

Difference in means	3.795
df(degrees of freedom)	42
Calculated t-statistic	0.69
2-tail Sig P	0.5002
Critical t at .05 level of significance	2.019

The calculated test statistic was 0.69, while the critical t-value with 42 degrees of freedom was 2.019. As the calculated t statistic falls within the acceptable region (+ or - 2.019) the result fails to reject the null hypothesis that there is no significant difference between the means of both groups, with respect to academic ability. Consequently, the assumption that that both groups are taken from the same parent population was not rejected. This is further reinforced with p= 0.5002, which is greater than .05.

4.3 Pre Questionnaire

The aim of the pre questionnaire (Appendix B) was to elicit background information about the participants in the study. Section A dealt with the computer and Internet in school and the section B focused on the computer and Internet in the home. 95% of participants had access to the Internet in school as well as 100% having a computer at home and 91% of participants had the Internet on their Personal Computers (PC). 68% of participants spent between 1 and 2 hours on the Internet at home and 37% used the Internet in school at least once a month.

Within the school section, 98% of the participants said they usually work on the computer individually, 52% typed out essays, 34% searched for information for a project, 16% had used educational software, 84% had used the Internet and 2% ticked the other box but did not include an answer.

In the home section, 100% of the participants used the Internet to search for topics and 87% of participants used it to send and receive Email. 45% wrote a story or carried out school work and 23% did school related project work. 86% of the students spent their time using social networking sites such as BEBO.

The participants were able to carry out a number of activities independently, including 61% could save a document to their computer and 25% could save a document to a USB key. 70% could run Internet Explorer and 98% could use a search engine. 80% of the participants were able to shut down the computer.

4.4 Pre Test Results

For the two groups, the following table gives the summary statistics from Appendix G: Study group test results and Appendix H: Control group test results. The null hypothesis, H^{o}, stated that there was no significant difference between the means of both groups with respect to academic ability and therefore, both groups were taken from the same parent population. The alternative hypothesis, H^{1}, indicates that control group and the study group were not academically similar and therefore did not represent samples from the same parent population.

H^o: $\mu 1 = \mu 2$

H^1: $\mu 1 \neq \mu 2$

Total Group-	**Study Group**	**Control Group**
Mean %	10.45	10.14
SD	3.10	3.98
Sample Size	22	22

Difference in means	0.31
df(degrees of freedom)	42
Calculated t-statistic check this	0.29
2-tail Sig P	0.7732
Critical t at .05 level of significance	2.02

The calculated test statistic was 0.29, while the critical t-value with 42 degrees of freedom was 2.02. As the calculate t-statistic falls within the acceptable region +/- 2.02, the result fails to reject the null hypothesis, H^o, that there is no significant difference between the pre case test means of the each group. Since there is no significant difference, we can conclude that both groups were at the same level of geographical knowledge initially. This is further reinforced with p=0.7732, which is greater than 0.5.

4.5 Post Test Results

The same test was distributed for the post test as the pre test. The null hypothesis, H^o, states that the mean scores of the study group and the control group for the post test are equal. The alternative hypothesis states that the mean scores of the control group and the study group for the post test are not equal. For the two groups, the following table gives the summary statistics from Appendix G: Study group test results and Appendix H: Control group test results.

H^o: $\mu 1 = \mu 2$

H^1: $\mu 1 \neq \mu 2$

Total Group-	**Study Group**	**Control Group**
Mean %	19.95	14.59
SD	3.58	3.85
Sample Size	22	22

Difference in means	5.36
df(degrees of freedom)	42
Calculated t-statistic	4.78
2-tail Sig P	0.0001
Critical t at .05 level of significance	2.02

The calculated test statistic was 4.78, while the critical t-value with 42 degrees of freedom was 2.02. As the calculate t-statistic is greater than the critical t-value, or alternatively with a highly statistically significant p=0.0001, the result implies that the null hypothesis is rejected. We must therefore, accepting the alternative hypothesis that the mean scores of the control group and the study group for the post test are not equal.

4.6 Paired Samples T-Test

A paired t-test is a statistical test, which is performed to determine if there is a reliable difference or a statistical significant difference between two means on the pre test and the post test. It is evident from the raw data that the geography level of all student increased by the end of the study. The mean result of the study group at the start of the study was 10.45 and at the end it was 19.95 which was a difference of 9.5. The mean result of the control group at the start of the study was 10.14 and at the end it was 14.59 which was a difference of 4.45.

To analyse how significant this increase was for each group, a paired sample t-test was conducted, based on the following hypothesis. The null hypothesis, H^o, states that there is no difference between the mean scores of the pre test and post test within a group. The alternative hypothesis, H^1, states that the mean score of the post test is greater than the mean of the pre test within a group.

H^o: $\mu 1 = \mu 2$

H^1: $\mu 1 \neq \mu 2$

	Pre –Test			Post- Test		
	Mean	SD	No of observations	Mean	SD	No of Observations
Control Group	10.14	3.98	22	14.59	3.10	22
Study Group	10.45	3.10	22	19.95	3.58	22

Difference in means	4.45
df(degrees of freedom)	21
Calculated t-statistic	3.70
1-tail Sig P	0.0013
Critical t at .05 level of significance	1.721

Upon analysis of the data in the table for the control group, the following conclusion can be made: The calculated test statistic was 3.70, while the critical t-value with 42 degrees of freedom was 1.721. As the calculated t-statistic is greater than the critical t-value, or alternatively with a highly statistically significant p= 0.0013, we must reject the null hypothesis H^o. Therefore accepting the alternative hypothesis, H^1, that the post test means score is greater than the pre test mean score.

The analysis of the study group showed a similar result:

Difference in means	9.5
df(degrees of freedom)	21
Calculated t-statistic	9.42
1-tail Sig P	0.0001
Critical t at .05 level of significance	1.721

The calculated test statistic was 9.5, while the critical t-value with 21 degrees of freedom was 1.721 or alternatively with a highly statistically significant $p=0.0001$, we must reject the null hypothesis that the pre test scores and post test scores are equal and accept the alternative hypothesis because the test statistic of 9.5 is greater than that of the critical t of 1.721.

4.7 Research Findings from Observation Checklist

While the Internet project was in progress, the people involved, a 6^{th} class Mainstream Teacher, 2 Special Needs Assistants, 2 Resource Teachers and the author carefully monitored the students through informal observations, using an observational checklist (Appendix D). In the semi structured interview, the observers were asked to discuss what they observed during this study and what they felt were the advantages and disadvantages of students using the Internet, to search for information for a class based Geography project. These are now discussed below:

4.7.1 Locating Internet Explorer and the Search Engine

All the pairs in the study group were able to locate the Internet Explorer by double clicking the browser icon on the Windows 2000 desktop. All eleven groups were able to locate a search engine. The homepage on the PC and laptop were set to Google so most students used this search engine for convenience. However, two groups also used the search engine Yahoo.

4.7.2 Operation of the Search Engine

In order to operate the search engine the students had to type in the search word(s). Each group, eleven in total, were given three countries to search for information to complete a Geography project. The countries involved in the research were: The United Kingdom, Japan and Australia. Each group had a list of information to search for, for example, capital city, language and population. There was little chance for misspelling as each group had the list of topics in front of them. However some groups chose to use the search engines online corrections and suggestions.

The time constraint for each session was 20 minutes. Each student in the group got 10 minutes control of the computer and the search, while the other student assisted. The student was timed until she reached a page that she thought was relevant to their search. 91% of the groups found information about their country within two minutes of their start time. After each question was answered the average search time equated to four minutes.

4.7.3 Search techniques

Students were taught how to attach two or more words together for a search by using + or - and “speech marks” on an overhead projector, prior to the beginning of the study. 18% (2 groups) chose to use these refined searching techniques to limit the scope of the search. 18% (2 groups) used the website that was provided by the author, to help with the search for information on the United Kingdom, Japan and Australia. The other 82% (nine groups) chose to use a search engine.

4.7.4 Difficulty with the Internet

A group was deemed to be in difficulty if help was sought from the observer whilst using the Internet. However, if the group required confirmation on the search topic, this was not classified as being in difficulty. All eleven groups looked for help. Students most commonly asked how to save information on a word document and how to save an image. Other groups anxiously clicked on so many hyperlinks that the browser froze and had to be restarted.

Frustration was classed when anger and irritation was shown, one student hit the computer, and 3 students declared “I’m not doing this anymore.” Students also displayed frustration while operating the browser, especially when they were waiting for a page to load or if the webpage that appeared did not contain the appropriate information. Out of the twenty two students participating in this project 45% (10 students) became frustrated with the computer.

The Internet, even with a filtering system, is not always suitable for the user. Sponsored links appeared on the right hand side of the screen and it was noted by the observer, that some of them were inappropriate for students in 6th class.

73% of the groups found webpages about their search but chose to return to the search result list without saving material from it. Unrelated material was retrieved by 45% of the participants after they searched a topic. This may have happened because the student forgot to include the country they were searching for. For example, the search only consisted of "sports" instead of "sports and Japan or sports and Japan" in the search engine. Therefore a lot of unrelated material appeared on these occasions.

None of the groups became preoccupied with an unrelated topic while searching on the project and knowingly continued through the website. All groups were focused on the task at hand but this may have been due to the observation taking place.

The groups were inclined to choose the webpage based on the top ten choices that the search engines provided. 55% of groups went in the order of websites chosen by the search engine. If a group decided not to use the information on a website, it was deemed unusable in their project work.

4.8 Post Questionnaire

Analysis of students post questionnaires revealed a positive response overall.
The rationale of this analysis was to discover and understand the students' underlying attitudes in the study group, towards the teaching of Geography through the Internet. An attitude scale was constructed consisting of nine statements (Appendix I).The options on the scale included "strongly agree", "agree", "not sure", "disagree" and "strongly disagree". The questions were worded simply so the 6th class students could understand them. The statements included:

1. "I enjoyed using the Internet to learn about Japan, the United Kingdom and Australia."
2. "I feel I learned a lot about Japan, the United Kingdom and Australia."
3. "Internet Projects should be carried out more in class."
4. "The use of Internet can make learning more interesting."
5. "I would like to use the Internet to help me with other subjects."
6. "It is easy to copy other people's work for the Internet."

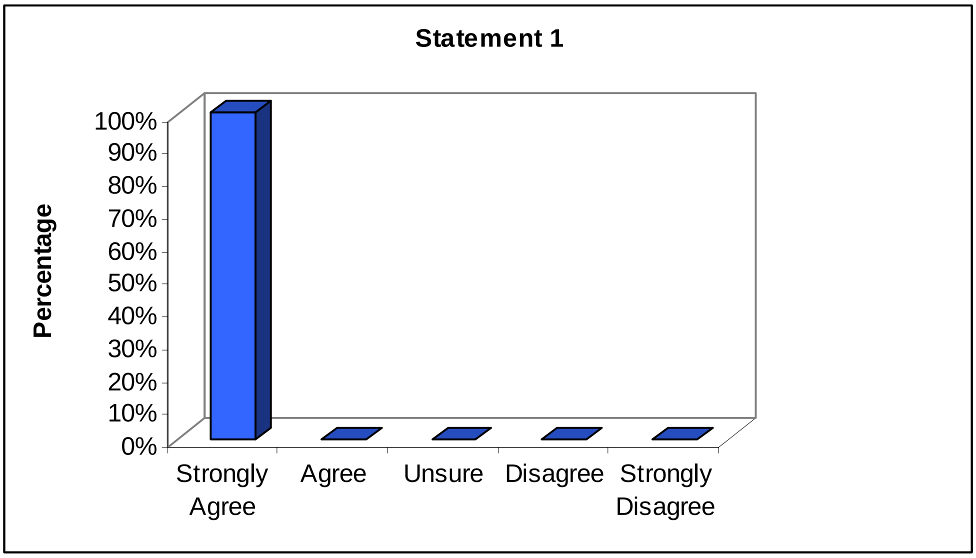
7. “The Internet is difficult to use.”
8. “Some information was hard to find.”
9. “The Internet can be frustrating to use.”

The teacher helped any children who had difficulty answering the questions. The 22 students in the study group completed the post questionnaire. Each statement will now be analysed.

Statement 1: “I enjoyed using the Internet to learn about Japan, the United Kingdom and Australia.”

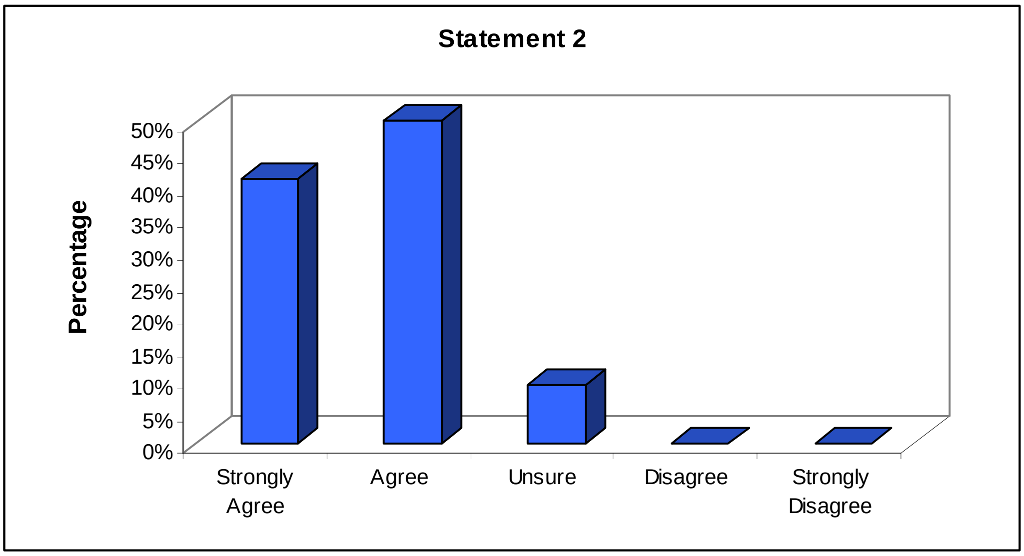
100% of the students were extremely positive about their experience using the Internet. This showed that the students were comfortable with using the Internet. During the observation it was immediately evident that the students were concentrating well and enjoyed using the Internet.

The Internet held the students’ attention for a longer period of time than in a traditional class. Additionally, throughout the period of the study group, students approached their teacher and observer to confirm that the Internet classes would be taking place that week.



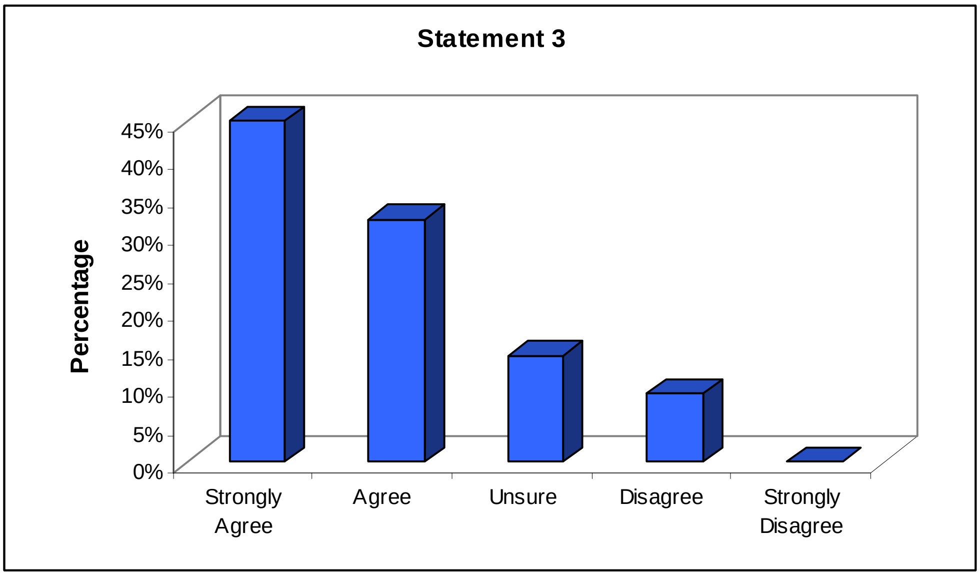
Statement 2: "I feel I learned a lot about Japan, the United Kingdom and Australia."

No student strongly disagreed or disagreed with this statement. This indicated that the students felt they learned something new about the countries in the study. 41% (9 students) strongly agreed with this statement, 50% (11 students) agreed and 9% (2 students) were unsure about this statement.



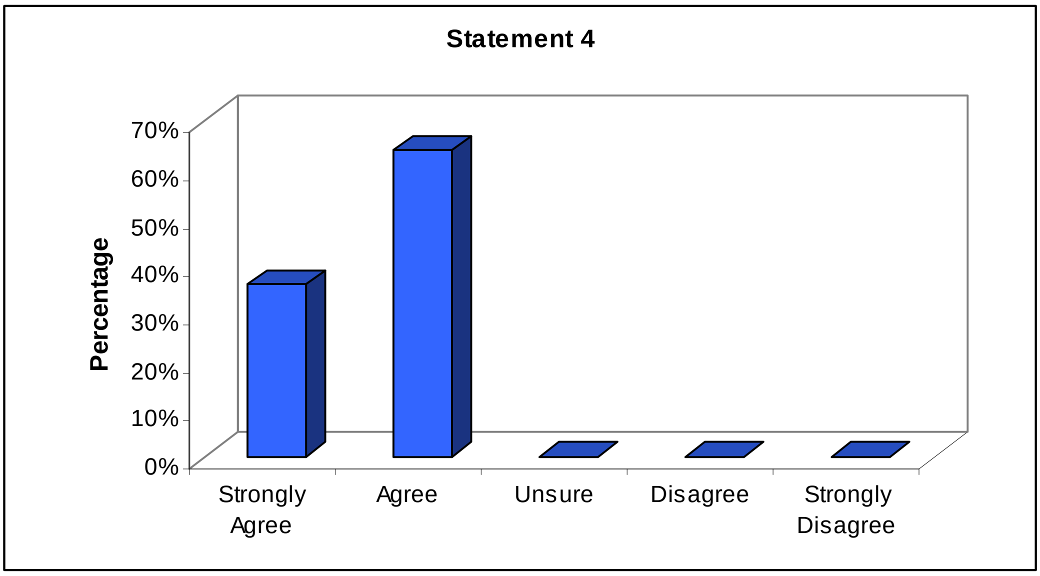
Statement 3: "Internet Projects should be carried out more in class."

45% (ten students) strongly agreed with this statement, 32% (seven students) agreed, 14 % (three students) were unsure and 9% (two students) disagreed. These responses show that in general the use of the Internet was a positive experience for the students. 77% of the students would like the experience to be repeated in class. 23% of the students were less enthusiastic about this type of learning. It could be concluded that this was possibly due to the association between learning using the Internet and the series of tests that followed.



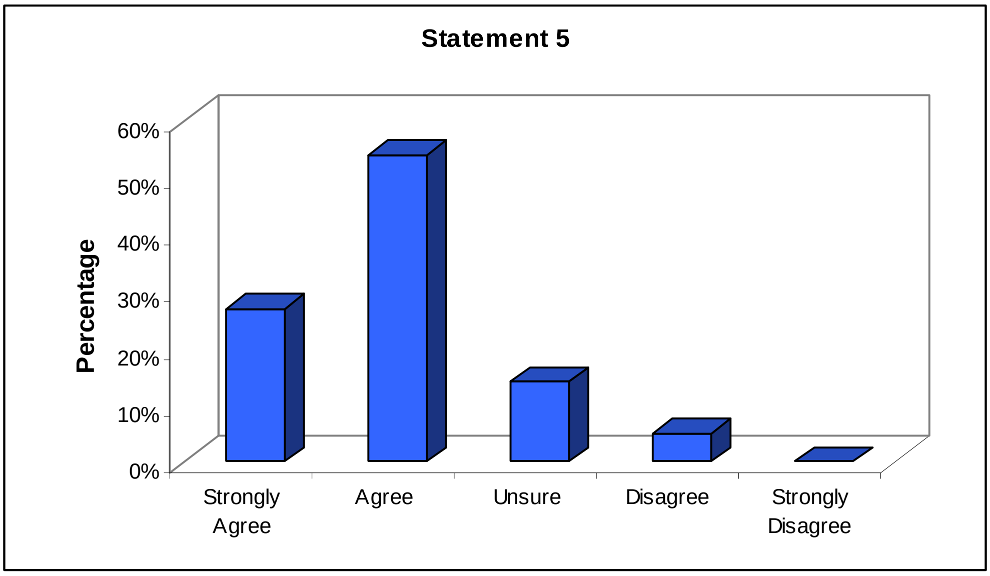
Statement 4: "The use of Internet can make learning more interesting."

The overall response to this statement was extremely positive, with 36% (8 students) strongly agreeing and 64% (14 students) agreeing. From these responses, the author concluded that using the Internet during class time was a novelty for most students and very different from the traditional classroom learning, therefore making it interesting for the student.



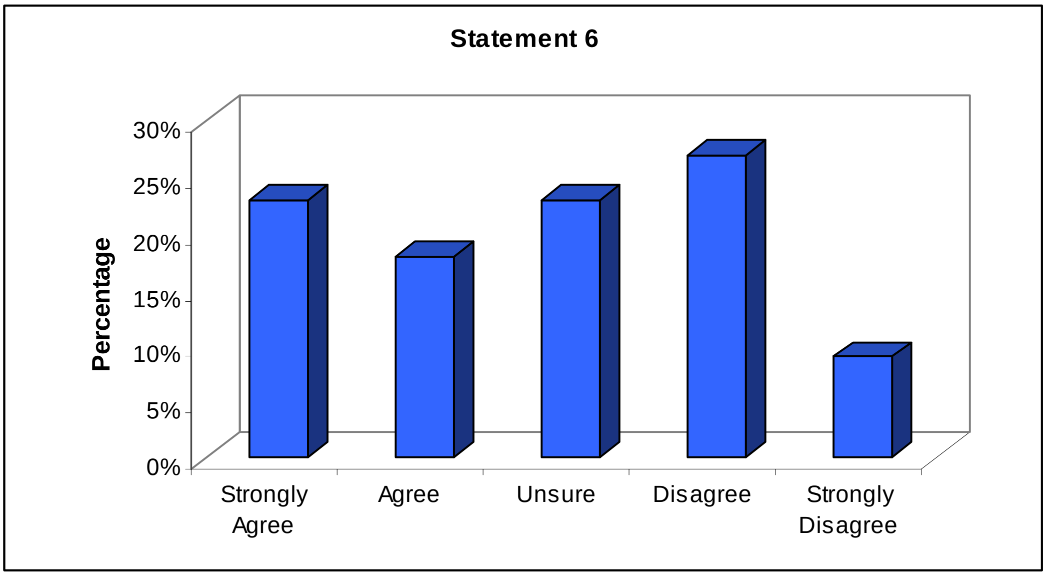
Statement 5: "I would like to use the Internet to help me with other subjects."

81% of the students were extremely positive about this statement. 27% (6 students) strongly agreed with this statement. 54% agreed (12 students), 14% (3 students) were unsure and 5% (1 student) disagreed. It became evident from the students' responses that they would like to use the Internet in the future for other subjects.



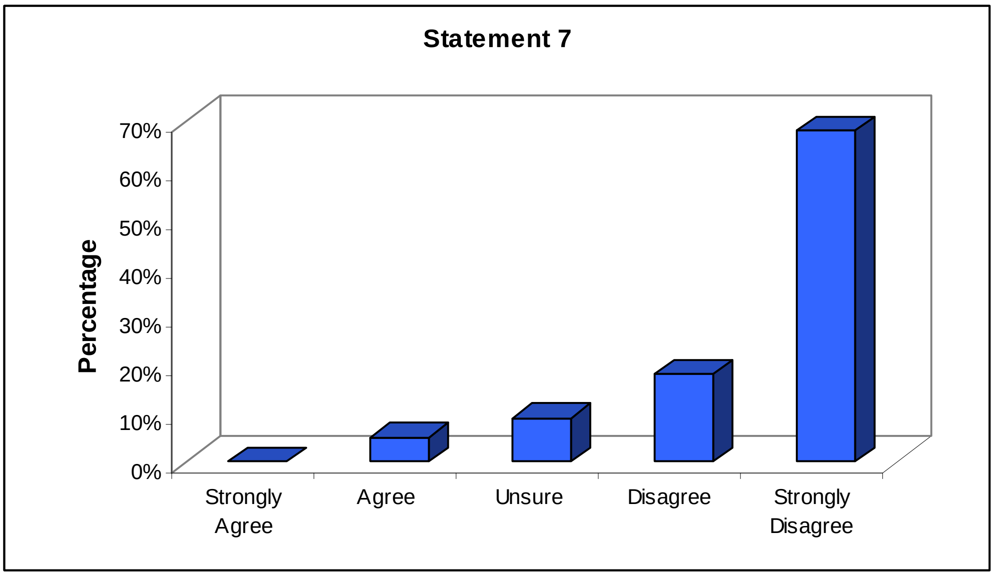
Statement 6: "It is easy to copy other people's work for the Internet."

A mixed set of responses was reported here, possibly due to students not understanding the question. The teacher had to give an explanation to the group as they answered the questionnaire. 23% (5 students) strongly agreed, 18% (4 students) agreed with the statement, 23% (5 students) were unsure and 27% (6 students) disagreed with this statement. 9% (2 students) didn't fill in an answer.



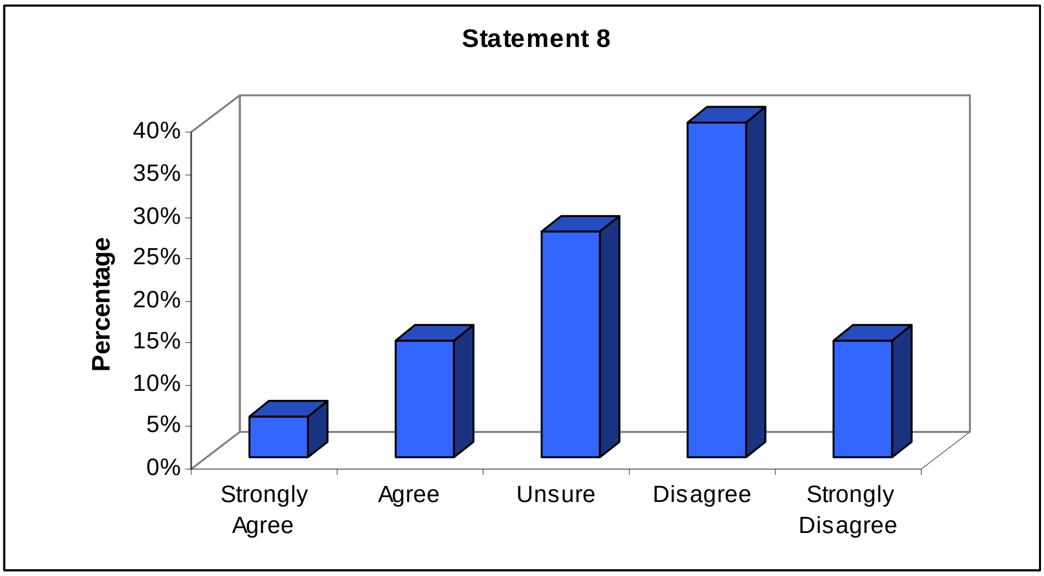
Statement 7: "The Internet is difficult to use."

The overall response was of a positive nature, with 68% (15 students) strongly disagreed and 18% (4 students) agreed with this statement. 9% (2 students) were unsure and 5% (1 student) agreed with this statement. Students who were negative about the Internet may have interpreted this question wrongly as it is written negatively.



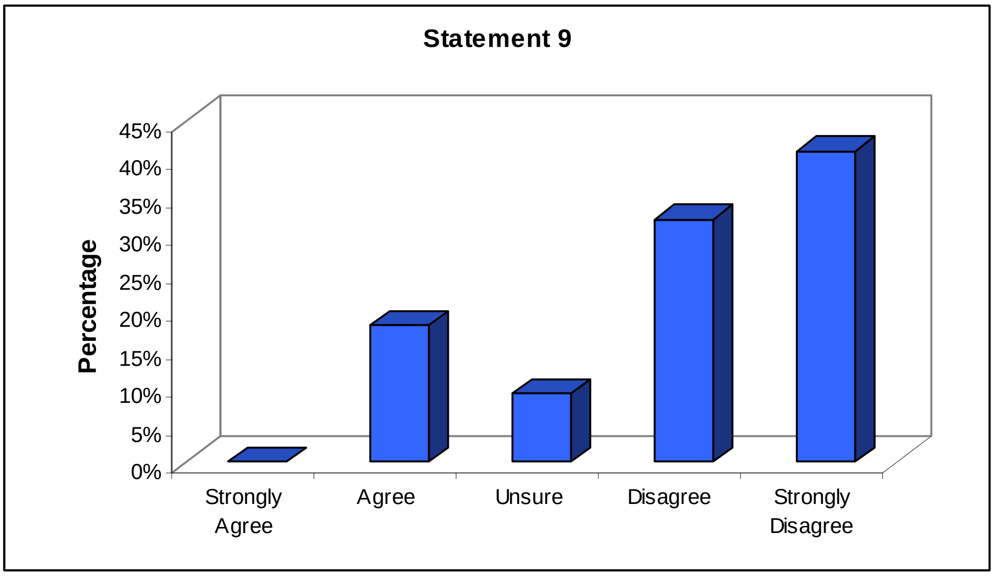
Statement 8: “Some information was hard to find.”

5% (1 student) strongly agreed with this statement and 14% (3 students) agreed, 27% (6 students) were unsure and 40% disagreed (9 students). 14% (3 students) didn’t answer the question. These responses may be due to several factors. From observation, some groups got lost in the navigation of a website and had to go back to the search engine and begin again. Students found this time consuming and frustrating. Also unrelated websites often came up, which annoyed the students.



Statement 9: “The Internet can be frustrating to use.”

The majority of the students disagreed or strongly disagreed with statement. 41% (9 students) strongly disagreed and 32% (7 students) disagreed. 9% (2 students) were unsure and 18% (4 students) agreed. The training at the beginning of the research with the overhead projector helped to make the process easier for the students, as they could follow exactly the teacher’s instructions. Initially some students had to be shown by the observer how to type in the Uniform Resource Locator (URL). The author assumed that 73% of the responses were positive because the student found the Internet easy to navigate through. The four students that had difficulty had to be helped by the observer.



The analysis of the post questionnaire showed the students were extremely positive towards using the Internet, to produce classroom based Geography projects. The students were encouraged to write their own comments at the end of the questionnaire. The following were offered: “If I will ever use the Internet again I would be much quicker than before.” “It was a lot of fun and I learned more than I would on a writing Project.” “I liked using the Internet because it makes learning a lot of fun.” “I really enjoyed working on the Internet.” It was clear that the students overall experience of the Internet was enjoyable. They felt that they learned new information and would like the experience repeated.

4.9 Conclusion

This research focused on the effectiveness of the Internet as a resource for Project Based Learning (PBL), in the teaching of the Geography Primary Curriculum. The research approach selected was a small-scale, multi method case study, incorporating a combination of qualitative and quantitative research methods. The qualitative research methods, included the pre and post questionnaires, the pre questionnaire established that the control group and study group had experience of the Internet, both at home and in school at the beginning of this research. It was clear from the semi structured interviews and observational checklists that the study group became independent users of the

Internet. However some negative aspects occurred such as frustration, unsuitable sites and sponsored links. A statistical comparison of the control group and study group using pre tests and post tests determined which method of teaching was most effective, the Internet or traditional teaching methods such as books. The post questionnaire established the study group's opinions and attitudes towards using the Internet, as a resource for teaching Geography.

Chapter 5 Discussion of Findings

5.1 Introduction

The purpose of this chapter is to discuss the results outlined in the previous chapter on the research findings and also to examine whether the aims of this research have been achieved. The Primary aim of this research was to examine the effectiveness of the Internet as a resource for Project Based Learning in the teaching of the Geography Primary Curriculum.

5.2 The Research Questions

Three research questions were identified at the beginning of this study:

- Is the Internet an educational resource from which students in a classroom setting can retrieve relevant and helpful information for project work, in the subject of Geography?
- Can students learn factual information more effectively from the Internet than traditional teaching methods?
- What are the study group participants' attitudes towards using the Internet for Project Based Learning?

The research approach selected was a small scale, multi method case study, incorporating a combination of qualitative and quantitative research methods. The scope of this research encompassed four Mainstream Teachers, two Resource Teachers, two Special Needs Assistants, six 5th class students and forty four 6th class students broken up into two groups: The study group and the control group. The data collection tools used included pre and post questionnaires, direct semi structured interviews with the observers, focus group sessions with teachers and students, observation using an observation checklist, pre and post testing which allowed for the statistical comparison of the two groups, to ascertain which method of teaching was most effective, traditional or using the Internet.

5.3 Discussion of Results

5.3.1 Pre Case

The pre case analysis compared the study group and the control group on their academic performance in their summer test. The main goal of this pre case study was to establish that the control group and the study group were of a similar academic ability, and therefore, both samples were taken from the same parent population. A t statistic was calculated using the mean. The study group had a mean of 43.80 and the control group had a mean of 47.59. This analysis showed that prior to the start of this case study, there was inconclusive evidence of a significant difference in the mean mark achieved by each group.

5.3.2 Pre Questionnaire

The pre questionnaire clearly showed that all participants in this research had experience of the Internet either at home or in school. 95% of participants had access to the Internet in school, 100% of the participants had a computer at home and 91% of participants had the Internet on their home PC. 100% of participants had used the Internet to retrieve information about a topic that interested them at home because the Internet is an information rich environment that is convenient to students (Applebome, 1999). 84% of participants used the Internet in school because it provided numerous educational websites (Hackbarth, 1997; Khan, 1997). Beer and Burrows (2007) point out that Social Networking Sites (SNS) are perhaps the most socially significant of the Web 2.0 applications. This is evident from the results of the pre questionnaire where it showed that 86% of the students, spend their time on the Internet at home, using social networking sites such as BEBO.

5.3.3 Pre Test and Post Test

There was a two month gap where the students had a summer break and returned to school in September. It was necessary to make sure that student productivity was still at the same level and that the students were still of similar academic ability at the beginning of a new academic year. The pre test was designed as a simple multiple choice exam

(Appendix C). There were a total of thirty questions in the exam. All questions carried equal marks - 30. The questions were “closed” and students were asked to select one answer from a possible three. Open questions with potentially qualitative answers were avoided, to simplify the comparison of the data. There was no dialogue allowed between students during the exam. The findings showed that there was no significant difference in the mean results of the control group and the study group in the pre test. Consequently, the assumption that both groups were taken from the same parent population was not rejected. The post test was the same as the pre test and all forty four students took the post test. In the post test analysis a statistically significant difference at the 5% significance level was found, using the mean results of the control group and the study group. This suggested an increase in students productivity when taught Geography with the assistance of the Internet. The Internet has become a place for students to learn (Berenfeld, 1996; Sherry, 2000) and this research enabled students to develop their learning potential (Gray, 1999).

5.3.4 Paired Sample T-Test

The thirty minute presentation given to all students at the beginning of the project work on how to use and navigate through the Internet, helped them become independent users of the Internet. The teacher was present to answer all questions posed by the students. After the six week research period, data was recorded from the post test completed by each student. In order to determine whether there was as significant difference between the groups, a paired sample t test was performed on the study group and the control group.

On examination of the statistical data, it was evident that the geographical knowledge of the participants in the study group and the control group increased significantly. The study group started the study with a slightly higher mean score than the control group - a difference of 0.31. It was apparent from the test results in (Appendix G and H) that the study groups’ marks were considerably larger than the control group at the end of the study. The study groups carried out their project using the Internet as a source of information, which appears to have increased students' productivity. The control group carried out the study using traditional teaching methods, which also increased student productivity but not to the same level. A paired sample t-test on the pre test and post test mean scores showed that there was a significant increase, in the performance of each group. Therefore, students can learn factual information more effectively from the Internet than traditional teaching methods.

5.3.5 Post Questionnaire

The qualitative data from the post questionnaire revealed the study group participants' attitudes towards using the Internet for Project Based Learning. It showed that the participants were motivated and the Internet held their attention for a long period of time. It also showed that 100% of the participants had an extremely positive attitude towards the use of the Internet in school. The rationale of this analysis was to discover and understand the children's underlying attitudes in the study group, towards the teaching of Geography through the Internet. The overall experience appeared to be positive and enjoyable. 100% of the participants felt they learned something and would like the experience to be repeated. 77% of the participants would like to use the Internet to help with other subjects. 86% of the participants felt that the Internet was easy to use, as enthusiasm was shown by many participants, regardless of their ability.

5.4 Semi Structured Interview

The findings from the semi structured interview reflected that the Internet is an educational resource from which students in a classroom setting can retrieve relevant and helpful information for project work, in the subject of Geography.The following comments were noted by the author during the semi structured interview with the observers of the study groups' Internet project. For the period of the observation two Special Needs Assistants, two Resource Teachers, one 6^{th} class Mainstream Teacher and the author assumed the role of observers. While the Internet project was in progress, observers involved carefully monitored the students and used an observation checklist.

It was clear after the thirty minute presentation using the overhead projector, that the participants became independent users of the Internet. 91% of the groups found information about a country within two minutes of their start time. They easily managed to locate relevant information for their topic of search. Participants got faster as they progressed through the questions. The average time for one search was four minutes because the questions got harder as the students progressed through them. None of the groups got sidetracked but it was noted that the participants were aware they were being observed.

Participants had to read a lot of material, due to the abundance of websites available. Answers.com and Wikipedia.org are websites that present cumulative content from other reference websites and these were used regularly for answers. However these websites are not always reliable because no one authorises the creation of wiki pages (Fountain, 2005). Some answers the students found on these websites were incorrect. Sharma (2003) believes that not all websites contain accurate information and that there is a problem with judging the credibility of some websites. It would be important to encourage participants to source at least two websites for answers. One group didn't understand the meaning of playwright so one of the observers suggested finding its meaning by entering "meaning of playwright" into the search engine. The group was successful and was able to continue with the project. One particular group was quite selective in the information they chose. They found websites easily but didn't choose information until they checked a few. One group chose to get images for many of the questions, for example, places to visit. This was easily done, as the Internet is animated with graphics (Sharma, 2003). The project didn't insist on text only so images were acceptable.

The Internet class certainly held the participants' attention for a longer period of time than the group in the normal traditional classroom, possibly due to the Internet's growing source of multimedia resources and educational websites containing images, sound and video (BECTA, 2001). The students in the study group never seemed to be under pressure and confidence levels grew with each search item. The participants using the Internet were absorbed in the learning process and concentrating on the task at hand.

BECTA (2001) believes that this type of learning environment engages and motivates students because it deviates from the traditional text book style of teaching

The students were not distracted by noise in the background or by movement within the classroom. Woodhouse and McDougall (1986) believes that the child sees the computer as just another aspect of the classroom and Wellington (1985) suggests the computer can fit in just as easily as another resource in the classroom. There was good interaction between participant pairs. They exchanged conversation freely and swapped control of the computer with ease. Some participants liked feedback straight away for an answer they located on the Internet and often asked the observer if their choice was correct. Unfortunately an observer can't always be at hand when students are on the computer. However the Internet, even with a filtering system, which is recommended by Wishart (2003), is not always suitable for the user. Unnecessary and inappropriate advertising appeared after a search. This happened to 100% of the groups. This concurs with Mason, et al (2000) findings that online advertising is problematic for students, as they find it difficult to discriminate between the content and advertisements. 45% of the study group retrieved pages of unrelated material after they searched a topic. 73% found webpages about their search but chose to return to the search result list, without saving material from it.

A final point which the observers agreed with was that while the Internet has huge advantages which include, allowing participants to work at their own pace, motivating the participant, improving self-esteem, the teacher cannot be replaced. A machine cannot replace the teacher of a class because the Internet cannot interpret emotions, feelings or cannot answer questions from the participants. 100% experienced difficulty whilst using the Internet and required help from the observer. After the study the observers believed that the Internet should be used as an additional resource with the teacher acting as a facilitator.

Chapter 6 Conclusions and Recommendations for Future Research

6.1 Introduction

This research focused on the use of the Internet into the classroom in one Primary School. Within this study, the aim was to examine the effectiveness of the Internet as a resource for Project Based Learning, in the teaching of the Geography Primary Curriculum. Chapter 8 will outline the conclusions to the research and look at opportunities for further research. Combinations of quantitative and qualitative analyses were used for the research.

Within this study there were three research questions:

- Is the Internet an educational resource from which children in a classroom setting can retrieve relevant and helpful information, for project work in the subject of Geography?
- Can students learn factual information more effectively from the Internet than traditional teaching methods?
- What are the study group participants' attitudes towards using the Internet for Project Based Learning?

6.2 Summary of Findings and Conclusions

Forty four students from one Dublin Primary School participated in this research. The students were divided into two groups and pre tested. They then commenced a Geography project. The study group used the Internet to search for information and the control group used traditional teaching methods, such as books and the teacher's knowledge. At the end of the six week learning period, the students were post tested and results were analysed quantitatively.

The first major conclusion of the study was that the geographical performance of the students in both the study group and the control group increased significantly. It was also evident that the students who used the Internet as a learning aid performed better than the control group who used traditional teaching methods. The students in the study group averaged 5.36% better than those using traditional teaching methods.

Results of the questionnaires and observations made during the research would suggest that the Internet produced a higher level of motivation amongst the study group and held their attention for a longer period of time. The Geography project using the Internet provided a challenge for the students and alleviated the chance of boredom that is associated with traditional teaching methods. Traditional teaching methods such as books cannot offer the same level of motivation and stimulation as the Internet can. The World Wide Web provides visually rich and simultaneous information on all of the topics being searched. Information received is up to date and speedily accessed. The Internet also provides lots of animations, graphics, images and sound features, which are enjoyed by the user.

It is clear that while the Internet can enhance traditional methods of teaching, it can't completely replace them. As the Internet is limited in its understanding or comprehension of individual student's needs, it cannot fulfil the role of a traditional teacher. The Internet does not provide feedback and cannot answer questions. It also cannot interpret emotions and feelings from the students. The Internet should be used as an additional resource, where the teacher acts as a facilitator.

6.3 Limitations of the Research

A number of important limitations need to be considered. Some limitations were related to the nature of the research and timescale and others which were beyond the control of the author.

- The research was limited to two sample groups of a total of forty four participants who were of the same ability and age range in one disadvantage north Dublin school.
- The groups were observed and monitored over a short period of time.
- During the research the control group and study group were limited to learning about one subject.
- The current study was also limited by the fact that the researcher was the sole instrument for conducting Primary research, therefore running the risk of becoming too involved and so becoming subjective in terms of data collection.

- It would be interesting to carry out a similar project in another school, with a different age range and a different subject.
- The issues of access to and implementation of the Internet in the classroom.

6.4 Recommendations for Future Research

This research has thrown up many questions which need further investigation. It is recommended that further research be undertaken in the following areas:

- The Internet has a particular contribution to make to all teachers. Teachers need to look at how the Internet may enhance curriculum delivery in every subject area.
- Future research warrants a variation in age, gender and ability of the sample groups.
- Training and monitoring a teacher with no Internet experience for the use of project work.
- Creating a website for a particular Geography topic.
- The Internet could be used successfully by a learning support teacher, for children with learning difficulties and those with exceptional ability.
- Research of a similar nature could be carried out in secondary schools, to establish the similarities and differences between the school levels.
- The research to be carried out over a longer period of time and with a larger number of students, to see if the outcome would be different.

6.5 Conclusion

Research has shown that people use the Internet as a complement to traditional media rather than a substitute for them, thereby increasing information gaps across the population (Robinson, Barth and Kohut 1997; Robinson, Levin and Hak, 1998). Since the introduction of *IT 2000* policy framework, Primary Schools have been equipping themselves with computers and access to the Internet. Educators need to establish what works for learners in terms of their educational needs, how they interact with the technology and how they can be supported and encouraged in this type of learning. The

Internet with its many tools and applications fosters real communication, with an emphasis on the user and can enhance learning, particularly geographical awareness. The World Wide Web speeds up the process of acquiring information, enabling the student to acquire more up to date information. The Internet will lead to a new educational paradigm, involving a partnership of students, teachers and the Internet. In conclusion the Internet can offer the teacher a powerful teaching and learning resource, to ensure that all children can enjoy learning.

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Appendix A

SCOIL CHAITRÍONA CAILÍNÍ

2nd September 2009

Dear Parents,

I am writing a thesis for my Masters in Digital Media Development for Education. For research purposes I need to work with pupils in 6th class. The pupils will be using the Internet to carry out a Geography project on the Internet.

This research will require information from the pupils and will entail the following:

- Questionnaires
- Computer observation
- Data collection from tests completed by the children

All information is confidential and your child's name will remain anonymous in my thesis. I would appreciate it if you would complete the attached form and return to the school.

Yours sincerely,

____
Fiona O'Sullivan

--------------cut ----------------------cut -------------------------- cut --------------------------

Please return to your child's class teacher by Monday 7th September, 2009.

I give permission for my child ________________________ to take part in this research project.

Signed_________________

Appendix B

Student Pre Questionnaire Test

Section A

1. **Have you used a computer before in school?** Yes ☐ No ☐
2. **Does the school computer have Internet?** Yes ☐ No ☐
3. **Do know where the computers are located in your school?** Yes ☐ No ☐

   If yes where ______________
4. **How often do you use the computer in school**?

   Daily ☐

   Weekly ☐

   Monthly ☐

   Twice per term ☐

   Never ☐

5. **Which of the following activities have you done in school?**

Typed out essays ☐

Searched for information for a project ☐

Use educational software (CD) ☐

Use the Internet ☐

Other ☐ ___________________________

6. **In school I usually work on a computer**

   Individually ☐

   With a partner ☐

   In a group ☐

Section B

7. **Do you have access to a computer at home?** ☐Yes ☐ No

8. **Is there Internet on it?** ☐Yes ☐ No

9. **How often do you use the Internet in a week at home?**

Less than 1 hour ☐

1-2 hours ☐

2-3 hours ☐

more than 4hours ☐

10. **Have you used the Internet before?** ☐ Yes ☐ No

If yes which of the following activities did you use it for?

Email ☐

Searching information on a topic you like ☐

Writing a story/school work ☐

Social networking site e.g. BEBO ☐

Project work ☐

Other ☐ ____________________

11. **What is your favourite website?**

www.___________________________________

12. **Please tick which of the following you can do:**

I can save a document to my computer ☐

I can save a document to a USB key ☐

I can run Internet explorer ☐

I can find search engine e.g. Google ☐

I can shut down the computer ☐

Appendix C

Geography Pre Test

The United Kingdom

1. What is the capital of the United Kingdom?

Edinburgh ☐

Cardiff ☐

London ☐

2. What is the unit of currency in the United Kingdom?

Pound Dollar ☐

Pound Sterling ☐

Krone ☐

3. What continent is the United Kingdom in?

Europe ☐

Asia ☐

Africa ☐

4. What is the population of the United Kingdom?

60,943,912 ☐

6,943,912 ☐

66,943,912 ☐

5. Which person do you associate with the United Kingdom?

William Shakespeare ☐

Leonardo da Vinci ☐

WB Yeats ☐

6. What colour is the United Kingdom flag?

- Red, white and blue ☐
- Green, white and blue ☐
- Red, white and green ☐

7. Which of the following is a place to visit in the United Kingdom?

- Phoenix Park ☐
- Buckingham Palace ☐
- Eiffel Tower ☐

8. What is the name of the underground transport system in London?

- Subway ☐
- Tube ☐
- Metro ☐

9. Tick the cities that are in the United Kingdom:

Boston	☐	Stockholm	☐
Liverpool	☐	Malmo	☐
Manchester	☐	Cardiff	☐

10. Which river flows through London?

- English Channel ☐
- Blackwater ☐
- The Thames ☐

Geography Pre Test

Japan

11. What is the capital of Japan?

Yokohama ☐

Osaka ☐

Tokyo ☐

12. What is the unit of currency in Japan?

Japanese Dollar ☐

Japanese Yen ☐

Japanese Pound ☐

13. What continent is Japan in?

South America ☐

Asia ☐

Africa ☐

14. What is the population of Japan?

27,288,416 ☐

127,288,416 ☐

77,288,416 ☐

15. Which of the following car manufacturer do you associate with Japan?

Toyota ☐

Peugeot ☐

Opel ☐

16. What colours are on the Japanese Flag?

Red and yellow ☐
White and red ☐
White and black ☐

17. Which of these countries borders Japan?

Korea ☐
China ☐
None it is an island ☐

18. What ocean surrounds Japan?

North Atlantic Ocean ☐
North Pacific Ocean ☐
Indian Ocean ☐

19. What sport would you associate with Japan?

Rugby ☐
Football ☐
Martial Arts ☐

20. What is the most popular form of transport in Japan?

Walking ☐
Car ☐
Train ☐

<u>Geography Pre Test</u>

Australia

21. What is the capital of Australia?

- Sydney ☐
- Brisbane ☐
- Canberra ☐

22. What is the unit of currency in Australia?

- Australian Rupees ☐
- Australian Dollar ☐
- Australian Pound ☐

23. What continent is Australia in?

- Asia ☐
- Australasia ☐
- Africa ☐

24. What is the population of Australia?

- 31,007,310 ☐
- 11,007,310 ☐
- 21,007,310 ☐

25. What colours are on the Australian Flag?

- Red, yellow, and Blue with stars ☐
- Blue, White and red with stars ☐
- White and black with stars ☐

26. Which of these countries borders Australian?

- New Zealand ☐
- None it is an island ☐
- Africa ☐

27. What sport would you associate with Australia?

- Rugby ☐
- Martial Arts ☐
- Hurling ☐

28. What language is spoken in Australia?

- French ☐
- English ☐
- Australian ☐

29. What are Australia's oldest minority group of people referred to as?

- Aborigines ☐
- Maori ☐
- Zhuang ☐

30. Which of these is a place you can visit in Australia?

- Empire state building ☐
- Alice Springs ☐
- Tivoli gardens ☐

Appendix D
Internet Observation Checklist

Group: ____________________

1. Was the group able to locate Internet Explorer? Yes ☐ No ☐
2. Was the group able to find a search engine? Yes ☐ No ☐
3. Did the group get frustrated while searching? Yes ☐ No ☐
4. Did the group use refined search techniques like +/- ? Yes ☐ No ☐
5. Did the group use the website provided by the teacher? Yes ☐ No ☐
6. Did the group seek help from the teacher? Yes ☐ No ☐
7. Did the group become disinterest in searching? Yes ☐ No ☐
8. Did the group give up at any stage? Yes ☐ No ☐
9. Did the group become preoccupied with another topic while searching? Yes ☐ No ☐
10. Did out of place websites appear after a search? Yes ☐ No ☐
11. How long did it take the child to reach the correct website with the right information about the topic being searched?

    Less than 2 minutes ☐

    2 minutes ☐

    4 minutes ☐

    6 minutes ☐

    8 minutes ☐

    10 minutes or more ☐

12. Did useless information appear after a search? Yes ☐ No ☐
13. Could the same information be found in the children's school books? Yes ☐ No ☐
14. Did the child save their information Yes ☐ No ☐

15. Questions: Tick if found

• Capital of Japan ☐	• Capital of United Kingdom ☐	• Capital of Australia ☐
• Language ☐	• Language ☐	• Language ☐
• Ocean around Japan ☐	• Population ☐	• Population ☐
• Population ☐	• Seas around Britain ☐	• Seas around Australia ☐
• Currency ☐	• Currency ☐	• Currency ☐
• Map ☐	• Map ☐	• Map ☐
• Flag of Japan ☐	• Flag of Great Britain ☐	• Flag of Australia ☐
• Food ☐	• Famous playwrights ☐	• Sports ☐
• Sports ☐	• Places to Visit in London ☐	• Places to Visit ☐
• Transport ☐	• Parks ☐	• Animals ☐
• Types of houses ☐	• Travelling around London ☐	• The first Australians people's name ☐
• Earthquakes ☐	• Shopping Streets(London) ☐	• Size of Australia (sq km) ☐
• Climate ☐	• Name the countries Great Britain is made up ☐	• Continent ☐
• Area of Japan(sq km) ☐	• Size of Great Britain (sq km) ☐	• Countries that border Australia ☐
• Car Manufacturers ☐	• Continent ☐	
• Continent ☐	• River that flows through London ☐	
• Countries that border Japan ☐		
http://www.japan-guide.com/e/e623.html	http://www.visitlondon.com/	http://www.australia.com

Appendix E

Geography Post Test

The United Kingdom

1. **What is the capital of the United Kingdom?**

   London ☐

   Liverpool ☐

   Cardiff ☐

2. **What continent is the United Kingdom in?**

   Australia ☐

   Europe ☐

   Africa ☐

3. **What is the unit of currency in the United Kingdom?**

   Pound Dollar ☐

   Pound Sterling ☐

   Pound Euro ☐

4. **What is the population of the United Kingdom?**

   60,943,912 ☐

   6,943,912 ☐

   66,943,912 ☐

5. **Which person do you associate with the United Kingdom?**

   William Shakespeare ☐

   Leonardo da Vinci ☐

   Seamus Heaney ☐

6. Which of the following is a place to visit in the United Kingdom?

Phoenix Park ☐
Buckingham Palace ☐
Eiffel Tower ☐

7. What colour is the United Kingdom flag?

Red, white and blue ☐
Green, white and blue ☐
Red, white and green ☐

8. What is the name of the underground transport system in London?

Subway ☐
Tube ☐
Metro ☐

9. Tick the cities that are in the United Kingdom:

Boston ☐	Stockholm ☐
Liverpool ☐	Malmo ☐
Edinburgh ☐	Cardiff ☐

10. Which river flows through London?

English Channel ☐
The Thames ☐
Blackwater ☐

Geography Post Test

Japan

31. What is the capital of Japan?

Yokohama ☐
Tokyo ☐
Osaka ☐

32. What is the unit of currency in Japan?

Japanese Pound ☐
Japanese Dollar ☐
Japanese Yen ☐

33. What continent is Japan in?

Australia ☐
Asia ☐
Africa ☐

34. What is the population of Japan?

27,288,416 ☐
127,288,416 ☐
77,288,416 ☐

35. Which of the following car manufacturer do you associate with Japan?

Opel ☐
Peugeot ☐
Toyota ☐

36. What colours are on the Japanese Flag?

White and black ☐
Red and yellow ☐
White and red ☐

37. What ocean surrounds Japan?

North Atlantic Ocean ☐
North Pacific Ocean ☐
Indian Ocean ☐

38. Which of these countries borders Japan?

None it is an island ☐
China ☐
Korea ☐

39. What is the most popular form of transport in Japan?

Walking ☐
Car ☐
Train ☐

40. What sport would you associate with Japan?

Rugby ☐
Football ☐
Martial Arts ☐

Geography Post Test

Australia

41. What is the capital of Australia?

Sydney ☐
Brisbane ☐
Canberra ☐

42. What continent is Australia in?

Asia ☐
Australasia ☐
Africa ☐

43. What is the unit of currency in Australia?

Australian Pound ☐
Australian Rupees ☐
Australian Dollar ☐

44. What is the population of Australia?

31,007,310 ☐
11,007,310 ☐
21,007,310 ☐

45. What colours are on the Australian Flag?

Red, yellow, and blue with stars ☐
Blue, white and red with stars ☐
White and blue with stars ☐

46. Which of these countries borders Australian?

New Zealand ☐

None it is an island ☐

Africa ☐

47. What language is spoken in Australia?

French ☐

English ☐

Australian ☐

48. What sport would you associate with Australia?

Rugby ☐

Martial Arts ☐

Hurling ☐

49. What are Australia's oldest minority group of people referred to as?

Aborigines ☐

Maori ☐

Zhuang ☐

50. Which of these is a place you can visit in Australia?

Empire state building ☐

Alice Springs ☐

Tivoli gardens ☐

Appendix F
Results for Pre Case Study Analysis

Summer Test to measure academic ability of both groups prior to case study

CONTROL GROUP			
Student	Maths %	English %	Average %
Student 1	87	50	68.5
Student 2	55	87	71
Student 3	42	82	62
Student 4	99	79	89
Student 5	61	79	70
Student 6	59	63	61
Student 7	27	61	44
Student 8	30	58	44
Student 9	53	53	53
Student 10	77	51	64
Student 11	35	47	41
Student 12	93	47	70
Student 13	47	46	46.5
Student 14	15	39	27
Student 15	79	37	58
Student 16	27	35	31
Student 17	9	35	22
Student 18	61	31	46
Student 19	10	30	20
Student 20	37	21	29
Student 21	27	15	21
Student 22	8	10	9
Mean	47.182	48	47.59
Median	44.5	47	46.25
Standard Deviation	27.685	21.33	20.96
Variance	766.44	454.9	439.5

STUDY GROUP			
Student	Maths %	English %	Average %
Student 1	90	50	70
Student 2	70	50	60
Student 3	53	37	45
Student 4	50	50	50
Student 5	50	16	33
Student 6	87	50	68.5
Student 7	47	95	71
Student 8	47	24	35.5
Student 9	30	35	32.5
Student 10	27	13	20
Student 11	25	68	46.5
Student 12	53	68	60.5
Student 13	21	53	37
Student 14	27	58	42.5
Student 15	69	13	41
Student 16	13	45	29
Student 17	35	37	36
Student 18	37	21	29
Student 19	35	51	43
Student 20	22	47	34.5
Student 21	30	10	20
Student 22	79	39	59
Mean	45.32	42.27	43.80
Median	42	46	41.75
Standard Deviation	22.06	20.89	15.343
Variance	486.7	436.3	235.42

Degree of freedom=(22-1)+(22-1)=42

Appendix G

Results: Study Group
This group had access to the Internet

Student	Pre-Test (30 marks)	Post Test (30 marks)	UK(pre) (10 marks)	Japan(Pre) (10 marks)	Australia(Pre) (10 marks)	UK(Post) (10 marks)	Japan(Post) (10 marks)	Australia(Post) (10 marks)
Student 1	10	20	4	3	3	7	6	7
Student 2	10	24	4	2	4	8	8	8
Student 3	12	18	5	3	4	10	4	4
Student 4	20	29	8	6	6	9	10	10
Student 5	10	22	3	3	4	7	6	9
Student 6	10	18	5	0	5	6	6	6
Student 7	6	14	2	3	1	3	4	7
Student 8	9	19	2	4	3	8	6	5
Student 9	12	20	4	4	4	6	7	7
Student 10	14	23	5	3	6	7	9	7
Student 11	11	22	3	4	4	7	8	7
Student 12	8	24	1	3	4	8	8	8
Student 13	6	17	3	1	2	5	6	6
Student 14	6	18	2	2	2	6	6	6
Student 15	9	19	2	4	3	8	7	4
Student 16	10	19	5	3	4	5	7	7
Student 17	9	14	3	2	4	5	4	5
Student 18	13	15	4	5	4	6	8	8
Student 19	14	18	2	6	6	6	6	6
Student 20	10	22	2	2	6	7	5	10
Student 21	10	21	5	0	5	5	8	8
Student 22	11	23	3	4	4	5	9	9
Mean	**10.45**	**19.95**	**3.5**	**3.05**	**4**	**6.55**	**6.73**	**7**
Median	**10**	**19.5**	**3**	**3**	**4**	**6.5**	**6.5**	**7**
Standard Deviation	**3.10**	**3.58**	**1.60**	**1.59**	**1.35**	**1.60**	**1.67**	**1.70**
Variance	**9.59**	**12.81**	**2.55**	**2.52**	**1.81**	**2.55**	**2.78**	**2.86**

Appendix H

Results: Control Group

This group were taught by traditional teaching methods

Student	Pre-Test (30 marks)	Post Test (30 marks)	UK(pre) (10 marks)	Japan(Pre) (10 marks)	Australia(Pre) (10 marks)	UK(Post) (10 marks)	Japan(Post) (10 marks)	Australia(Post) (10 marks)
Student 1	19	23	8	5	6	9	7	7
Student 2	16	20	5	5	6	6	6	8
Student 3	12	16	5	4	3	5	5	6
Student 4	16	21	9	4	3	10	4	7
Student 5	14	15	5	5	4	6	6	3
Student 6	8	13	6	2	0	6	2	5
Student 7	7	12	3	1	3	5	2	5
Student 8	10	16	5	4	1	7	6	3
Student 9	15	20	4	8	3	6	8	6
Student 10	4	9	1	2	1	2	3	4
Student 11	9	11	2	4	3	3	6	2
Student 12	6	11	1	2	3	2	3	6
Student 13	8	15	4	3	1	6	4	5
Student 14	9	10	6	1	2	5	3	2
Student 15	12	16	4	5	3	5	5	6
Student 16	4	12	2	0	2	4	1	7
Student 17	8	11	3	3	2	3	5	3
Student 18	11	14	5	4	2	4	6	4
Student 19	7	12	4	0	3	5	2	5
Student 20	10	17	5	3	3	6	5	6
Student 21	11	16	3	5	3	5	4	7
Student 22	7	11	2	2	3	4	2	5
Mean	**10.14**	**14.59**	**4.18**	**3.27**	**2.73**	**5.18**	**4.32**	**5.09**
Median	**9.5**	**14.5**	**4**	**3.5**	**3**	**5**	**4.5**	**5**
Standard Deviation	**3.98**	**3.85**	**2.04**	**1.93**	**1.42**	**1.94**	**1.89**	**1.72**
Variance	**15.84**	**14.82**	**4.16**	**3.73**	**2.02**	**3.77**	**3.56**	**2.94**

Appendix I

Post Questionnaire

	Strongly Agree	Agree	not sure	Disagree	Strongly Disagree
1. I enjoyed using the Internet to learn about Japan, the United Kingdom and Australia	☐	☐	☐	☐	☐
2. I feel I learned a lot about Japan, the United Kingdom and Australia	☐	☐	☐	☐	☐
3. Internet Projects should be carried out more in class	☐	☐	☐	☐	☐
4. The use of Internet can make learning more interesting	☐	☐	☐	☐	☐
5. I would like to use the Internet to help me with other subjects	☐	☐	☐	☐	☐
6. It is easy to copy other people's work from the Internet	☐	☐	☐	☐	☐
7. The Internet is difficult to use	☐	☐	☐	☐	☐
8. Some information was hard to find	☐	☐	☐	☐	☐
9. The Internet can be frustrating to use	☐	☐	☐	☐	☐

Any other relevant comments about using the Internet____ Thank you!

Appendix J

<u>K-W-L-S Chart</u>

Name:________________ **Date:__________________**

K **What I *know***	**W** **What I *want* to know**	**L** **What I *Learned***	**S** **What I *Still* want to know**