Using the Internet to Research Curriculum-Based Topics at the Grade Five Level

A Thesis

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Abstract

As part of an action research study, the best learning and teaching strategies for the most effective use of the Internet as a research tool for grade five students were examined. Students' reactions and attitudes to using the Internet were explored throughout the study by use of a questionnaire, student learning logs, and participation in an inquiry-based learning activity developed by the researcher called a webquest. Student-centered and cooperative learning approaches, constructivist teaching practices as well as student enthusiasm for learning were examined during the research. The study's findings support the contention that the Internet can be an effective source of information for students at the fifth-grade level, and that appropriate use of the Internet can increase student understanding of curriculum topics, can encourage cooperative and student-centered learning, and can actively engage students in the information process. Implications for effective teaching and learning strategies that have an impact on student learning are also highlighted.

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I would also like to thank the Eastern School District and its administrators for allowing me to conduct my study in one of their schools. I would particularly like to thank my grade five students who were co-researchers in this study. Their honest and valuable participation allowed me to critically examine our use of the Internet as a research tool in education.

Finally, I'd like to thank my wife, Charlotte, and our children, Nolan and Kaela, for their support, patience and understanding from beginning to end.

Dedication

I would like to dedicate this thesis to Charlotte, Nolan, and Kaela,

for their love, patience, and support throughout this journey.

May all of our learning never stop!

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Chapter 1 - Introduction

Our world is a technological one in which television, video, VCR's, DVD's and computers play a major role in how children receive and process information. As a result, many students enter the classroom with rudimentary skills in using technology. Every student in Prince Edward Island has access to computers and this accessibility has supported a shift from the early use of computers as a tool for drill and practicing to the use of the computer as a tool for enhancing higher level thinking skills.

The *Journey On* (2000) document, developed by the Prince Edward Island (PEI) Department of Education, highlights the advantages of technology integration in education and demonstrates that communication and information technologies (CIT) can support contemporary educational approaches such as co-operative and resource-based learning. *Journey On* (2000) suggests that digital technological learning resources such as the Internet may provide students with the opportunity to access information-rich resources. This may also result in students having learning experiences that extend far beyond those of the traditional classroom (p.26). In our schools students have available to them a wide variety of Internet-based multimedia applications such as video-conferencing, digital video, java applets and java script, which have the potential to enhance education as well as provide entertainment and facilitate communication more effectively than ever before.

Communication and information technology can be a powerful force and, at least in theory, may have many educational benefits (Hammett & Barell, 2002). More than before, students have the potential to navigate through large amounts of information and

the use of the computer and its applications, as stated above, is on the rise in our school systems. However, frequent use of computers does not by itself guarantee that students will become more efficient learners, and putting computers with Internet connections into the classroom setting will not automatically develop students who are able to collect, sort, categorize and draw conclusions from the information they may find on the Internet. These skills must be specifically taught.

Various forms of communication and information technologies are now commonplace in public schools (Hammett & Barell, 2002). According to the *Journey On* document (2000), the way to enhance learning is to provide strategies and suggestions that will effectively integrate these technologies into the public school curriculum. Transmission modes of teaching are being replaced by the inquiry and project-based learning models (Housego & Freeman, 2000; Wyld & Eklund, 1997) . Similar models that are outlined in the *Journey On* (2000) document invite both teacher and student to investigate, explore, and critically examine much of the information that is available on-line to students today.

In order for students to be able to critically examine this information teachers must have the proper training in the use of technology and adequate resources should be made available to them. A national survey of how teachers use computers as a classroom teaching resource concluded that a teacher's educational philosophy often plays a significant role in whether or not he or she will use computer applications in his or her teaching (Becker, 2001). This research also found that most teachers use the computer in the classroom as a word processor exclusively and only those teachers with

more constructivist teaching philosophies use computers in more challenging ways. The teacher's own technical expertise, professional experiences, personal involvement, and philosophy will ultimately determine how effectively he or she will use the computer for other applications within the classroom. The key, then, is not to simply supply teachers and classrooms with computers, but rather to have teachers become more aware of the ways computers and their educational applications can be utilized in the learning environment. Therefore, we must find ways to increase teachers' comfort levels and build their technical expertise and professional experiences in using technology tools like the Internet in the classroom.

Researchers agree that traditional teacher-centered approaches to learning are being replaced by more student-centered approaches to learning; teachers are viewed as facilitators of information processing itself instead of just being providers of information (Bigge & Shermis, 1999; Ewing, Dowling & Coutts, 1999; Housego & Freeman, 2000; Sivin-Kachala, Bialo & Rosso, 2000). With the technology that is now available, students are eager to reach outside the confines of the school or community and participate more fully in the many aspects of a much wider, global society (Hammett & Barrell, 2002). In particular, our students are encouraged to utilize new forms of multimedia technology to do research, engage in individual and class projects, and communicate with others around the globe. It is evident that the skills which will enable them to adapt to this changing educational environment are needed (Harris, 2001). On the educational front some contend that this new technology encourages students of all levels to become more actively involved in the process of learning and it

therefore follows that teaching strategies must change in order to adapt to this new form (Jonassen, 1991).

The use of the Internet and its "World Wide Web" has grown in startling proportions over the last several years. Many school systems are being encouraged to integrate this type of technology into classroom practices (*Journey On*, 2000; Kerrey & Isakson, 2000; Shields & Behrman, 2000). The Internet has become an increasingly important feature of the learning environment for teenagers (Lenhart, Simon, & Graziano, 2001). This research on school-related use of the Internet showed that 94% of youth between the ages of 12 - 17 who have Internet access use this resource to conduct school research.

There is a growing body of research which addresses the various uses of the Internet and its effect on learning. However, there are gaps in the research literature. What is the role of the Internet in the information process? What is the effectiveness of Internet use as a resource-based learning activity? How can teachers be assured that students use the resources in an effective manner? Since so many of our schools on Prince Edward Island use the Internet for educational purposes, there is a critical need to examine how this resource can be used most effectively in education. The impact of the Internet, whether positive or negative, will have a lasting effect on Prince Edward Island's school children at all grade levels.

Rationale

As a classroom teacher of elementary and middle school students, I have observed a positive correlation between student attitudes and academic success rates

when students use the Internet to locate information and resources to complete school-based projects. In many cases the Internet is used as the primary resource for finding up-to-date information on Science and Heritage Fair topics (Slater, 1998). Some researchers suggest that students using the Internet to locate information of this kind are more likely to find the relevant information that they require (Kerrey & Isakson, 2000; Saliba & Shoemaker, 1997). Many students believe that the Internet, because of its quick retrieval of information, is superior to traditional library materials, though this belief is not necessarily borne out in practice (Lenhart, Simon & Graziano, 2001).

The Internet is becoming a vital tool for students who wish to access old or new information quickly. However, just placing computers with Internet connectivity into the schools does not necessarily mean that it will benefit the teaching profession or the student experience. There is a need to explore the best practices surrounding the use of the Internet to complete curriculum-based learning activities. It is also necessary to reflect upon which teaching strategies are most effective for helping students learn while they utilize the Internet for this purpose. Through a study exploring the best practices in the use of the Internet as a research tool in the information process, educators will develop a clearer understanding of the effective use of the Internet as a resource. Students who participate in such a study will also be given the opportunity to discuss and learn how communication and information technology supports the information process.

Research Question

This research will address the following question: *What are the best learning*

and teaching strategies that contribute to the most effective use of the Internet as a research tool for grade five students?

The goal of this action research project will be to explore the factors that have an impact on student learning as grade five students utilize the Internet as a source of information to research curriculum-based topics. As a teacher-researcher, I will apply factors to refine educational practices in utilizing the Internet as a research tool. In addition, this study will explore the participants' reactions and attitudes when learning and applying different strategies as they use the Internet to conduct research at this level.

Chapter 2 - Literature Review

Information Literacy

Historically there was a more teacher-centered, content-oriented approach to learning (Bigge & Shermis 1999). Learning environments often focused on short-term recall of facts rather than on the opportunities for deeper building of knowledge (Fulton, 2001). The underlying premise was that the teacher, and not the student, was the strongest factor in student learning. However with the advent of such computer technological advances as the Internet, the focus of learning tended to shift to the individual student rather than teacher-transmitted information (Tapscott, 1999). The Internet has the potential to center learning around the student instead of the classroom (Kerrey & Isakson, 2000).

Information-gathering requires students to take a much more active approach to learning (Doyle, 2003). This is deep-rooted in the constructivist approach to learning which emphasizes the building of understanding by active learners who have more control of their work. The constructivist approach to learning builds upon what students already know then actively involves them to go beyond information gathering to create something that is uniquely their own (Kuhlthau, 1993). It is not enough for students to just learn from what they have read in textbooks or other factual information gleaned from teachers; students must learn to investigate this information further, and build upon or construct meaning from what they have learned.

According to the Prince Edward Island's educational document entitled *Building Information Literacy* available at <http://www.edu.pe.ca/bil>, information processing

theory suggests that students should actively process, store, and retrieve information and engage in problem-solving activities where they create and share information with others. Much more than a simple regurgitation of information, the research process should involve the construction of new knowledge. Unfortunately some teachers who are responsible for empowering students to become lifelong learners do not necessarily comprehend the information process and this impacts the nature of student learning (Langford, 1998). To truly learn it might be necessary for students to go beyond just searching for information on assigned topics and then presenting their findings as mere copies of the original sources. Information literacy implies helping students develop the skills necessary to become actively engaged in the process of research. Teaching strategies must focus on developing student's abilities to think critically and students need to be encouraged to present new information in more creative and meaningful ways. The Internet may be a "tool" that has the potential to offer teachers and students solutions to some of these challenges. It could be that it has the potential to involve students in more purposeful interaction with information and provides a whole range of classroom projects or ideas that involve more than the mere rehashing of information (Harris, 2000).

The Internet provides opportunities for learners to develop a more constructivist approach to learning and gathering information (Wyld & Eklund, 1997). The learner, with guidance from the teacher, can now determine which are the best learning methods as he/she wades through the sea of information to create and share information with others. This allows the learner to become more actively engaged, allowing him/her to

think and function at higher intellectual levels (Ewing, Dowling & Coutts, 1999). The amount of information on the Internet far exceeds that information available even five years ago and it is expanding exponentially (Kerrey & Isakson, 2000). Students who have access to this information can become more self-directed and assume greater control over their own learning. With careful guidance and coaching, students may gain a clearer understanding of the material and can then present it in such a way that goes beyond the simple transmission of knowledge (Moursund & Smith, 2000; Rakes, Flowers, Casey & Santana, 1999).

Internet as a Research Tool

For the purpose of the present research, the literature on how the Internet is used by students and teachers as a research tool will be discussed. Over the past several years, I have witnessed an increase in student productivity while researching web-based sources for school-related topics. Students also appear to have an overwhelming desire to research school-related topics using the Internet as a primary resource where traditionally library resources, before the introduction of the Internet, were used as the primary resource. Ba, Tally, & Tsikalas (2002), Becker (2001), Bork (2001), Healy (2000) and Oppenheimer (1997) have discussed issues that have evolved as a result of Internet use and at the forefront is the issue of inequity. Children from more affluent social and economic backgrounds may have more access to information at home or in school than others. Other relevant issues such as how children process information, their varying interest and age levels, their recreational uses of computer technology, and their parents' knowledge and skill levels may have a positive or negative impact on how

children view and ultimately utilize the computer and Internet for personal use.

As the Internet began to grow in popularity, it started to become more interactive and many teaching communities began to update their web sites to make them more visually appealing and entertaining. The Internet exhibits excellent resources for math and science-related topics, museums often give virtual tours, scientific agencies like NASA display satellite pictures of planets and government agencies host a variety of information on history, art and medicine for all those who wish to access it. The most popular Web sites for teachers are those that offer lesson plans on curriculum-related topics or sites that list favorite links for these topics. Many agencies, museums, and organizations followed suit and began building comprehensive education-based web sites (Alevizou, 2000; Kerrey & Isakson, 2000).

Despite this popularity, Internet usage in education has created quite a few challenges. Powerful search engines turn up huge quantities of non-relevant data that can divert from students' actual queries . Students become lost in an information jungle and end up engaging in many time-consuming trial-and-error procedures that yield little relevant information. One of the major problems that students face when using the Internet for research purposes is how to validate the information they encounter. Traditional library sources provide information to students that has gone through rigorous validation already. We know that the publishers of books, magazines and encyclopedias are accountable for information accuracy. The Internet, however convenient, has none of these safeguards and students should be reminded that the quality and depth of the available information can be in jeopardy (McKenzie, 2000).

The Internet brings a substantial amount of information to the individual student but at what cost? Does it meet the high standards of reliability and validity achieved by the publishers of traditional library-related print materials? Students, using the Internet to find information, are constantly being bombarded with images and pop-up-windows that are designed to attract. Many Internet sites contain "info-glut" (too much information), "info-garbage" (too much irrelevant information), and "info-tactics" (manipulative strategies to influence thinking) (McKenzie, 2000). This may be the reason that some students adopt a "cut and paste" philosophy when researching on the Internet. Here they get as much information as they can as quickly as possible to download into their personal files. The plagiarism that is often evident in research projects completed using traditional library resources is also frequently apparent in the finished projects of students conducting research on the Internet.

> The ease of gathering information on the Internet has a darker side. The simplicity of finding out things on the Web also makes it easy for students to cheat. Cutting and pasting text from a website is effortless. So is wholesale copying or purchasing finished essays or reports. (Lenhart, Simon & Graziano, 2001, p.5)

Hammond (2002) refers to the two types of cyber-plagiarism in which students engage when doing research on-line: intentional (deliberate plagiarism) and unintentional (plagiarism due to poor referencing skills). Most middle school students don't intentionally try to plagiarize, but do get caught in the process of cutting and pasting to get their projects done because they simply run out of assigned time. In many cases,

students have not been properly taught and/or held accountable for citing and crediting information they find readily available on the Internet. Selecting, evaluating, and properly crediting information found on the Internet are some of the skills outlined in the *Journey On* (2000) document.

Traditional school library resources have changed in the last few years because of the popularity of the Internet. School libraries are now privy to current sources of information such as electronic books and CD-ROMs that offer many relevant and up-dated topics (McKenzie, 2000). CD-ROMs have excellent searching abilities and often allow students to compare and contrast many topics. Some of the possible constraints of the school library are that materials may not always be available for students because of overuse, current information is not always up-to-date or relevant, and often libraries face financial restraints that limit the quality of new books available to students (Saliba & Shoemaker, 1997). However many of the traditional library reference sources are trying to change their image for students. Students can now access many of a school's library reference sources on-line. Encyclopedias like *Encarta* and *Britannica* are attempting to reestablish themselves as viable and up-to-date information sources on-line. Due to the popularity of the Net and the shrinking sales of traditional print material reference sources, these well-established encyclopedias are connecting to the growing number of on-line references that are available on the Internet (Alevizou, 2000).

Student deficits in conducting research using either the more traditional library sources or the newer tool of research via the Internet concerns educators (Fulton, 2000; Kerrey & Isakson, 2001; Schrock, 2001). When using the Internet to research a given

topic students will access sites that are written by scholars in their particular fields but they will just as easily access information written by elementary school children. How does the student learn to differentiate between what is critical information and what is not?

Education In A Changing Society

To meet the daily challenges that children face in today's society students must be taught skills that enable them to cope with a changing world (Roschelle, Pea, Hoadley, Gordin & Means, 2000; Shapiro & Hughes, 1996). Educators are always seeking ways for students to interact more effectively with this changing environment. Students are expected to become proficient learners of traditional subject matter and must face the many challenges of an evolving society (Healy, 2000). We live in a world that is constantly being bombarded by technological advances and it is essential that students acquire skills that will prepare them for life and work in this quick-paced, ever-changing society (Tapscott, 1999). Technology plays an integral role in the education of our students and they are expected to use appropriate skills to interact with their immediate and global environments.

Via the Internet, most students have access to enormous amounts of information about many different subject areas (Kerrey & Isakson, 2000). This quickly accessed information has greatly increased our potential for better understanding the world around us (VanFossen, 1999). There are many different ways for students to view the world and interact with people of varying cultural and social backgrounds. Gathering information from the global environment is made possible through the constantly changing

information that is readily available on the Internet. However, it must be recognized that while the Internet can be a source of information, it can also be a source of misinformation (Bork, 2001). This makes it all the more critical that students be taught to evaluate the accuracy of the information they uncover on the Internet (Kubly, 1997).

The Internet has become an integral part of our ever-changing society and is recognized as an influential part of our children's lives. The Internet is a technological tool that is capable of providing our children with ideal learning environments and it is privy to fast and updated information allowing children to access information in ways that was considered almost impossible only a few short years ago (Revenaugh, 2000; Shields & Behrman, 2000). In addition, the Internet also allows children to readily communicate in real-time, as with chat-rooms, or in e-mail or web-boards with people of different cultures and ethnic backgrounds from across the globe. Although the Internet is not a solution to all of the challenges facing education, it does provide a rich learning environment for students which has the potential to increase the academic performance of children (Berenfeld, 1996; Shields & Behrman, 2000; Wartella & Jennings, 2000). To properly prepare our children for tomorrow then we must learn to utilize the learning capabilities made available to us through the Internet (Kerrey & Isakson, 2000).

The P.E.I. Department of Education's *Journey On* (2000) document was developed to provide a resource framework for teachers and to integrate communication and information technology into the classroom. The *Journey On* (2000) document outlines how students will use technology to acquire the knowledge and skills to meet the daily challenges required to become competent members of our society.

> The purpose of the *Journey On* document was to focus on how CIT (Communication and Information Technology) can be used from grades 1-12 and areas of the curriculum as part of a more global strategy that will contribute to the development of technologically competent and literate individuals graduating from our school systems. (p. 2)

Applying technology in everyday situations therefore enhances students' chances of improving life-long learning skills. The advantages of technology-use outlined in the document are based upon contemporary beliefs about learning which espouse that the correct use of technology has the potential of promoting learners' creative thinking and problem-solving skills, providing them with rich resources and learning experiences, introducing ample motivational techniques, and supporting co-operative and resource-based learning styles (p.7). Every child therefore should be given the opportunity to use technology to their educational advantage (*Journey On*, 2000).

The role of the teacher has also shifted. Student-centered approaches to learning have replaced traditional content-based educational approaches. Once an "information giver", he or she is now an "information facilitator". The student's role has also changed from that of "passive learner" to one of "problem solver or decision maker" (Gibson & Oberg, 1997; Hack & Smey, 1997; Rakes et al., 1999). New experiences encourage growth of the student's already existing body of knowledge. Newer models of teaching (group work, inquiry and project-based learning) are replacing the older transmission models of learning (Hammett & Barell, 2002). Many educational researchers agree that technology enhances or supports a student-centered approach to

learning (Ewing, Dowling, & Coutts, 1999; Housego & Freeman, 2000; Jiang & Ting, 1998; Wyld & Eklund, 1997).

The role of the Internet in education may potentially have a huge impact on how teachers teach and students learn. Internet connectivity has challenged many of our traditional educational practices. There is now an urgent need to identify the educational issues that arise when the Internet is introduced into the social structures of classrooms and schools and to evaluate its effectiveness as a learning tool (Dooling, 2000; Marx, 2001)

Learning Theories Related To Internet Usage

Educational theorists such as Piaget, Bruner, and Vygotsky demonstrated that children learn best in educational environments that use a variety of learning materials, encourage collaboration and teamwork, provide learning experiences through exploration and emphasize the process of problem solving and decision making (Bigge & Shermis, 1999). The P.E.I. Department of Education's *Journey On* (2000) document is predicated to a great extent, on the ideas of these educational theorists. Some of the beliefs underlying the uses of technology in our educational system are: (a) technology competence is a requirement for literacy and life-long learning; (b) students today require knowledge, skills, and attitudes for dealing with the rapid change and growth of our knowledge base; and (c) technology when used appropriately enhances student-centered learning and the teacher's role as a facilitator (p.4).

Students today are different from the generation of learners before them because they are being exposed to a variety of technological innovations that have lasting effects

on learning (Tapscott, 1999). These innovations, some in their infancy stage, have a dramatic effect on the process of how students learn. Some students are introduced to technological devices such as video and digital cameras, CD-ROMs and high-speed computers with their numerous interactive programs. These are frequently commonplace to students both in school and at home (Wartella & Jennings, 2000). Information that was once available only on television is now easily accessible on the Internet and indeed the Internet is even replacing television as a source of entertainment for many students. Students seek interactivity; they are no longer content to be just the "listeners" and "viewers" of information; they want to become the "users" of information (Green & O'Brien, 2002; Tapscott, 1999).

Educators are trying to keep pace with this interactivity and are using the capabilities of the Internet to offer students more challenging learning opportunities (Fulton, 2001). Many of these learning projects are created by teachers to help their students use the Internet to accomplish curriculum-related learning goals. Some of these learning activities include using the Internet to facilitate communication with key-pals or involvement in group to group exchanges or global classrooms where students from different parts of the world study a common topic together. Also students may be connected to specialists from universities, businesses, governments or other schools so that these experts can provide them with appropriate answers they may not be able to find elsewhere (Harris,1998). The shift from teacher-centered to more learner-centered education enables teachers to use technologies like the Internet to enhance the learning experiences of their students (Housego & Freeman, 2000; Rakes et al., 1999; Wyld &

Eklund, 1997).

Becker (2001), in a survey of how teachers in the United States utilized their computers in the classroom, found that the teachers with the most constructivist teaching philosophies were the more supportive users of computers within the classroom. They used computers more frequently and in more challenging ways and were more likely to involve their students in assignments that encouraged students to use the computer. The classroom is becoming a more student-centered environment where the primary focus of learning is directed by the questioning techniques of the teachers (Lynch, 1999; Rakes et al., 1999). This view has a profound effect in schools because it challenges the traditional teacher-student relationship. Students try to gain some control over their own learning and this in turn will change some of the teacher-centered instructional practices (Moseley et al., 1999).

Research studies on the application of the Internet in education focus on the positive or negative effects that it has on students of all grade levels. Wyld & Eklund (1997) examined how the Internet was used in elementary classrooms for the purpose of helping educators implement new learning practices. They found that more students were utilizing the Internet to access vast amounts of current and available information and that this capacity enhanced student learning. Housego & Freeman (2000) examined "web-based" learning systems and found that the most effective form of learning was utilized best with student-centered instructional practices. Web-based learning requires the student to take a more active approach to learning. Here the student learns not necessarily by listening to instructions or taking notes but rather by exchanging ideas

and concepts with other students or teachers to acquire a much broader learning approach. Moursund (1999) agrees that in the hands of a skillful teacher, a Web-based project increases students' knowledge by challenging their higher order thinking skills. The students learned best when they became engaged in the web-based systems and were required to demonstrate their understanding of a concept.

Ewing, Dowling & Coutts (1999) suggest that the Internet is capable of supporting learning that is context-based and relies on real-life environments. Use of the Internet as a source of information allows students to become active learners who gather meaning from what they do. These researchers also examined learning theories that were relevant in the planning, designing and implementing stages of information and communications technology (Internet). They found that this type of technology engaged learners interactively and helped them to function at much higher intellectual levels. If we agree with the researchers and practitioners that learning is not just a memorization of facts but rather an understanding of the concepts and that students need to find answers and solutions to their own questions and problems, then it is equally important that we examine how the Internet and its vast resources can be used to foster this kind of approach.

Internet Use in Education

Barker (2002) describes the Internet as

> A network of networks, linking computers to computers. The Internet itself does not contain information therefore it is a slight misstatement to say a document was found "on the Internet". It would be more correct

> to say it was found *through* or *using* the Internet. What it was found in (or on) is one of the computers linked to the Internet (p. 1)

The World Wide Web (WWW), on the other hand, is "A graphical interface for the Internet that is composed of Internet services that provide access to documents which in turn provide hyperlinks to other documents, multimedia files, and sites." (Kobler 1999, p. 285). These two terms, however, are often used interchangeably when we refer to Internet use in an educational setting. In essence, the Internet is a tool which allows people ready access to various forms of digital information be it sound, text, graphics or video. In the educational setting, its use has changed dramatically in the last several years. Internet use has progressed from just a few connections in isolated school computer labs to entire schools being connected, which gives every student at every grade level access to the WWW (Becker, 2001). The Internet has become an integral part of every school's technology system and wholly integrated into every Prince Edward Island school. Here students, by the end of grade six, are expected to understand Internet terminology, navigate a web page, recognize and use the Internet as a source of information and use safe and friendly search engines to access information (*Journey On*, 2000).

Undoubtedly, using the Internet for teaching is a benefit for many educators in the schools that are utilizing it for educational purposes. It has the potential to facilitate student access to boundless stores of information that can be retrieved effectively and efficiently (Fulton, 2001; Marx, 2001). This accessibility of information adds pressure

to other existing forms of information sources like books, magazines and similar print media found in school libraries. The Internet, in the earlier days of school use, was used almost entirely for communication purposes such as e-mailing information between teachers, students and classes. Today, the Internet has evolved so much and is such a part of the mainstream that it is often difficult to find articles in books or magazines that do not contain references to the WWW or as it is euphemistically referred to, the "super highway"of information. At one time it was difficult to find supplementary or complementary material to accompany the curriculum material, but today the reverse is true; there is often so much information available on the Internet that it is commonly difficult to evaluate its effectiveness or accuracy.

The number of research articles that stress the positive aspects of the educational use of the Internet far outweigh those that caution against its use. Some of the negative opinions on Internet use comes from studies where researchers have weighed the pros and cons of distance education. Bork (2001) states that educators are taking what is happening in the classroom and then attempting to recreate the same environment on the Internet and the research indicates that the lack of student interaction along with an insensitivity to individualistic learning needs are the main drawbacks.

The possibilities for education when the Internet is used as a resource are unlimited (Moursund & Smith, 2000). If used properly it is a very effective learning tool according to a recent report released by the Web-based Education Commission to the United States Congress (Kerrey & Isakson, 2000). According to the Commission the Internet is not just a fad or a quick fix; it is here to stay. However it also warns that it is

to be viewed cautiously: "The Internet is not a panacea for every problem in education. We need to be realistic. But we also must realize that the Internet is a tool that can help us empower every student and elevate each individual to new levels of intellectual capacity and skills" (p. 7).

If students have appropriate access, and teachers can provide proper instruction in its use, then the Internet has the potential to provide up-to-date information on any number of topics in any number of grade levels. It is an excellent resource for conducting project-based learning (Moursund & Smith, 2000). The Internet, therefore, has the potential to improve student capacity to perform research. In many cases teachers and students use the Internet for this purpose only and it simply becomes an information source; however, the Internet can be utilized for much more than this (Green & O'Brien, 2000). If students are expected to problem solve as well as research topics, then the Internet becomes a much more powerful educational tool. Students should be using the Internet as a resource that allows them to interact with others to find solutions to problems. This dual capacity for information retrieval and problem solving give rise to higher-order thinking skills and makes the Internet, at least in theory, a very important educational tool.

Today's student often comes to classes armed with the most recent information on school-related topics. In addition to being current, the information also contains a number of different viewpoints. If students are exposed to so many different points of views on topics that may have some pertinence in their lives, then teachers could advocate a guided-inquiry approach to learning and bring the world of expanding

information, via the Internet, to everyday classroom situations (Marx, 2001). However, accessing this information can be a mind-boggling experience for the average high school student and an information nightmare for the average middle grade student. The availability of different types of information with differing viewpoints on any one topic often leads to frustration for many students and, while there is the potential for limitless information, the potential for "junk" is also commonplace (Nigohosian, 1996).

A quick Internet search on any educational topic shows just how many people and organizations are vying for the educational market and the findings from these sites are unauthenticated in many instances. The sheer vastness of information is simply overwhelming. Inevitably, students are forced to wade through junk information in an attempt to search out what is viable and authentic. When conducting on-line searches students often end up wasting valuable time at home or in school. Students must be educated on how to execute proper searching techniques (Carper, 1996; Fulton, 2001; Lewin,1999; Moursund & Smith, 2000; P.E.I. Department of Education, 2000).

Additionally students need to know how to effectively evaluate all information garnered from the Internet. They must be taught proper search engine techniques and learn how to refine their searches by using key words (Schrock, 2001). Available Internet search engines access so much information on school-related topics that a simple search using the word "space" leads to a multitude of hits of which only a few will yield useful information. Students must learn to effectively "site read" to critically analyze web sites for applicable information (Lewin, 1999).

Student Usage of the Internet in Conducting Research

In observing students' use of the Internet to conduct research, I have found along with other researchers that too often they waste time using major search engines (Hammond, 2002; Kubly, 1997; Nigohosian, 1996; Watella & Jennings, 2000). Some students, who were not taught key word searching, spend whole class periods trying to find related sites on a topic of interest and end up wandering from site to site (Shields & Behrman, 2000). Many of these sites are unreliable and often use superficial "cool" or "fun" things to draw a student's attention; frequently they are controversial in nature or written from a biased point of view. Ebersole (2000) examined student use of the WWW and found that the majority of middle and high school students were attempting to use the Internet for research and learning but only a small percentage of them were actually looking at sites deemed suitable for that purpose. Typically many students depend on Internet search engines like Alta-Vista, Yahoo, Google and Lycos to conduct their searches. These are effective search engines and return a variety of research-related topics, if students know how to properly conduct searches. There are available video tapes that show students how to conduct effective searches using available search engines. One such video entitled "AltaVista Canada" shows students how to conduct proper searches using their website <www.altavistacanada.com>. Here students are encouraged to limit their searches to a few well-defined words or phrases and to use Boolean operators, which are words such as "and", "or" and "not" to simplify their searches. Students are instructed to look carefully at the Universal Resource Locator (URL) and to look for key words or phrases that may indicate whether the site is worthy

of a closer look. Finally, students are instructed to look at some of the key address words like "gov", "ed", "com", and "org" that may indicate the authenticity of the chosen sites. These strategies are also outlined in the *Journey On* (2000) document to help students identify reliable authorship when selecting Internet sites for research.

Students' lack of knowledge and skills on conducting effective searches appears to be an issue in many of the research studies on using the Internet in education. Teachers found that students who tried to utilize the Internet did not know how to narrow the scope of information they reviewed (Schrock, 2001). It seems to follow then that the learning process could be much enhanced if students were given proper instructions on how to pursue on-line searches (Slater, 1998). Carper (1996) recommended that students should be provided with on-line information and also be instructed in Boolean searching methods before using the Internet to research science projects. Sivin-Kachala, Bialo & Rosso (2000), in a review of over two hundred research studies on the effects of technology on achievement, found that in most cases student instruction in search techniques was given prior to any research in which students were required to utilize the Internet for information.

The most successful educational on-line sites involve students in the process of learning. One such site entitled *Interactive Mars Habitat* is an on-line interactive site which inspires learning about space science and technology through the use of a web-based Mars simulator and is available at <www.exploremarsnow.org>. These sites are interactive in that they have students collect, compile and compare many different types of information. Harris (1998) noted that some of the most effective learning unfolds

when students share information that they have learned by publishing, organizing or reporting that information on-line to others. Students are involved in collaborative projects which involve tele-computing activities such as keypals, tele-field trips and social action projects that encourage authors/hosts to sign on as expert participants to answer student questions online. The more opportunities that students have for sharing, the more likely it is that they will participate fully in their projects (Harris, 2000). According to Moursund (1999) the most valuable Internet sites must have several key characteristics: they must be learner-centered, focus on real world problems , offer opportunities for challenging and higher-order thinking, involve students in an end-product or presentation and encourage the collaboration of students and their teachers.

Online collaborative projects draw on local and global resources and allow for dialogue to take place between teachers and students from around the world (Cena, 2000). One such project entitled *Take a Dip: The Water in Our Lives* is an on-line collaborative project where students team up with other students or classes around the world to test the quality and research the cultural significance of fresh water. This Center for Innovation in Engineering and Science Foundation (CIESE) collaborative project is available at <http://www.k12science.org/curriculum/dipproj2/en/>. Students using these collaborative projects are no longer limited to just the information that is available in textbooks but can explore other cultures and backgrounds allowing them opportunities to become critical thinkers (Fulton, 2000; Harris, 2001). Web-based projects are also becoming popular and can be used to utilize the vast resources of the Internet; however, to be really effective they must focus on the learning levels and aptitudes of the students.

Open-ended projects that require students to find and evaluate information are more suitable for upper levels in high schools as students at this level are quite capable of both finding and evaluating information. This type of project, entitled Handbook of Engaged Learning Projects, typically targets grades 9 - 12. An example can be found at <http://www-ed.fnal.gov/help/Wegley/index.html> in which physics students are asked to be involved in an open-ended study of the application of physics to radiation therapy. These may be inappropriate for elementary and middle school because younger students generally need to focus more on how to find and evaluate the information that is available to them and not as much on the quantity or quality of the information.

The Internet offers students many opportunities to be involved in hands-on school projects. Many sites encourage students to develop skills that require scientific understanding. A web-based project entitled *A Journey Through Space and Time* was developed as an interactive web site in which students were allowed to gain access to scientific grade telescopes on-line; this site is available at <www.csu.edu.au/telescope>. After the students had the opportunity to use this interactive site it was found that they showed marked differences from previous post-test questionnaires (McKinnon & Geissinger, 2002). These students became much more motivated and their hands-on experiences fostered a greater appreciation for scientific ideas. A similar web-based project entitled "Kids as Global Scientists" developed by the University of Michigan and located at <http://www.onesky.umich.edu/kgs01.html> had students developing, interpreting, and explaining scientific data related to weather (Songer, Lee and Kam, 2000) . The researchers found that students' content understanding increased

dramatically from pre to post-tests. Wright & Dickerson (1999) found similar increases in student interest while interacting with on-line games that taught students information about scientific elements.

How do we overcome some of the difficulties such as the authenticity or quantity of available information that students often encounter when using the Internet for researching purposes? Peha (1995) suggests that the value of using the Internet depends largely on the role that educators and teachers place on its implementation in the schools. To overcome some of these difficulties we must be more vigilant when we introduce students to the Internet. Students must be expected to reach specific deadlines and objectives for on-line projects. Pre-selected Internet sites should be searched diligently by those creating the projects for relevant and valid information before they are assigned to students. Attention must be given to teaching students how to use the Internet so that they can effectively find and use the best sites that it has to offer (Ebersole, 2000). Sufficient in-school time must be given to the students for completion of projects to ensure equity for all students. Constant supervision of students looking for information on-line is necessary not only to police controversial topics but also to ensure that assigned tasks are properly structured (Kubly,1997).

Perceptions and Roles of Teachers Utilizing the Internet

The majority of teachers who are presently working in the educational system began their teaching careers before the introduction of the Internet as a viable teaching tool and for various reasons many teachers are still hesitant to utilize the Internet in their teaching. Earlier studies indicate that variables like ongoing training, technical support,

home access, in-servicing, lack of administrative support, and availability of time to learn how to incorporate the computer into teaching are some of the factors that discourage teachers from using this technology in their classrooms (Gallo & Horton, 1994; Gibson & Oberg, 1997). Many still believe that they have to be experts before they can successfully implement the use of something as overwhelming as the Internet in their teaching. Other teachers don't see the need or purpose of the Internet in the school or simply see it as a negative addition to their already hectic school day. Pedagogical practices, however, are changing and the Internet is now being used by more teachers every day. Cox, Preston and Cox (1999), Ertmer, Gopalakrishnan and Ross (2001), Hack and Smey (1997), Kumari (1998), Peha (1995) and VanFossen (1999) examined and surveyed teachers' opinions about the Internet. In many studies teachers realized that the Internet is a useful tool for enhancing classroom learning.

Teachers are discovering that the Internet can be an effective learning tool if used properly. Teachers, guided by constructivist theories of learning, are using the Internet more to conduct student-centered learning (Becker & Riel,1999; Bigge & Shermis, 1999; Brown, 1997; Harris, 2001). Teachers offering choices in learning have become "collaborators" in the information process and the success of student learning is measured by how the child learns. Teachers who demonstrated exemplary use of technology in their classrooms were those who devised innovative programs and integrated technology into their programs rather than teaching it separately (Ertmer, Gopalakrishnan & Ross, 2001). Teachers who involved their students in project-based work and assigned projects around topics of interest rather than wholly on the curriculum were also considered to be

exemplary teachers (Cox, Preston & Cox 1999). Peha (1995) found that as the Internet was introduced into the classroom, teachers believed that the primary benefit to students was that it enhanced their awareness of being part of a global community.

Of course, no two teachers will ever use the Internet for teaching in the same way. The real issue is not whether the Internet can be used to enhance learning because the majority of the literature that exists on Internet usage in education reveals that it can be used as an information medium to transform student learning in powerful and meaningful ways. The key question that dominates most of the literature on Internet use in schools is not whether it will be useful but rather how the use of CIT such as the Internet could potentially transform education and create a better learning environment.

Summary

The computer has become an important feature of the learning environment for our children. We have witnessed the increased use of the computer as a learning device since it was introduced into our school just a few short years ago. Since that time there have been numerous studies on the effectiveness of computer technology in education. Many of these studies have concentrated on the various ways that computer technology can be used to improve how and what children learn in the classroom (Kerrey & Isakson, 2000; Moursund & Smith, 2000; VanFossen, 1999).

Shortly after the implementation of the computer in the classroom came the introduction of the Internet with its potential to offer students information in larger quantities. As Internet capabilities grew, students were connected to a larger variety of information, facts, opinions and interpretations than was originally believed possible.

Educators had to rethink the ways that we could effectively use this information to improve student learning. With the wide usage of the Internet, the educational dilemma now centers around how to utilize this information with regards to quality and reliability. How do we teach our children to become critical users of the information that is now available to them via the Internet?

We demand that our students become more effective learners and more critical of the information they receive daily from any number of sources. The purpose of having students conduct research is to utilize an inquiry approach to learning in which critical fact finding, acquiring new ideas and supporting new positions and viewpoints are integral parts of the learning process. Since the information itself is so readily available on the Internet educators must teach students effective ways to research curriculum-related topics. Knowing how to use the Internet is useful only if we can encourage our students to critically reflect upon the information that they are accessing. By helping students develop the needed skills necessary for critical evaluation of online information we enable them to utilize the Internet for gathering, interacting with, evaluating and sharing knowledge with others.

The research literature suggests that the role of technology, especially the Internet, is becoming an increasingly important feature in the learning environment of our students. The Internet is providing educators with the opportunities to set in motion a wide range of new teaching and learning practices (Wyld & Eklund, 1997). Through this medium, students now have access to information that enables them to reach beyond the confines of the familiar classroom environment and search for information acquired from

a more global perspective. The use of the Internet is not only changing the way educators construct learning experiences in the classroom but it also redefines many of the conventional methods of instruction. Traditional content-based educational approaches are being replaced by more student-centered approaches to learning. Internet connectivity has challenged many of these traditional approaches and accessibility to vast amounts of information is redefining the learning experiences of our students. What impact, if any, does the incorporation of the Internet into existing teaching and learning practices have on the learning processes of our students?

Many researchers have found that students are likely to become motivated learners if they utilize the Internet for researching purposes. Students often use this medium to write and present reports on curriculum-related topics but are they actually demonstrating any real understanding of the material? Placing computers into the classroom with Internet access does not guarantee that students will become better learners. Can we be assured that this accessibility leads to positive learning experiences? It is important therefore to understand how the Internet can enhance or detract from students' development of learning concepts. If we want our students to become more reflective and critical thinkers then we have to examine the ways in which the Internet can be used to engage our students in the learning process.

Chapter 3 - Methods

This study was conducted using an action research inquiry method. The idea of action research was first introduced as a social management tool designed to improve the quality of human relationships and later gained popularity for its potential use in the educational setting (Elliot, 1985). Action research is a naturalistic approach in which the participants and researcher are directly involved in the collection of information (Patton, 2002). It is a reflective process which aims at improving the practice and understanding of the educational setting in which the teacher is immersed (Feldman, 2001). It is also collaborative in that it involves not only the teacher but the students as part of the shared inquiry process so the participant-students are actually co-researchers (Feldman, 2001). This research strategy presupposes that each of the students' ideas, thoughts and insights are equally important and that they offer their own interpretative analysis throughout the research study. Action research recognizes the judgements and perceptions that teachers develop over the years and allows them to utilize this background to seek answers to questions while carrying out research within the classroom environment. It is in the classroom setting that the teacher-researcher seeks answers to problems based upon the need to change some concept or strategy within his or her own teaching practices. Throughout this process new teaching concepts and procedures are being continually constructed through both the teachers' and the participants' reflections on their own observations and experiences. In theory, this leads to a better understanding of selected topics in which both the teacher-researcher and the student- participant/co-researcher gain valuable insight and knowledge.

This particular research design is well suited to the school context and it entails several steps. Initially, a problem is identified and data is then collected for a more detailed diagnosis of the problem itself. Problem identification is followed by the development of a plan of action or intervention in which the teacher-researcher reflects on the possible outcomes of that particular intervention. Data is collected from a variety of different sources which are then carefully examined to see if the proposed plan of action has been successful. After a careful assessment of the data, new action plans are developed and the entire cycle begins again. This process of reflection and re-evaluation continues with more reflection on the outcomes of the interventions (Kortecamp & Steeves, 2002). During the procedure the teacher-researcher reviews the success and failures and modifies lessons or strategies to overcome any perceived problems.

As outlined in the rationale, I recognized a need to explore the best teaching practices that would promote fifth-grade students' learning as they utilized the Internet as a tool for conducting research. Because many students use the Internet to conduct research, I noted that frequently the processes that students engage in are ineffective and time consuming for both the student and the teacher. The goal, then, was to discover the best teaching strategies to assist students in the effective use of the Internet as a tool to conduct research.

Using this process, I critically re-examined some of the teaching practices that I had developed over the years while integrating the Internet into curriculum-based classroom research. I believed that students had an important role in the research process and that their opinions and experiences as they went through the learning process were

beneficial. Together, we reflected upon, changed, and implemented new strategies to help improve the overall effectiveness of using the Internet to conduct research.

Inquiry-Based Internet Activity

As a classroom teacher I have used many strategies to enhance student learning and believe that the more students are involved in the learning process the richer the opportunities they have to explore and process new concepts. By using this research process, I hoped to determine how the Internet could effectively be a gateway through which students gained new knowledge and understanding of curriculum-based topics. Prior to this study, the student-participants utilized the Internet to explore teacher-designated web sites and answer questions or produce written reports based on the information retrieved. Using teacher-designated web sites provided useful information but did not always contribute to student understanding of the concepts. In order to be effective, it seems then that Internet activities should be more student-centered and engaging so that students interact with the material.

The study was developed around a webquest. This is an inquiry-based activity built upon a collection of information taken from various resources on the Internet. The webquest concept, developed initially by Professor Bernie Dodge of San Diego State University and discussed at <http://webquest.sdsu.edu/>, is becoming one of the most popular teacher-generated activities on the Internet. Webquests are interactive in nature and involve students of all ages. These electronic activities have students work on a specific task or adventure where they gain valuable information by solving some problem (Watson, 1999) as students are asked to compare, classify, observe, and identify many

concepts to complete specific tasks. Webquests are designed to focus student learning on more detailed and specific information rather than have students spend time aimlessly surfing the Internet for the same information.

This study was developed around the grade five science theme entitled Flight, a topic which builds on students' natural fascination with flying objects and animals. Since the students had not been previously introduced to the webquest concept there was a brief introduction and description to familiarize them with its design. A synopsis of the six essential components of the webquest was given and included: (a) an introduction that provided students with some background information; (b) a description of the task to be completed by the students; (c) a list of Internet resources to be utilized to complete the task; (d) a process section that described the steps of task completion; (e) a guidance section that told students how to organize the information; and finally (f) a conclusion section that brought closure and reminded students of what they had learned.

The instructional length of time for the completion of a webquest is usually five to six classes in the school's computer lab but the length of time can vary depending on the number of instructional goals or the degree of demonstration required for student understanding. For the purpose of this study there was a minimum number of six, forty-minute classes in the school's computer lab. An introductory session involved the task of dividing participants into selected groups, explaining the six steps involved, and then defining students' jobs and responsibilities. The next several sessions involved student participation as they worked together constructing, identifying, and researching the many details of the flight theme. Each of these sessions involved researcher and participant

interaction, searching for relevant information, and discussing and developing the concepts. The final product for each group was a class presentation on flight. I used a rubric I had developed to evaluate each group's presentation and it was based on how each group worked together, researched and comprehended the information made available.

Throughout each of the sessions I worked directly with the participants as they navigated through this inquiry activity. In their student learning logs participants were guided by a series of questions designed to help them frame their thoughts and impressions about the learning process. After examination of the learning logs, I then posed further questions, based on the participants' responses, to encourage more in-depth reflections. Examples of questions that were generated for students to respond to during the initial stages are found in Appendix I.

I also examined how motivated students were in learning, how co-operatively they worked together and what procedures and information-gathering strategies encouraged them to become more critical thinkers. Further analysis of the data was continued through the use of my field notes, reflective journal and conferencing sessions with selected students.

Researcher's Role

In action research the teacher-researcher becomes a facilitator who interacts with the participants (the students in the classroom) as they define and solve problems together (Stringer, 1996). In this study, I became actively engaged in observing the strategies that students used to conduct research using the Internet in the classroom. Many of my beliefs

are built on the mutual respect I share with students and therefore emphasis was placed on building a trusting relationship with the participants. I was aware that because I was also the participants' teacher, there was the potential for bias and an understanding that I may have had an underlying influence on students involved in this process. Through practices such as a reflective journal, collaboration with members of my advisory committee, and constant analyzing of the data, I attempted to address any issues of this nature as the data was collected. The participants were continually encouraged to provide feedback and share their opinions throughout the entire data collection so that ethical issues could be addressed if they arose.

Research Site and Population Selection

The twenty-three participants for this study were all the members of my fifth grade class in a mid-sized rural elementary school in the Eastern School District of Prince Edward Island, Canada. The total school population consists of about four hundred students from grades one to six. Action research requires that the teacher be engaged in the activity within the educational situations of the classroom (Feldman,1995); therefore, it was critical for the purpose of this study that the twenty-three grade five students from my class be invited to become the participants.

A parent information letter describing the study was sent home (see Appendix A). Approximately one week later a parent meeting was held to address any concerns or questions that the parents or guardians of the participants had. Participation of the students was voluntary and all twenty-three participants signed student consent forms and their parents signed the parent consent forms (see Appendices C & D). The participants

were observed in the school's computer lab which is set up in a separate closed room adjacent to the school's library and houses twenty-five on-site networked IBM compatible computers with Internet access. All students had some prior computer experience in word processing and gathering information from the Internet for school projects.

Data Collection

Data was collected through an initial questionnaire containing factual and open-ended questions (see Appendix E), student learning logs in which students completed a series of guided questions, student-teacher conferences that focused on further insights and experiences of selected participants, my field notes collected after every session and a reflective journal which contained reflections on my own insights and observations. After participants and their parents had given informed consent, a questionnaire was distributed to the students. The questions generated in this questionnaire were employed to survey students' facts and opinions on how they use the Internet for school and home applications.

Learning logs.

During the school term, I introduced the concept of the learning log to each of the participants. Here, guided by a series of researcher-posed questions (see Appendix H), students were given opportunities to reflect upon previous class projects involving teacher-designated web sites. I collected the learning logs and posed questions to guide future learning log responses. During the study, I posed similar questions to guide the learning log responses and because participants had been exposed to these types of

questions the process was less complicated. At the end of each class for the duration of the webquest the participants were given ample time to respond to these questions. I then responded to the learning logs after each session. For the purpose of this thesis, pseudonyms for student names have been used where student log entries are reported.

Student conferencing.

Here I asked a series of guided questions of the participants who had consented to this procedure. Conferencing with the student can be an effective learning tool as children's own thoughts and feelings about the role that technology plays in their lives are often neglected (Healy, 2000). According to Healy, younger children should be involved in the learning process and provided the opportunity to reflect upon how the Internet can help them become better problem solvers and decision makers. Healy also points out that the key to effective communication between students and teachers is to carefully watch students as they learn with technology and then to engage them in thoughtful dialogue about what they are actually learning. Throughout the present study, students were continually involved in this process. As they continued through the webquest, conferencing with the participants provided unique opportunities for them to provide further valuable information and insights.

Purposive sampling (Patton, 2002) was used to select students in this study. Only six participants were chosen to take part in the conferencing component of the research. The six participants who were selected for this process displayed the greatest range of characteristics possible in regards to gender and computer knowledge, and had the experiences and attitudes to ensure sufficient responses to the questions. By using the

process of reflection and consultation with supervisors, the questions developed for conferencing purposes were carefully formulated to ensure that the selected participants were given the best opportunity to present the events and occurrences in their own terms (Stringer, 1996). As they proceeded through the designated webquest, conferencing with the students enabled me to focus on their deeper understanding of the task. This avoided some of the writing pitfalls that students may have encountered in recording their thoughts and feelings on paper.

Transcripts of the conferences were tape recorded. I then transcribed the conferences and promptly shared the transcripts with the participants to check for accuracy (Stringer, 1996). Each conference was approximately twenty minutes long and was conducted in a quiet place with no distractions. All conferences were conducted at the school and at a time that was convenient for each of the selected participants. Transcripts were developed as fully and fairly as possible and kept in a locked filing cabinet for further analysis.

Field notes.

As the participants continued through the webquest, I kept detailed field notes of classroom observations. These field notes included my own insights, interpretations and beginning analysis of what might be occurring during the process (Patton, 2002). At no time during the study were the findings accessible to anyone other than myself and members of the supervisory committee.

Reflective journal.

During the study I documented personal perceptions and insights through the use

of a reflective journal. This reflective journal allowed for the exploration of new strategies for action as a result of problems that arose from the research. Entries into the journal were made immediately following each of the sessions with the participants allowing for accurate recording of the research process. Essentially, the reflective journal enabled me to further reflect upon the participants' use of strategies as they conducted research on the Internet.

Data Analysis

Data was collected from student conferences, observations, student learning logs and a teacher reflective journal. The data was carefully scrutinized and constantly re-examined throughout the entire process. After accurate examination of the data I made transcripts of all student conferences and learning logs. All findings were then coded and categorized. Any linkages generated by the contrasting and comparing of data were noted and then grouped into a structure whereby emerging themes were identified. Using the tape recorder for recording student conferences assured that students' full responses were accurately transcribed. The use of the word processing program *Word Perfect* also made it possible to retrieve and cross-reference any data made available during this research.

Trustworthiness

This study attempted to address the features of trustworthiness that apply to qualitative research. Credibility was established during this action research process by using data triangulation strategies. Here, multiple forms of data collection were used instead of relying on any one single form of data collection. Research data was collected

through student questionnaires, participant learning logs and six conferencing sessions for selected participants. Other data collection strategies included my field notes and reflective journal (Lincoln & Guba, 1985). In an action research model, it is essential for the teacher-researcher to have the opportunity to spend enough time in the selected site to fully examine multiple influences that may occur during the entire process (Feldman, 2001) and since credibility relies more heavily on the richness of the data that is collected and less on the size of the sample (Patton, 1990), it was essential that this research incorporate the many forms of data collection that it entailed.

According to Lincoln & Guba (1985), the transferability of data depends upon the degree of similarities between the original situation and that to which it is transferred. The information that was brought forward in this research is useful in that it provides knowledge from first-hand experiences which may be applicable to new situations. Other teachers then will be able to decide how to utilize the information that comes from this research to their best advantage. According to Stringer (1996), the mere act of observing and reflecting on our own practices can be an enlightening experience, enabling us to see ourselves more clearly and formulate ways of working that are more effective and that enhance the lives of the people with whom we work (p.143). It is this reflective process of action research that enables it to provide other educators with information that might apply to their own educational situations.

Confirmability is the degree to which the researcher can demonstrate the neutrality of the research interpretation (Lincoln & Guba, 1985). Through practices such as a reflective journal, and with the collaboration of members of the advisory committee,

I was able to demonstrate a neutral, non-judgmental research interpretation of the data. The participants were consistently encouraged to provide honest and reflective feedback and asked to share their opinions and feelings throughout the entire process. This process ensured that observations of the research findings were reported in a balanced and non-judgmental way. According to Stringer (1996), action research is a way in which the research itself generates trust between the research-teacher and the participant-student. This process provides significant decision-making opportunities to ensure that the researcher and participants work together so that the interpretation of the research is both meaningful and accurate.

The underlying premise of an action research process is that it begins with a problem. In the present study the problem was how to effectively use a technological tool like the Internet to conduct research at a grade five level. Through this action research process the whole group worked towards a better understanding of the problem and eventual exploration of various methods to deal with or solve the problem. In qualitative research, the researcher bears the responsibility of discovering and interpreting the significance of what is being uncovered. Therefore, in the true sense of what qualitative research is trying to establish, an action research process is ultimately a search for true meaning in which people can collectively create and enhance new ways to help improve the quality of learning for the participants and the quality of teaching for the researcher.

Chapter 4 - Findings

The rationale for this study was to explore some of the best teaching and learning practices surrounding the use of the Internet to complete curriculum-based learning activities. Although several research studies address the various usages of the Internet and the effect that it appears to have on learning, there remains a gap in the literature. The effectiveness of the Internet as a resource for curriculum-based learning activities must be explored. Therefore the purpose of this study was to examine how the Internet could be used effectively to support learning and, in particular, how the Internet could be used as a research tool in the information process.

An action research approach was utilized in this study. Such an approach provided an ideal format which allowed me to formulate ideas about the actual experiences and reflections of both the participants and myself as we went through the learning process. The actual learning experiences of the participants and my own teaching experiences provided practical insights and knowledge throughout the study. The research study involved my students and myself working through an inquiry-based Internet activity known as the webquest. As this activity progressed we reflected together upon many of the teaching and learning experiences that were occurring. This enabled us to be involved in a unique opportunity to critically examine and evaluate many of the themes that emerged throughout the study. This chapter presents a discussion of the findings based on the data that was collected.

This chapter is comprised of several sections that explain both the process of the research and present the findings as we worked through the study. The first section

provides an overview and description of the action research procedures implemented in the study, and then a discussion of the school setting and the class participants that were involved. Next, the results of the questionnaire that was distributed to participants before the study itself are shared. Here participants' responses to each of the nine survey questions generated for the study are presented to provide some insight into the students' views of the Internet and their use of the computer for educational purposes. Following this is an account of how student learning logs were utilized in the study. Students were given an opportunity to reflect upon many of the learning activities involving the Internet and the computer before the actual implementation of the study. This was important to developing an understanding of students' learning experiences before the actual study so comparisons between students' attitudes and experiences before and after the study could be constructed. Next a description of the researcher-developed webquest used in the study is given along with the reasons for choosing this particular activity. A recount of the daily experiences of working with the students on this particular type of inquiry-based learning activity is given. Finally, the facts and the themes that surfaced as my students and I journeyed through this action research process together are presented.

The reader must be reminded prior to the presentation of the research findings that this study explored the participants' reactions and attitudes that emerged as the result of employing different strategies using the Internet to conduct a curriculum-based research project. The assumption is made that the Internet is merely a tool which, when properly used, may have the potential to develop students' learning in creative and meaningful ways. The students involved in this study were given every opportunity to freely discuss

how information technology like the Internet can support the information process. In this manner both the teacher-researcher and the student-participants addressed the questions about which teaching and learning strategies support the most effective use of the Internet as a research tool.

The Action Research Study

The action research process employed three methods for obtaining information from the participants regarding their views about using the Internet and computer both at home and in school. Student responses to a questionnaire given prior to the study and their entries in learning logs both before and during the study were two sources of this information. The third source came at the conclusion of the research when six students were selected to individually participate in a twenty minute conferencing session with me for further in-depth analysis of their reflections and interpretations during the learning process. Further analysis of the data was obtained from my field notes and reflective journal.

Students were initially provided with a pre-study survey questionnaire that uncovered student information on how participants perceived and utilized the computer and the Internet in the learning process. Results from this questionnaire allowed me to determine how the students used the Internet and the computer both in education and for their own personal use. The questionnaire can be found in Appendix E and will be discussed further in this chapter. Before the study participants were invited to respond to a series of assigned questions in their student learning logs. These questions (see Appendix H) were formulated to gather information from the students about their

experiences when using computers and the Internet in earlier curriculum-related projects. These questions served a dual purpose: they provided the students with initial training on how to respond to such questions, and also helped me develop an in-depth analysis of their answers by encouraging participants to further reflect on many of the statements made in the learning logs.

Another series of questions (see Appendix I) was generated to guide each of the student learning log entries during the study itself. These were different from the earlier set because they encouraged students to reflect on their learning strategies as they actually worked through the webquest. Further elaboration of some of their responses occurred when I encouraged students to respond more thoroughly when answers needed clarification. Student reflections on these questions will be highlighted in this chapter.

Finally, six of the students participated in an individual twenty minute conferencing session with me in order to obtain data for a more in-depth interpretation of their perspectives on the learning process. Three females and three males who exhibited a wide range of experiences in computer and educational knowledge were chosen for the conferencing sessions. I also believed that these six students were capable of offering a great deal of information on the topic of the Internet and could honestly reflect upon many of the themes that emerged throughout the study. The student conference responses are highlighted in this research because they thoroughly illuminate the learning process.

School setting and participants.

As mentioned in the previous chapter, this study focused on the students of my grade five class in an elementary school located in the Eastern School District of Prince

Edward Island. The school's computer lab is equipped with twenty-five Pentium computers of varying descriptions connected to the Internet via a provincial government server. The lab has an LCD projector and printer which were utilized to some degree during the study. The lab is configured so that computers are arranged in rows against the walls to allow for maximum teacher observation. All of the computers were updated by the provincial government in 2002 through a computer replacement initiative. The computer room is located centrally in the building's upper floor and is situated adjacent to the school's library. Class time in the computer room lasts approximately forty minutes and most classes utilize the computer twice in a six day cycle.

For the purpose of this study time spent in the computer lab involved six forty-minute classes over a period of two weeks. I arranged the students in pairs based on their compatibilities and computer knowledge as observed in previous classroom and computer projects. Some stronger more experienced students were paired with weaker students while others were paired on how well they interacted with each other from previous school activities. All students were given the opportunity to participate in the study and reflect upon the questions assigned by me during the study.

The class consisted of an almost perfect mixture of twelve boys and eleven girls with a wide range of educational abilities. All of the students reported that they enjoyed working in the school's computer room to complete teacher-directed website activities or school-wide Heritage or Science Fair projects. The class, on the whole, functioned as an average grade five classroom. Many of the students stated that they enjoyed working together on classroom-related activities and indeed much classroom work involved

students working in pairs. However this enjoyment in working with partners did not appear to extend to working on computer-related projects. According to student responses before the implementation of the study, twenty out of the twenty-three students preferred to work alone in the computer room on school-related projects. This fact was to prove challenging for me because the webquest that had been developed necessitated the use of cooperative pairs for its completion. Despite the fact that students preferred to work alone on computer-related activities there existed a friendly yet competitive atmosphere within this particular grade five classroom.

The Questionnaire

The grade five students in this study had previously used the Internet to conduct research of some form. Many of them had used it to research topics they had chosen for their Heritage Fair projects. In that instance, students had access to the school's computers during scheduled breaks and lunch time with the teacher's consent. Most students had used computers the previous school year and all of the students had been introduced to word processing programs (e.g., Appleworks) and had used the Internet to some degree. Student questionnaire responses allowed me to determine how students were utilizing the computer for projects both at home and at school prior to the start of this study. They were asked a series of questions related to their perspectives on computer and the Internet. These nine questions (see Appendix E) will be examined fully in an attempt to clarify for the reader the students' thoughts and impressions about using the computer.

Question 1 dealt only with the student's gender. In this study twelve out of the

twenty-three students were Caucasian male (52%) while eleven of the twenty-three were Caucasian female (48%). This was very important in the study for determining if there were any differences in opinions because of gender. A near perfect ratio facilitates a balanced mixture and addresses any gender bias that might result had the ratio been different (see figure 1).

Question 2 asked the students if they had a computer at home. This question was formulated first of all to find the percentage of the students that had access to home computers and second to determine the reasons for which they were using their computers. Additionally, those students who might have had greater computer experience as a result of having a home computer were identified. Twenty of the twenty-three students (87%) had access to home computers. Eleven boys (55%) and nine girls (45%) stated that they had home computer access. In the survey those students who did not have access to a home computer were directed to go to question 6 because the next three questions dealt with home computer use (see figure 1).

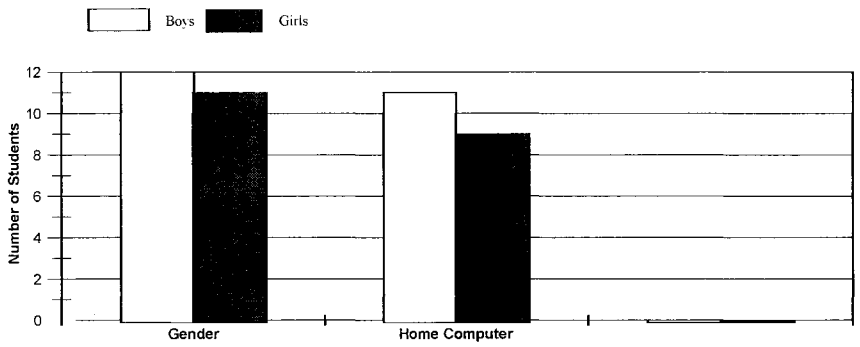

Figure 1. Questionnaire items 1 and 2 reporting on gender and home computer use.

Question 3 asked the students to choose among several options that described the

particular activities for which they used their home computers. They were able to choose e-mailing friends, playing games, doing school work, or participating in chat rooms. Students were also given the option of "other". In this category, they were to write down anything else not listed for which they used the computers. These option choices were based on my previous experiences dealing with students at this age level and on a general knowledge of how students utilize their time on the computer. The survey revealed that eighteen out of the twenty students (90%) used their computer at home to play games. Eleven out of the eighteen (61%) of these users were boys while only seven out of eighteen (39%) were girls. Fourteen of the twenty students (70%) used the home computer to do homework and of these fifty-seven percent were boys. For clarification purposes, a typical 'homework' activity in this category would be using a word processing program to type up a report due the following day. Eleven of the twenty students (55%) stated that they used home computers for chat rooms while ten students (50%) said they used it for e-mailing their friends. Girls accounted for sixty-two percent of the usage in the chat rooms and e-mail categories while boys accounted for only forty-eight percent. There were no "other" options chosen in this question (see figure 2).

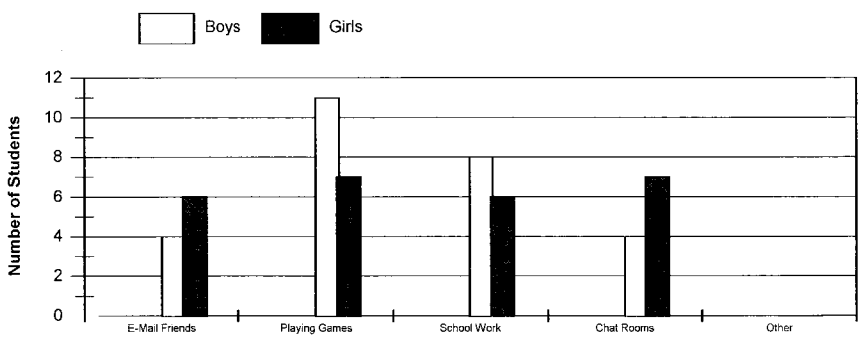

Figure 2. Questionnaire item 3 reporting on student usage of home computers.

In question 4 students were asked to indicate which Internet activities they used their home computers for. Although similar to question 3, this question garnered responses about the students' use of Internet time only. The options they had to choose from were: surfing and browsing, playing on-line games, downloading music files, finding information for school projects and "other" where they could write down any other activities not mentioned in the options. Eighteen of the twenty students (90%) mentioned that they used the Internet to find information for school projects and such use would not be classified as homework (i.e., assigned task for home completion). Both boys and girls had an equal number of responses to this option. The next highest percentage of student responses was for playing on-line games and twelve out of the twenty students (60%) utilized the Internet for this reason. Seven of the twelve students (58%) who responded to this option were boys while five of the twelve (42%) who responded were girls.

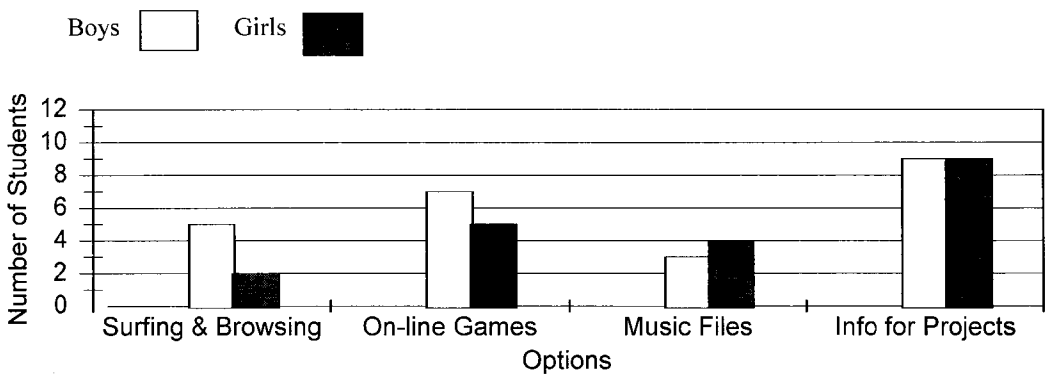

Figure 3. Questionnaire item 4 reporting what students use the Internet for.

Both surfing and browsing and downloading music files each received seven out of twenty (35%) of the responses. Five out of the seven students (72%) that choose surfing and browsing were girls while only two of the seven (28%) were boys. Downloading music files had very similar percentages in both genders (see figure 3).

Question 5 requested the students to indicate the average amount of time that they spent on the computer each day at home. The three choices the students were given in this question were: less than one hour per day, one to two hours per day or more than two hours and if they chose the last one they were to indicate how many hours they actually spent on the computer. Nineteen of the twenty students chose to answer this question. Five out of the nineteen (26%) indicated that they spent less than one hour per day. All of these students were boys. The majority of the students, five boys and four girls (48%), commented that they spent anywhere from one to two hours per day on the computer. Finally, five out of nineteen (26%) also indicated that they spent more than two hours per day on their computers and four of these students (80%) were girls. They stated that they spent as much as three to four hours a day on the computer (see figure 4).

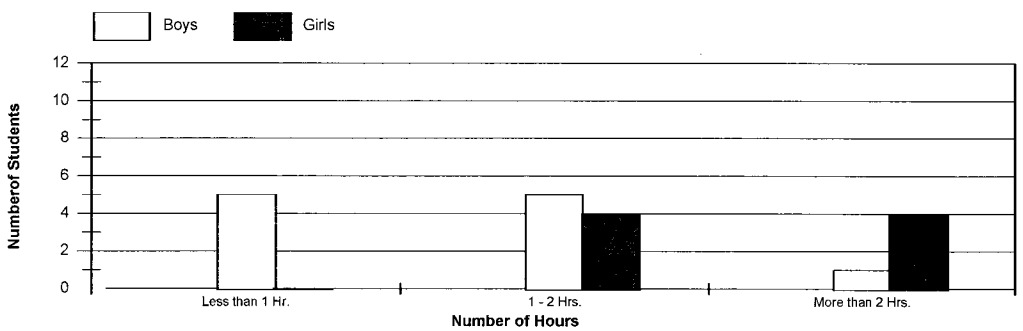

Figure 4. Questionnaire item 5 reporting on students' time spent on home computers.

Question 6 was designed for all students whether or not they had a home computer. Here students were asked how they spent their time on the computers at school. If they had a home computer, they were asked to differentiate between how they spent their computer time at school versus home. Response choices included: e-mailing friends, playing games, word processing, finding information for school projects, using CD-Roms or data bases, and "other" where they could note any other option not included on the list. All twenty-three students indicated that they spent time finding information for school projects and all but one indicated that they spent time on the computer for word processing. None of the students spent any of their in-school time e-mailing friends or looking at CD-Roms and data bases. This contrasts with question #3 where many of the students use their computers at home to e-mail friends or visit chat lines. Twelve of the twenty-three students (52%) indicated that they did spend time in school playing games (see figure 5). This, however, is well below the number of students who use the computer at home to play games.

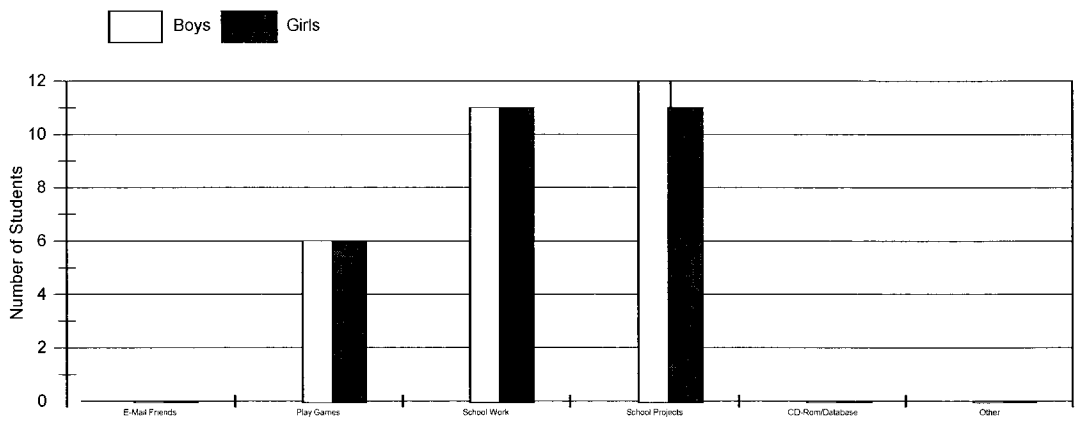

Figure 5. Questionnaire item 6 reporting on student use of computers in school.

Question 7 simply asked students to indicate whether they had used the Internet to find information for school projects and it also asked them to indicate for what purpose they used it. Twenty-three of the students indicated that "yes" they had used the Internet for the purpose of finding information for school projects. Eighteen out of the twenty-three students (78%) mentioned that they used the Internet for a Heritage Fair project in which they had recently participated. Five out of twenty-three (22%) indicated that they did not use the Internet for their Heritage Fair project but had previously used it for similar class projects.

Question 8 asked which search engine they used to find their information and all twenty-three of the students indicated that they used Google as their major search engine. Three of these students also mentioned that they use Yahoo on occasion.

When responding to Question 9, students were asked to reflect upon whether they thought that the Internet was worthwhile in finding information or whether it was a waste of time. They were then asked to explain why they chose either of these two options. Twenty-one of the twenty-three students (91%) agreed that the Internet was worthwhile for finding information. The reasons given for this choice included a number of specific responses. The most popular response was that the Internet could provide a great deal of information for the student. Other responses indicated that using the Internet was faster, easier, and more fun. The remaining two students who thought that the Internet was a waste of time also reflected on their answers and suggested that the Internet was a waste of time because they believed that it takes too long to find the information even though they believed it has the potential to offer much more information on specific subjects.

The pre-study questionnaire revealed many interesting facts about the students' usage of the computer and the application of the Internet for researching purposes. Their responses indicated that they found the Internet and the computer easy to use and they utilized it for playing games, operating chat-lines or e-mailing friends. The survey results also indicated that both at home and in school students used the Internet for finding information on school-related projects and that it has become an increasingly important feature in the learning landscape for students at this level. This survey gave boys a slight advantage over girls when it came to access to home computers and also recognized that boys in this group of children did more surfing and browsing on the Internet than the girls did. Conversely, girls used their computer more frequently to e-mail friends or chat than did boys. All students thought that the Internet was a good way to find information and Google seems to be the search engine of choice for students in this particular class.

Student Learning Logs

Prior to this study these fifth grade participants had been engaged in Internet activities and projects chosen by the teacher and designed specifically around websites closely related to the grade five curriculum. In these projects students utilized the facts and information found on given sites to complete a series of tasks. These tasks usually asked the students to compare or organize information and then share the information back with the teacher or the class in the form of a presentation or written report. To develop a deeper understanding of the students' views on Internet use, a series of guiding questions was designed for student learning log responses (see Appendix H). These questions were carefully prepared to ensure that the participants were given the maximum

opportunity to present the information in their own terms (Stringer, 1996). I was genuinely aware of providing the students with the opportunity to describe in their own terms many of the learning experiences they encountered while working with the Internet prior to study's implementation. The learning logs themselves served two very important purposes. First, introduction of the learning log itself helped students become familiar with responding to the actual questions that would be generated during this study. Second, through responding to questions the students became more comfortable with the process and this allowed for a greater comfort level when answering questions that arose later on in the study.

Action research is a collaborative event involving the development of practical knowledge between the researcher and the practitioner; therefore, the students' involvement in this process was essential. Questions about previous Internet experiences attempted to ascertain how students perceived past learning experiences while interacting with the Internet. Questions also elicited students' opinions about what they enjoyed or disliked when working on computers. They also collected attitudinal data about past Internet projects and clarified students' beliefs and interpretations about Internet usage for researching purposes. These questions were initiated weeks prior to the study in order to familiarize students with actual experiences of responding in their learning logs. I gathered the students' responses after every session and read over them in the evening. If it was felt that some of their reflections needed more elaboration, then further questions based on the answers that students had given were written in the learning log. The students would have a chance to respond to these further inquiries the following day in

their learning logs.

An example of encouraging further analysis to a question can be found in Jeanne's learning log. Students were asked to respond to a question that asked them to compare two previous Internet activities. I was attempting to find out which Internet activity was preferred by the majority of the students and since the nature of these two activities was different it was important to discover which was more popular and why. The questions were: (a) what are the differences between working on the Space Theme Project and the World Facts Project, and (b) what projects did you like or dislike and why? Jeanne responded, "I didn't like the Space Theme Project because it was boring. I liked the World Fact Project because it was fun and easy" (Learning Log, February 9, 2004). I further prompted Jeanne by responding in her learning log, "What made the Space Theme so boring?" She wrote "I didn't like it because I had to scroll up and down for the information" (Learning Log, February 10, 2004). In this way each student was encouraged to fully explain their responses to the questions. Giving each of the students the opportunity to supply more complete and accurate responses encouraged a greater in-depth understanding for me and promoted further analysis on the part of the student.

Students were asked questions about what they enjoyed doing while they were working on the computers and also what they disliked about working on computers during school time. The purpose in asking these questions was to obtain a clearer view of each of the student's perceptions about either the advantages or the disadvantages of working on the computers during school-related activities. Eight of the students referred to working on the computers as an enjoyable or fun activity while four of the students

referred to searching on the Internet itself as a "fun thing to do". Michael stated, "I like to work on the Internet and enjoy searching on the web, simply because I found it fun" (Learning Log, February 9, 2004). Beth reasoned that working on all of the activities in the computer room itself was enjoyable: "I enjoy everything in the computer room, it is just so much fun in there" (Learning Log, January 21, 2004). Robert said, "I enjoyed everything in the computer room because it was still all fun" (Learning Log, January 21, 2004).

Student responses revealed that all twenty-three students enjoyed working on some of the past projects that the entire class had worked on in the lab. Some of their comments illustrated that they used the Internet to find relevant information for projects. One student remarked, "I mostly enjoyed working or doing class projects and also looking up information on the computers" (Learning Log, January 21, 2004). Another commented, "I enjoy finding the answers for assigned questions" (Learning Log, January 21, 2004). Many of the responses reflected enjoyment with going on the Internet to explore relevant information and as well as having fun, students felt that they learned a great deal by doing this. One student said, "I like going on the Web and searching on the Web. I just find it fun" (Learning Log, January 21, 2004). Students said they used the lab to research, do assigned projects and work on word processing programs and all of the students claimed to be anxious to get into the computer room to complete curriculum-related projects. In summary, student comments during this stage of the research indicated that many of the computer activities in which they participated were thought to be fun and enjoyable.

Many projects completed in school involved the students locating and exploring relevant information from pre-selected web sites. After viewing these sites students either answered questions generated at the sites or presented a written narrative of the information to the teacher. Iris stated, "I mostly enjoyed working or doing these class projects and also looking up information on the computers" (Learning Log, February 9, 2004). Betty also commented, "I enjoyed finding the answers for assigned questions on the space shuttles" (Learning Log, January 21, 2004). More than just enjoying themselves, these students stated that they learned a great deal when participating in this kind of activity. Murray said, "I enjoy working on all kinds of things because it is fun. I learn a lot on computers" (Learning Log, January 10, 2004). Students find such activities both enjoyable and exciting as they use the Internet for research on pre-assigned projects and complete most of their written assignments on the computer when the time permits in word processing programs like *AppleWorks*. Other students indicated that they would rather surf the Internet to find information. These participants chose this option because they thought that surfing the Internet was a pleasurable activity. Blair stated, "I would rather surf the Internet because it is fun and exciting" (Learning Log, March 10, 2004). Heather summed it up by saying, " I like surfing the Internet because you find more websites instead of just an example of what the teacher wants us to find" (Learning Log, March 10, 2004). Iris believed that she learned more while surfing the Internet because "It is more fun and you learn how to use the Internet by yourself" (Learning Log, March 10, 2004).

Students commented on what they did not like or what they found difficult about

working on the Internet and three responses focused on the difficulties in finding information and referred to "searching" as one of the most difficult tasks. Tanya wrote about the difficulty she had searching for information: "The most difficult thing is trying to find the information or data" (Learning Log, January 21, 2004). Two of the students found that logging on was the most difficult thing to do. Michael, even though he had commented previously that he had fun searching for information on the Internet, said he found it difficult because he had trouble just logging into the computer and stated that he often "could not remember the website or my passwords" (Learning Log, January 21, 2004). Robert noted that "getting logged in takes way too long" (Learning Log, January 21, 2004). Three other students had difficulties writing down the information from the chosen websites. Iris, who also previously stated that she enjoyed looking up information on the Internet, found that the most difficult thing about conducting Internet research was having to write it down: "The most difficult thing I found working on the computer was having to write it down on a worksheet or in my computer notebook" (Learning Log, January 21, 2004). John, an avid user of the computer, also struggled with this task: "I enjoyed working on the Internet, but I find it hard to write the information down on paper (Learning Log, January 21, 2004). Five of the students who answered this question mentioned that they had no difficulties in working with computers. Irene commented, "I find nothing difficult because I practice on the computer everyday after school" (Learning Log, January 21, 2004). Two of the students mentioned the most difficult thing for them was that sometimes it was hard to follow the teacher's directions or that the questions were just too difficult to understand.

It appears, then, that simply searching for the information was not as demanding as actually writing the information down. Mary summed it up by stating, "The most difficult thing is if you are a slow typist then the whole class is on the Internet and it can be hard just to catch up" (Learning Log, January 21, 2004). Cathy disliked the whole setup of the computer lab: "We are all cramped and you have to lift up the keyboard, and it is hard to concentrate" (Learning Log, January 21, 2004). Overall, the majority of the students had strong feelings about the effectiveness of the Internet and searching for the information. Their dislike about working on Internet projects, however, originated from not having the requisite writing and organizational skills necessary for effective searching. The skills needed to work efficiently, along with students' lack of knowledge in conducting proper searches (Schrock, 2001), are essential reasons that students should be encouraged to develop good typing skills earlier in the school system.

Before the study, students participated in two computer projects where they utilized the Internet to locate and use information for research purposes. Both these projects were basic fact-finding Internet projects. The first project, World Facts, had students use the World Facts web-site to simply locate and compare facts about two countries. Using this site the students compared Canada and Peru on the basis of population, climate, transportation, etc. The second project, Space Exploration, required students to locate and present information, and to design a time-line on early space travel. The Space Exploration project was a more challenging project because it encouraged students to search for information and present their research in a poster format. The World Fact project was less challenging because it merely asked students to compare by

writing the facts down on paper and then present their findings to their teacher. Both projects took about the same amount of time to complete. The main difference between the two was that students worked together in pairs on the Space Exploration project.

In their learning logs students were given guiding questions that asked them if they perceived any differences between the two projects and to give reasons for their likes or dislikes about each one. The reason for this question was to gather student opinions and feelings regarding these two projects so that later on reasons for favoring one project over another could be examined. It was believed that it would be valuable to compare their initial student learning log responses to the ones generated during the implementation of the webquest.

Student responses showed a general dislike for the Space Exploration Project. Only four of the twenty students (20%) responding to these questions chose the Space Exploration Project as the one they most enjoyed. Their reasons for this choice was that it was more fun and that they got to work with a partner. Bruce stated, "I had fun doing it with another partner" (Learning Log, February 9, 2004). Murray also commented, "I liked the Space Project because you had to find the information around the pictures and working with a partner was more fun" (Learning Log, February 9, 2004).

Sixteen of the twenty students (80%) responding to this question preferred working on the World Fact Project for a variety of reasons. Generally students enjoyed doing less work and not having to work with partners. Jennifer mentioned that she enjoyed the World Fact Project because "It was easier to find the information and then write about it " (Learning Log, February 9, 2004). Beth remarked that, "The Space

Project was harder while the World Fact was more fun and cool" (Learning Log, February 9, 2004). A similar interpretation was given by Tanya who compared the two by saying, "There wasn't as much work on the World Fact Project and there were more things to do on the other"(Learning Log, February 9, 2004). Iris simply stated that she liked the World Fact Project better because she enjoyed writing down the information and learned more by comparing the two countries, "I had to look up the information but I learned more things about Canada and Peru" (Learning Log, February 9, 2004). Four students chose the World Fact Project over the Space Exploration Project because they did not have to work with partners. Alan acknowledged that "I got to work alone" (Learning Log, February 9, 2004). Irene stated, "I liked the World Fact Project because we didn't have to work with a partner" (Learning Log, February 9, 2004) and felt that working with a partner kept her from completing the Space Exploration Project on time.

I was also interested in understanding whether students preferred to work on teacher-selected websites or to freely surf the Internet for information. According to the *Journey On* (2000) document, the use of pre-selected web sites is necessary for students at this grade level. From past observations of fifth grade students working with the Internet, I learned that they simply do not have the necessary skills to "surf the Net" efficiently or effectively. Ten out of the nineteen students (53%) who responded to this learning log question preferred to work on teacher-selected web sites rather than surfing the Internet on their own. Eight of the ten students (80%) who chose teacher-selected web sites over surfing the Internet were boys. They found that it was much easier to conduct research on the Internet when they relied on the teacher to select the appropriate

informational sites for them. Jamie noted, "It would be better if the teacher selects the websites because it is much faster and easier. We can get our projects or what ever we are doing much faster" (Learning Log, March 10, 2004). Several students mentioned that while freely searching the Internet may be more enjoyable, it is less productive on their part. Tanya summed it up by explaining, " I would rather have pre-selected websites because it is easier to find the information about the topic you are working on. Sometimes it is fun to surf the net when you want to do a lot of finding things. I think it is more fun to have selected sites because it is a lot easier to get where you are going" (Learning Log, March 10, 2004). Bruce commented, "I would rather use the teacher-selected websites because I might not find the websites that have all the information and I would get nothing for that project" (Learning Log, March 10, 2004). Mary realized that surfing the Net is too time consuming: "I like it when you give us the web sites because I get the work done faster and if we had to surf the web site it would take me a very long time" (Learning Log, March 10, 2004). Murray stated, "I would rather have selected websites because it would be easier and you don't have troubles looking for the sites" (Learning Log, March10, 2004). Ryan reasoned that surfing the Internet could lead to unnecessary or bad things. He commented, "It is better to use teacher-selected web sites because we might find something bad or different and it could take a much longer time to find what we want" (Learning Log, March10, 2004). Nine of the nineteen students (47%) preferred to surf the Internet over teacher-selected sites. Six of the nine (67%) who preferred to surf the Internet for information were girls. They indicated that this was more enjoyable and instructive and as Iris suggested, "I would rather surf the Internet

because it is more fun and exciting. You learn how to use the Internet" (Learning Log, March10, 2004). Irene, who is very skillful at using the Internet, preferred this method because of her familiarity with using the Internet at home, "I am very independent and surf the Net all the time at home" (Learning Log, March 10, 2004). Robert mentioned that he likes to surf the Internet because he also feels more independent. He commented, "I'd rather find the web pages by myself because you always show us where to find the answers. I'd like to find my own information"(Learning Log, March10, 2004). The three students who chose both options had various reasons for doing so. Cathy commented, "I would prefer to surf the Internet because it is easier but you might not find what you're looking for. Teacher selected web sites are easier but they usually come with questions" (Learning Log, March10, 2004)(see figure 6).

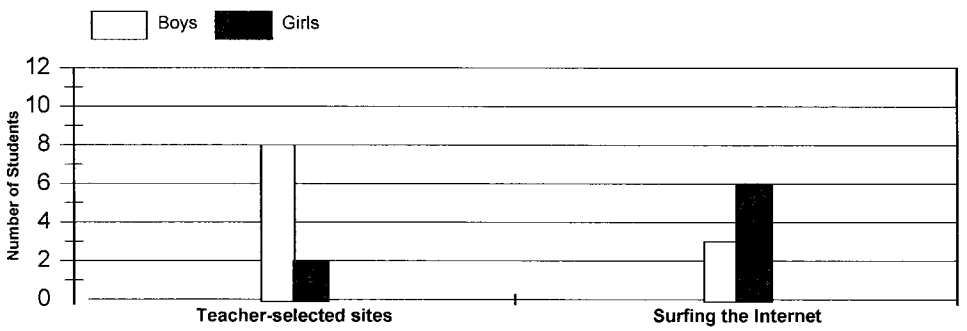

Figure 6. Reporting on student choices of using teacher-selected sites or surfing the Internet to find information.

Students were then asked whether they believed that surfing the Internet was a good way to find information. Not surprising, all nineteen students who responded to this question indicated that this was a good strategy for finding information. Ten of the

students indicated that the availability of the information was the most significant reason for their decision. Robert reasoned, "You can find almost anything you want on the Internet on any subject. I found a lot of information on our Heritage Fair topic" (Learning Log, March 10, 2004). Iris remarked about how easy it was to find information because, "all you have to do is type in what you want and there is the information" (Learning Log, March 10, 2004). Cynthia answered this question by creating a list of the most positive things about using the Internet. At the top of her list was its ability to find information. She commented, "You can find anything you would ever want to know. You can learn history, science, math and everything else" (Learning Log, March 10, 2004).

Many of the students responded even further by making comparisons to traditional research methods. Murray stated that the Internet could be more useful and faster and that it "helps you find a lot of information and helps you get things done faster than going to a library and finding a book" (Learning Log, March 10, 2004). John elaborated on this by saying, "The Internet has a lot more information that books can't give a person for projects. You can take pictures from the Internet but you can just look at them in a book" (Learning Log, March 10, 2004). Jeannie also commented, "It can be helpful for school projects. I found information on the Klondike Gold Rush for my Heritage Fair project" (Learning Log, March 10, 2004).

Although all the students agreed that the Internet had certain advantages for finding information, three students chose to take an impartial stance. Jamie agreed that the Internet was a good source of information but it had some disadvantages, "Surfing the

Internet is good if you find a good website with lots of information but sometimes the page may be unaccessible." (Learning Log, March 10, 2004). Cathy stated that, "Sometimes the Internet can be helpful because you will get information but it can also be a waste of time" (Learning Log, March10, 2004). Betty commented, "The Internet is a good way to find information but sometimes bad things can come up on your screen or viruses can spread to your computer" (Learning Log, March 10, 2004).

Overall the students saw the benefit of using the Internet in their projects. They believed that by using the Internet they could find relevant and useful information. They were very happy to be working on the computers during the many learning activities that we had in the computer lab and enjoyed working on selected web sites but only if they involved less work and fewer research skills. A majority of students preferred to work individually on many of the learning activities utilizing the Internet for informational purposes. When given the choice between working on teacher-selected websites or surfing the Internet for information there appeared to be an equal number of students who chose each option. This indicates that the class was split on deciding which was the preferred option for finding information. The majority of students who chose teacher-selected sites were boys while the majority of students who chose to surf the Internet were girls. It is important to recognize that many of the difficulties the students experienced while working on the computer activities were the result of weak searching and writing skills. They did make several statements comparing the Internet and more traditional methods of finding information, and claimed that using the Internet for this purpose was much easier and faster.

The Webquest

As a teacher, I decided that it was necessary to change some of my teaching practices and adopt different methods, ones that could encourage students to become more reflective and critical thinkers. Feedback from the students' learning logs prior to the study confirmed their dislikes about using the computer for research purposes. Many of their responses focused on the difficulties of searching and finding information. Their enthusiasm for learning increased when they were enjoying themselves or engaged in activities beside those that required retrieval of information. The choice to utilize a webquest in this research was made easier after learning that webquests involve students fully in the process of learning and are designed to make optimal use of the Internet's resources (Yoder, 1999). Originally designed by Bernie Dodge, they go beyond simple fact-finding information tasks and actively involve the students in an inquiry-based approach to learning. In this study's webquest (see Appendix K) students were asked to examine the information that I had collected and then present this information in a more creative way.

I developed this webquest around the science topic of flight and it can be viewed online at <www.edu.pe.ca/montaguecons/website_2004/homepage/homepage.htm.> In this webquest students were asked to evaluate a number of different sites that had been selected from Internet sources directly related to the flight topic. The groups were to take this information and use it to develop and deliver a ten minute presentation to the class. During the presentation the participants were to accomplish three separate tasks: (a) introduce a famous flight pioneer; (b) explain the four principles of flight; and (c)

explain and demonstrate Bernoulli's Principle. As I introduced this to the class, I observed and explored the factors that had an impact on students' learning as they used the Internet to research this curriculum-based topic of flight.

The webquest used in this study was based upon similar flight webquests that I had located on the Internet and was constructed with the grade five science curriculum outcomes in mind. My goal was to develop an effective Internet activity that went beyond simple retrieval of information and the webquest was the activity of choice because it involved students more effectively in the learning process. Using Google as the primary Internet search engine, I gathered reputable sites for the resource section of the webquest. Many of the educational sites chosen for the activity were taken from educational(.edu) or governmental (.gov) websites containing relevant information on early flight pioneers and the four principles of flight: thrust, drag, lift and gravity. Also included were several websites that explained Bernoulli's Principle which would prove useful for students when it came time to demonstrate this concept in their presentations.

I was aware that chosen sites had to be appropriate for grade five students to understand. As a result, the sites used in the webquest had appropriate vocabulary for student comprehension and provided information that would be useful for understanding the science concepts of interest. Students also had to be able to demonstrate Bernoulli's Principle which states that as the velocity of air increases its pressure decreases. This is why airplane wings are constructed the way they are so that the air flowing quickly over the wing will produce a decrease in air pressure causing an increase in air pressure in the slower moving air under the wing that lifts it upwards. The sites that were chosen

demonstrated and explained this scientific concept very effectively. I developed the webquest to contain the six suggested stages: an introduction, a task, a process, the resources, an evaluation, and a conclusion. The details and directions for the six stages of the webquest were constructed to maximize student understanding. An organizer sheet to help students organize their information was also constructed as well as an assessment rubric so students could understand how they would be evaluated during the process.

Themes that Emerged

The process of working through this webquest took place over two weeks and six forty-minute classes in the computer lab. During this time I observed the students as they worked through the learning process. I then constructed notes as the students reflected upon and responded to the events that happened during this procedure. The research was guided by several questions all related to the students' understanding of the learning process. These questions encouraged students to voice their opinions or views about the learning process: Were they understanding the science topic? Were there any problems working in cooperative pairs? Were they developing any new computer skills? How motivated were they as they utilized different strategies to gather information? Were they being challenged in any way? Was this activity any different from other classes in the computer room? What things did they find difficult or easy as they worked through the webquest? At this time all of the students had an opportunity to respond to these questions in their learning logs. As the data was interpreted certain words and phrases began to stand out and I narrowed these down into several manageable themes (Bogdan & Biklen, 1998) as a result of the participants' reflections upon the actual learning

process that was taking place. Three prominent themes emerged in the study: (a) the development of educational skills through cooperative learning; (b) the effectiveness of student centered approaches to learning and constructivist teaching practices; and (c) the increased enthusiasm for learning and increased motivational levels among students.

One of the most notable themes that surfaced in this study was how the participants were developing their educational skills through cooperative learning. As the study proceeded the students became more cooperative in their approaches to learning and this affected the overall dynamic of the learning process itself. Student cooperation appeared to help participants become more involved in learning and develop more collaborative skills. John stated that working cooperatively with a partner had certain advantages, "The advantages are that you might not have to work alone. One person might be able to get something while the other person may get something different." (Interview Session, April 19, 2004). Tanya similarly commented, "Working with a partner gets things done a lot quicker. We both look at different things and get different information" (Interview Session, April 19, 2004). Other students remarked on how much faster it was to work with a partner. Jamie said, "You can do more work faster because you can do one thing while your partner does another" (Interview Session, April 20, 2004). There appeared to be an increased improvement in the overall understanding of the science concepts by the students as they progressed through this study.

Another theme that surfaced through this study was how student-centered approaches to learning and constructivist teaching practices were effective for facilitating learning at this level. The Internet is well suited to providing students with the

opportunity to explore information by making it more engaging and interesting. Students appeared to take more ownership of their learning. Jamie stated, "I felt like I was learning by myself. My partner and I were taking responsibility by ourselves" (Interview Session, April 20, 2004). John commented, "You are doing more of the work than just copying it from a book or something. You were learning it" (Interview Session, April 19, 2004). The study's webquest presented the students with more opportunities to become actively engaged in working with the information and as a result they became more involved in the learning process.

A third theme that surfaced throughout the study was the students' enthusiasm for learning and their increased motivational levels. There appears to be a positive relationship between this type of learning activity and increased levels of motivation on the part of the participants. Students often compared it to other classes. Jamie reported, "The webquest was better than the other classes because the information is better and it was more fun" (Interview Session, April 20, 2005). They also felt that they had a better understanding of the flight concepts that were discussed. Tanya felt that she not only had fun but understood the concepts much better: "Working on the webquest was fun. I felt that I had a better understanding of flight" (Interview Session, April 19, 2004). Other students felt more focused on the topic as a result of the webquest. Irene commented, "The webquest helped me stay on topic because there is a lot of information that I need to read and I didn't have time to talk to anyone" (Interview Session, April 21, 2004).

These themes will be examined in more detail in Chapter 5 as the participants' reactions and attitudes towards using the computer and the Internet in the learning

process are discussed. Through reflection on these themes that emerged throughout the study I hope to provide the reader with a clearer understanding of the process of learning that took place as the fifth-grade participants utilized the Internet to conduct research. Participants' opinions and attitudes will be discussed to assist in developing this understanding. The aim of the present research was to develop a knowledge base of the best learning and teaching strategies that contribute to the most effective use of the Internet as a research tool for grade five students.

Chapter 5 - Discussion of Results

This research was conducted to address the question of what are the best learning and teaching strategies that contribute to the most effective use of the Internet as a research tool for grade five students. It explored the factors that have an impact on grade five students' learning as they used the Internet to conduct research on a curriculum topic. The data was collected from the participants through a questionnaire administered prior to the study, student learning logs during the study and conferencing sessions with six students after the curriculum project was completed. My field notes and reflective journal are also considered. Following a discussion of the study results, the limitations of the study as well as suggestions for future research are considered. Finally, the implications of this study as well as my conclusions are discussed.

Information Literacy

The major focus of this study was to explore the effectiveness of the Internet as a principle source of information in fifth grade students' research. A webquest was designed as the guiding activity to help the participants work through the information process and by using this forum participants were able to access a wide range of information from a variety of sources. During the study the participants displayed more of a constructivist approach to learning. Here the learners, not the teacher, become the strongest factor in the learning process where they use the new knowledge to build upon information they already possess to create new learning. This supports Kuhlthau's (1993) contention that a constructivist approach to learning builds upon what the students already know and actively encourages them to go beyond information gathering to create

something unique.

As outlined in this research, the participants appeared to take a much more active approach to learning and as a result they became more involved in the process. Here the students began to use many of the strategies to locate, organize, and analyse the information to make it more learner-based. As this occurred, several things began to surface. As student-centered and cooperative learning continued, participants appeared to develop a good understanding of the science concepts. Student motivation toward learning seemed to increase throughout the study. As a result, students displayed growth in the information processes of gathering, identifying, organizing, and applying the information to create a finished product.

The results that emerged from the data regarding which teaching and learning strategies constitute the most effective use of the Internet for grade five students as they research curriculum-based topics are examined in this chapter under the following broad headings: (a) fifth grade students' experiences with the Internet; (b) skill levels required for working on the Internet; (c) role of the webquest in the study; and (d) observations on the teaching and learning processes. Each category is then sub-divided into sections that focus on specific points of interest that arose as a result of the research process. As a whole, the results shed some light on how educators can best use the Internet as a resource to support curriculum-based learning.

Fifth Grade Students' Experiences with the Internet

This research reveals that 87% of research participants in this grade 5 class have Internet access at home while 100% of them have Internet access at school. Of those

with home access 60% primarily go online to play games. The remainder of their online time is spent doing homework, participating in chat-lines and e-mailing friends. Additionally, 90% of those with home Internet access indicate that they use it to find information for school projects. This is similar to a survey conducted by Lenhart, Simon & Graziano (2001) who found that the majority (94%) of online twelve-to-seventeen year olds with home access use the Internet as a major resource for school research.

Study participants use the Internet in school mostly to research school-related projects and agree that this is the best use of school computer time. They clearly view Internet-based research practices as easier, faster, and much more fun than traditional ways of finding information. In their discussion of how the Internet can be utilized in the upper elementary level, Green & O'Brien (2002) found that boys were more likely to use the Internet to play computer games while girls typically spent more time communicating with their friends via the Internet. The findings of the present study support this as girls reported that they were more involved in chat-lines or e-mailing friends than playing online games. This research also confirmed that boys at this grade level tend to do more surfing and browsing than their female classmates.

Requisite Skills for Working on the Internet

According to Fulton (2000) and Moursund & Smith (2001), students must be educated on how to execute proper searching techniques. At the fifth grade level students often lack the necessary skills to conduct effective research. The present findings support Shrock (2001) and Slater's (2001) suggestion that the learning process can be enhanced if students are given proper instruction in Internet searching methods.

Teaching proper searching skills is a gradual process and it is essential to encourage grade five student researchers to efficiently 'site' read for authenticity and accuracy. In addition to learning proper searching techniques, participants' learning logs and interview responses as well as my observations overwhelmingly noted keyboarding and surfing skills as highly important to effectively conducting Internet research.

Keyboarding skills.

The results of this study also indicated major differences in how the participants recognized proficiency in their computer skills. Students made many references to their levels of competence in locating and retrieving information as being directly related to keyboarding skills. The majority of students viewed the ability to type as the most critical computer skill and, interestingly, in many instances the students with the faster typing abilities were seen as indispensable members of their groups. This theme surfaced in many of the learning logs and interviews where students reasoned that faster and more efficient skills in typing would allow them to become more proficient at their tasks. I observed over the course of the study that the quicker typists were usually frequent computer users; however, this ability to type quickly did not necessarily equate to having proper keyboarding skills. Students with computer access, while they are frequently faster typists, are not necessarily accurate or efficient keyboarders. Students' opinions on typing as well as my own observations of students' typing skills suggest that there is a further need to investigate an appropriate time, as in age and/or grade, to introduce keyboarding as a requisite skill. Encouraging proper typing skills in earlier grade levels may alleviate some of the problems that fifth grade students perceive as being a practical

problem in their own computer efficiencies.

Internet surfing skills.

Study participants believe that the Internet provides a faster and more convenient way to access relevant information. However, they were concerned because in past experiences using the Internet to research topics they had difficulty sifting through the vast amounts of material available to come up with the most pertinent information. Their learning log responses indicate that such experiences leave them feeling overloaded. Cynthia stated, "The most difficult thing when working on the computer is searching to find things" (Learning Log, February 9, 2004). Tanya also commented, "The most difficult thing is to find the data or the information" (Learning Log, February 9, 2004). McKenzie (2000) notes that there is often too much irrelevant and useless information available on the Internet. Students' learning logs for the present study indicate that they spend much time navigating their way through information which may or may not have been useful for completing past projects. They feel that searching for and finding information is one of the most difficult tasks.

Students' comments before the current study suggested that although surfing the Internet was fun and exciting it often led to feelings of frustration because of (a) the sheer quantity of information, and (b) the reading level of the information. Kerrey and Isakson (2000) and McKenzie (2000) suggest that students should learn to differentiate between good and bad information. In the present study, students' learning logs implied that the potential for unearthing inappropriate information frustrated them. As indicated above, students do not possess the skills at this level to make good decisions on finding viable,

authentic information on the Internet and they commented on how they felt that looking for information was often a waste of time because they lacked the knowledge of exactly how to proceed.

Teacher-selected sites.

Structuring effective use of the Internet is different than simply allowing students to surf the Internet to find information and requires the use of teacher-selected websites. Teaching students critical evaluation skills is of major importance for instructors who encourage learners to utilize the Internet to conduct research (Ebersole, 2000). Ebersole indicated that students have a tendency to use commercial sites (.com) instead of government (.gov) or educational (.edu) ones when researching school-related topics and as a result the information they find is "at best a distraction and at worst a hindrance to the educational and social development of ... children" (p. 18). The most productive use of the Internet comes from using it as a tool to engage students in the exploration and integration of available information (Harris, 2001). This procedure involves students in the process of learning and the more opportunities they have to interact appropriately with information on the Internet the more likely it is that they will develop critical evaluation skills.

Role of the Webquest in the Study

The Prince Edward Island Department of Education's *Journey On* (2000) document promotes the use of teacher-selected web sites as being beneficial to fifth grade students. Learners tend to be more focussed when investigating teacher-selected web sites that are information rich, relevant to the topic, and written at the appropriate reading

levels (Yoder, 1999). The webquest developed for the present study heeded these principles suggested by Yoder in choosing appropriate websites for inclusion.

The webquest and learning.

The websites were fully explored by myself and chosen for use in the webquest only when they were deemed relevant and credible sources of information. Some sites were interactive in nature demonstrating some of the tasks organized in the webquest on the four forces of flight and Bernoulli's Principle. According to McKinnon and Geissinger (2002), interactive sites inspire more motivation in students and feature a greater appreciation of scientific ideas. Student involvement with and understanding of the scientific terms explored in the present study appeared to be enhanced because of the interactive capabilities of the web sites selected.

Sites used in the webquest were evaluated for content and accuracy. Many of the resources were government or educational web sites and were written at the appropriate level of understanding for grade five students. Several students commented on how focussed they felt as a result of this. Iris stated that working on the webquest was different because, "You don't have to look up web pages or get to Google to look for things" (Learning Log, April 2, 2004). Robert commented that the webquest helped him to focus, "It has helped me focus because it has a lot of information on the topic" (Learning Log, April 7, 2004). Finally, Jeannie noted, "It helps you because everything you need to know about flight is right in front of you" (Learning Log, April 7, 2004).

This study suggests that although students are familiar enough with the Internet to participate in online chat rooms and games, and most students have had some exposure to

a variety of computer programs, word processing programs, and school-based Internet activities over the last few years, it is clear that, even with this level of computer proficiency, surfing the Internet is not an option at this grade level. As Schrock (2001) suggests, I also found that students do not have the necessary research skills to narrow the scope of the information they access. The webquest, then, freed the students from having to examine the information for accuracy and content and they were simply able to concentrate on gathering and sorting the information that was presented to them.

The webquest and teaching.

I chose to engage the students in a webquest, an inquiry-based Internet activity because it goes beyond simple fact-finding. Studies have found that students' higher order thinking skills are challenged when teachers effectively use Internet technology that goes beyond finding and reporting information as a copy of the original (Green & O'Brien, 2002). Prior to the present study the participants were involved in projects where the teacher pointed them to preselected web sites as a single fact-finding activity but never required them to interpret the data they found. The webquest, however, goes beyond the parameters of the single fact-finding activity and motivates students to become more engaged in the learning process. It provides students with a source of information that is directly related to the curriculum and is considered an educational, entertaining, and motivational tool for learning. It consequently utilizes Internet sites to help the students increase their problem solving and decision-making skills. The webquest allows the students to focus on the materials and tasks rather than have them freely search for information. It was during this process that I observed the participants'

progress through the learning process and noted their interactions with each other.

Observations of the Teaching and Learning Process

The most effective forms of web-based learning require that students take a more active approach in the process. According to Housego & Freeman (2000) students learn best when they are actively engaged in the learning process. Studies that examine student use of the Internet for researching purposes recognize that this type of technology enhances learning when students are more directly involved in the process (Fulton, 2000). The purpose for designing the study's webquest was to enhance and support student learning. Throughout the webquest there was a shift from teacher-directed learning to student-centered learning. Initially students were apprehensive about taking control of their own learning and often looked to me for advice and assistance. As the study progressed, and with less assistance from myself, students began to exchange ideas and discuss concepts with both their peers and me. The move to a more student-centered process was evident. Students' learning logs indicated that the teacher was helpful in the beginning but as the student participants themselves took a more active role in the process they looked less to me for advice and focussed more on their own personal reflections. Jeannie commented although I helped, she often felt more responsible for her own learning, "The teacher helped if we had a problem with something. At some points I felt I was getting the information on my own" (Learning Log, April 2, 2004). The webquest appeared to encourage collaboration and teamwork and foster a problem-solving approach to learning. The webquest also seemed to motivate higher order thinking by encouraging students to demonstrate an understanding of the information by

presenting it in more challenging and creative ways rather than simply reporting information as students had done in past activities.

Student-centered learning.

It was evident through many of the students' comments in their learning logs that they believed the Internet to be an excellent source for finding and researching information on curriculum-related projects. They clearly stated, however, that they preferred to work on projects that involved less work and fewer researching tasks. What did emerge from the study, however, is that students took a less passive role in the information process. Rather than being mere recipients of information they took an active role in the learning. This is deep-rooted in the constructivist theory of learning (Doyle, 2003) which encourages learners to go beyond gathering factual information by then using it to create something that is uniquely their own. During the webquest students actively explored the information presented to them, then they used this information to generate a more creative learning environment. As the webquest progressed students increased their levels of understanding. They were asking fewer questions of me and were beginning to rely more on their own resources to make meaning and were gaining more confidence in their own abilities to make the necessary connections between the science concepts.

This shift from a more traditional teacher-centered to a student-centered approach to learning was evident throughout the study. In the beginning stage of the webquest students were content to locate and collect the information as they had done in previous Internet assignments. Many of the students did not have a clear understanding of the

processes outlined in the webquest. By instructing the students during the first several sessions on what their responsibilities were and what the finished product should look like, they realized that they had to do more than collect the information. They had to further investigate it and understand it in order to create a final presentation for their peers. In this way, the students became more focussed on the process of actually understanding the information. This became apparent in the final stage of the study when collaboration between students increased. Similar to Bork's (2001) findings, collaboration among students in the present study brought about an increased understanding of the topic. Additionally, students really appeared to enjoy the learning process.

Learning log comments revealed that a student-centered learning process was happening. Students believed that they had a better understanding of the topic because sites chosen for the webquest were easily understandable to fifth graders, and they were able to develop a deeper understanding of the material than they might have otherwise. Additionally, students felt in control of their own learning. As well, working with partners provided them with the opportunity for team work and positive social interaction.

Cooperative learning.

One of the prominent themes that surfaced during this research was how cooperative groups appeared to promote positive learning experiences for students. A notable feature of this webquest is that it encouraged the participants to work in cooperative groups, which is a departure from my past strategies for using the Internet.

Familiarity with the groups' work processes already utilized in classroom situations, and time taken to instruct students on appropriate behaviour while working on the Webquest, helped to prepare the students for group work activity. Matching students in cooperative gender and ability groups allowed students to focus on the group work and task outline in the webquest. In this way I grouped students who worked well together based on previous experience both in and out of the computer room setting.

During the webquest students had more opportunities to communicate with each other and share ideas. They were more likely to contribute basic knowledge and understanding of the science concepts while interacting with each other. This was demonstrated throughout the entire process where students worked together to organize, evaluate, and discuss the information with their peers. There appeared to be a supportive atmosphere within groups where each member felt they could contribute their portion of the knowledge required for the group's general success. In many instances students commented on how effective it was for the learning process to work in cooperative groups. Cynthia commented on how helpful it was to work with a partner, "Working with a partner was helpful because you didn't have to work all by yourself" (Learning Log, April 14, 2004). Betty also noted how fast and easy it was to work with a partner, "Working with a partner is faster because two heads are better than one" (Learning Log, April 14, 2004). The majority of students working with a partner agreed that this was a much faster and easier method for accessing and understanding the information.

This study found that providing students with an interactive learning environment enhances learning, and working collaboratively helps students achieve the required task

more quickly and easily. This finding supports research by Bork (2001), Fulton (2000), Harris (1998), Wyld and Eklund (1997). In the present study, working with partners also influenced classroom dynamics. There was a great deal of collaborating and peer-tutoring between groups and individuals leading to situations where students helped not only their immediate partner but neighbouring students as well. This appeared to enhance student self esteem. As well, working cooperatively kept students on task. Students were always engaged with learning because of the immediate feedback from their partners and other individuals in the class. Students who were content to work individually on past projects were now excited to share their results with others. They used each other for referencing purposes and there appeared to be continuous interaction between group members who were searching and finding information. They seemed to develop better communication skills, exhibit more confidence in their abilities and offered support and assistance to others in the learning purpose.

The pre-study questionnaire uncovered some differences in how gender played a role in students' use of the Internet at home and school. There appears, however, to be little gender difference when it comes to the students' skills or abilities on the computer in the classroom. This agrees with Green & O'Brien's (2002) finding that girls were becoming as comfortable as boys when using the Internet to search for information. In that study, as in the present research, girls were found to communicate more via the Internet than boys. In the present study, the majority of participants preferred to work with partners of the same gender and therefore there were six groups of boys, five groups of girls, and one mixed gender group. All the students were matched according to how

well they worked together in previous class activities. As a result, each group appeared focussed on learning for the duration of the study.

Student motivation.

Findings of this research appear to show an increase in student motivation and understanding of science-related content while working on the webquest. Student enthusiasm for learning was evident throughout as they appeared eager and excited to get into the computer room to complete their tasks and assignments. Participants often wanted to continue working into the next class and were always anxious and concerned about getting more time in the computer room other than their pre-scheduled time during the school's normal six day cycle. In many cases the students requested that arrangements be made with other teachers so they could utilize more than their allotted time in the lab. Since students had spent many previous classes participating in Internet activities, working on the Internet in the computer lab environment was not a novel experience. On the other hand, the novelty of this particular type of inquiry-based learning activity, i.e., the webquest, may have been more of a motivating factor. According to many of the students' comments, motivation for learning appeared to be based on their enthusiasm for this type of learning activity. Students were asked if the webquest had challenged them in any ways. Many of the students found that it was much more challenging and fun. John stated, "I find our time in the lab much better because its hands-on and there are many more things to do" (Learning Log, April 7, 2004). Jamie said, "The webquest was better than other classes because the information is better and we had more fun" (Learning Log, April 7, 2004). The interest they had in the science

topic of flight and their belief that this type of activity was more stimulating than a traditional science classroom activity made it possible for students to develop more in-depth understanding of the topic. The inquiry-based project appeared to motivate the participants by allowing them to actively explore and interpret the data. It also appeared to stimulate learning by creating an environment that involved the students more directly in the learning process and enticed them to share this learning with others. This was demonstrated in their final presentations on the flight topic.

The research presentation by the students at the conclusion of the study indicated that they had become quite knowledgeable on the topic of flight. Each group demonstrated comprehension of the four forces of flight and demonstrated Bernoulli's principle with a great deal of enthusiasm and understanding.

Teacher changes.

As Harris (2001) points out, if teachers are going to use the Internet as an educational tool with their students then they must change some of the strategies they use. There are reasons that teachers are still hesitant to utilize the Internet in their teaching and many of their reservations center around the availability of training, support, and time (Gallo & Horten, 1994). Although such issues did not figure into the present research because of my familiarity with using the Internet in a learning environment, some of my teaching strategies did change over the course of the study. Prior to this study, I generally had students use the Internet to locate information and copy it down to either answer questions or list details. This type of Internet activity did not particularly challenge students to actually think much about the information or become very engaged

with it. Indeed, many of the students commented on how writing down information for an assigned project was often an unpleasant task.

Teachers sometimes have difficulties in putting students in positions where they are allowed to have some control over their own learning. The introduction of the webquest essentially allowed participants to take control of their own learning; however, in the initial stages of the study they found this difficult. Students depended heavily on the teacher for direction but as time passed they began to rely more on their own judgement and appeared more comfortable making decisions. As a result, I became more of a facilitator supporting student decisions, offering encouragement, and advising when needed. The students came to enjoy this approach and they appeared to learn more and to find the learning experience more enjoyable. Students appeared to exhibit more confidence in their own decision-making abilities both individually and in groups. Similar to Green and O'Brien's (2002) findings, the participants in the present study ceased looking for immediate feedback from the teacher and became more self-directed in their learning. As a result, I spent less time giving instruction but spent more time in facilitating students' work.

Limitations of the Study

This study has several limitations. The first is that many of the insights and factors that had an impact on student learning during the process were based upon the participation of one class of students only and so the issue of transferability could be a concern. This type of research was chosen because of its potential to produce a rich base of information taken from actual learning experience. Action research places great

emphasis on the reflective practices of both the participants and the researcher with the primary purpose of developing practical knowledge. This is based on the collaboration between the participants and the researcher and to a great extent upon the trust that is developed. Although the findings from this research reflect similar results in other studies involving the use of the Internet in education (Wright & Dickerson, 1999) it does not necessarily mean that what was recognized as effective teaching and teaching strategies for this particular group of students would garner similar results in other situations.

Another limitation of this study is that the research itself required me to have a high level of computer skill, familiarity, and confidence in using the Internet in classroom activities and this may be interpreted as researcher bias. There are several important factors that play a role in whether the Internet will be effectively used in the classroom. These include the instructional level and training of the teacher involved, the degree of students' computer proficiency, and the type of Internet activity that the students are involved in. However I used many reflective practices to demonstrate a non-biassed research interpretation of the data such as the use of a questionnaire, learning logs, reflective journal, and interviews that produced honest and reflective feedback for the duration of the study from both participants and myself.

Future Research

The findings of this study show that the Internet offers a unique set of challenges to educators. The goal was to explore the factors that have an impact on grade five students as they utilize this medium as a source of information to research curriculum-

based topics. Schools connected to the Internet can provide students with a rich source of relevant and up-to-date information but can we be assured that using the Internet will provide students with a rich learning experience?

There is a need to study further how the Internet can be used in positive and constructivist ways in education. If it is used mainly as an information source then its full potential as a learning tool for developing students' higher order thinking skills is being overlooked. There are still many challenges facing teachers who use the Internet in their classrooms. This study focussed on a particular way of using the Internet with fifth graders but there is a need to evaluate Internet use at other levels of education as well. More participatory action research is necessary to examine students' learning at all levels of education.

Future research may reveal similar or different insights regarding the best teaching and learning strategies that contribute to the most effective use of the Internet. It might be appropriate to expand this type of research to include the perceptions and attitudes of teachers and students from various grade levels. It would be worthwhile to compare the use of the Internet with more traditional methods of engaging with the information process such as utilizing print materials in the school library. It is also necessary to look at the skill levels required for teachers and students to effectively organize and implement Internet activities in the classroom. More reflective research is needed to fully examine how to best use the Internet in the education of our students. Finally, there is a need to examine when students should begin to learn appropriate keyboarding skills and by what means.

Implications

This study highlights some of the effective teaching and learning strategies that have an impact on student learning at the grade five level. While using the Internet for classroom activities, teachers must carefully examine sites for content and reliability. Due to the Internet's capacity to offer huge amounts of information to users, one of the major challenges for teachers is finding appropriate websites that offer reliable information specific to the students' levels of understanding. At the grade five level, students are neither sufficiently experienced nor sophisticated to allow them to make appropriate decisions about which sites contain relevant and reliable data for finding information. Pre-selected Internet sites should be searched diligently by teachers who are using them to create student projects. This can be a daunting experience for educators for a number of reasons including workload, time constraints, and computer skills. There are numerous sites that educators can use for preparing any project; however, the problem is choosing sites that are both reliable sources of information and appropriate for the students' level of understanding.

Activities involving the Internet must go beyond simple question-and-answer sessions if they are to be meaningful and encourage growth in students' abilities for researching using the Internet. Learning activities like the webquest can be utilized for this purpose. Projects that require students to interact with or evaluate information found on websites have greater potential to result in more engagement with the process. There are many other web-based projects that can be found on the Internet such as keypals, tele-field trips, and other telecollaborative projects. Teaching students to reflect upon the

information they are accessing is critical for information processing. Expecting grade five students to openly surf the Internet to find information usually leads to wasting valuable time for everyone.

Many of the study participants indicated in their learning logs that they frequently had difficulty logging on to teacher-selected websites. A number of reasons could account for this. Grade five students' keyboarding skills are generally not well-developed thus making typing a slow, tedious process. To remedy this problem, information can be handwritten and websites can be selected by using a web-based bookmark managing site. These sites allow teachers to select websites on the Internet which are then available for quick and accurate access by students. Students simply log onto pre-determined sites already bookmarked by the teacher and this eliminates some of the trepidation students feel as a result of their poor typing skills.

Cooperative learning groups are advocated by many researchers who discuss technology-based learning (Becker, 2001; McKenzie, 2000). Instead of isolating students, the Internet can offer a variety of engaging ways in which students can work together to gather, process, and share information they find using this medium. One of the challenges that surfaced in the study was the students' initial uneasiness about working in cooperative groups. Working alone on previous Internet projects was acknowledged by them as being a beneficial practice. Since much of the research on webquests advocates the benefit of cooperative work (Harris, 2001; Yoder, 1999) it is important to look closely at classroom dynamics and pair students according to abilities and work ethic. In the present study, same gender partnerships were requested by most

students. Placing students into workable cooperative groups and strategically situating them around the computer classroom can minimize interference between groups and prompt students to focus on the activity. As groups focussed more on the process of learning they began to share information and ideas with each other so the cooperation between groups became more evident as the study progressed. Cooperative learning groups promoted student interaction, allowing participants to work together in gathering and collaboratively exploring the information so they could eventually share it with the entire class.

Teaching styles need to change to accommodate this type of activity. Inquiry-based learning projects such as webquests are more student-centered and and thus less teacher-directed in their approach to learning. Since students take more of an active rather than a passive role in the information-gathering process, teachers' roles must change from that of information dispensers to process facilitators. This may not be an easy transition for some classes that are more familiar and comfortable with a learning environment that is almost exclusively teacher-directed. As was noted in the present research, students had some difficulties as I changed my teaching strategies. They were looking for traditional types of leadership and direction in the early stages of the webquest but this diminished as students began to take on more responsibility for their own learning and relied more on their own abilities. My role was that of an observer who guided student progress by providing suggestions and support while the students themselves gathered, compiled, and utilized the information. As I modelled a more facilitative approach to teaching, the students became more actively involved in the

learning process which required them to locate, organize, evaluate, and present information in creative ways.

Many teachers are hesitant to introduce and integrate Internet resources into the classroom for a variety of reasons which may include lack of training, support, resources, or time in an already hectic school day (Gallo & Horton, 1994). Whatever the reason, there is a need to encourage teachers to use the Internet as a part of their teaching repertoire. This may involve professional development sessions in selecting and using the vast amounts of information available or one-on-one sessions with teachers and educators experienced in Internet-based teaching practices.

The results of this study support the Internet as a viable tool for enhancing learning. If the Internet can be utilized to strengthen student learning then teacher acquisition of technical skills is needed to explore its possible uses. These skills can be applied across the curriculum and can provide educators with the opportunities to use a wider range of pedagogical practices in any subject area. Teacher acquisition of technical skills would be the first step in creating more challenging learning environments for our students. In turn, teachers can then assist students in developing and refining their own searching skills and in so doing, promote the growth of critical evaluation adeptness. In teaching students to both navigate and negotiate the Internet, teachers encourage them to become more independent learners.

Conclusion

The results of this study support the idea that the Internet can be utilized effectively as a source of information to research curriculum-based topics at the fifth

grade level. Utilizing an inquiry-based learning approach such as the webquest to guide fifth grade students in Internet use reinforces a constructivist approach to learning. It helps increase student understanding of the topics, motivates them to learn through active engagement with the material, and encourages cooperative learning through frequent interaction and feedback between student and teacher. This type of Internet activity can also be used in all subject areas and at many different grade levels; however, it should be used in connection with existing approaches to learning rather than to replace them. This process offers many potential benefits to students: they have increased control over their own learning, they become more focussed and motivated to complete the tasks, and they effectively collaborate with each other to increase their knowledge and understanding of the topics.

The idea that the Internet can be used effectively for educational purposes is practical only if other elements are factored into its use. To be truly effective, teachers must have the necessary knowledge and skills to integrate this technology into their teaching. Using the Internet involves more student-centered and collaborative approaches to learning and therefore motivating both teachers and students in its implementation is germane to its success. First, the information must be relevant to students' learning needs and used to both reinforce and expand the curriculum. The sources must be readable and understandable to students. Next, students need to be allowed to be part of the process and encouraged to be partners in both gathering and sharing the information. The process should be interesting and enjoyable for them and presented in such a way as to encourage learning and interaction between students and the

teacher. Students then need to be encouraged to build upon what they already know and encouraged to gain further knowledge and develop skills. Finally, instructors must praise and provide positive feedback, encourage self-confidence and be enthusiastic in their own approaches to learning using the Internet as a learning tool. The Internet is simply a tool that can enhance students' levels of understanding when it is used properly in the educational arena. How this happens is up to the teacher. The challenge for all educators in today's electronic world is how to respond to the many different educational needs of students and select strategies to effectively utilize the Internet as one effective teaching and learning tool in their repertoire.

References

Alevizou, P. (2000). To wire or not to wire? Encyclopedia Britannica versus Microsoft Encarta. *Educational Technology and Society,* 5(1).

Ba, H., Tally, W., & Tsikalas, K. (2002). Investigating children's emerging digital literacies. *Journal of Technology, Learning, and Assessment*, 1(4). Retrieved April 15, 2005, from http://www.jtla.org

Barker, J. (2002). What is the Internet, the World Wide Web, and Netscape? UC Berkeley - *Teaching Library Internet Workshops*. Retrieved April 15, 2005, from http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/WhatIs.html

Becker, H. J. & Riel, M.. M. (1999). Teacher professionalism, school-work culture and the emergence of constructivist compatible pedagogies. *Centre for Research on Information Technology and Organization.* Retrieved April 15, 2005, from http://www.crito.uci.edu/tlc/findings/special_report2/

Becker, H. J. (2001). How are teachers using the computers in instruction? Paper presented at the *2001 Meetings of the American Educational Research Association.* Retrieved April 15, 2005 from http://www.crito.uci.edu/tlc/findings/conferences-pdf/how_are_teachers_using.pdf

Berenfeld, B. (1996). Linking students to the infostructure. *T.H.E. Journal*, 23(9). Retrieved April 15, 2005, from http://216.167.123.97/magazine/vault/A10.cfm

Bigge, M..L. & Shermis, S. (1999). *Learning theories for teachers* (6th ed.). New York, NY: Longman.

Bogdan, R.C. & Biklen, S.K. (1998). *Qualitative research for education* (3rd ed.). Needham Heights, Ma: Viacom Co.

Bork, A. (2001). What is needed for effective learning on the Internet? *Educational Technology and Society*, 4(3). Retrieved April 15, 2005, from http://ifets.ieee.org/periodical/vol_3_2001/bork.html

Brown, A.L. (1997). The advancement in learning. In H.J. Walberg & Geneva D. Haertel (Eds.), *Psychology and educational practice* (pp. 52-76). Berkeley, CA: McCutchan.

Carper, L. J. (1996). Effectively using technology to develop independent research topics by middle school language arts students. (ERIC Document Reproduction Services No. 401888).

Cena, J. E. (2000). Bridging the gap between cultures, classrooms and schools: A close look at online collaborative learning. *Educational Technology & Society*, 3(3). Retrieved April 15, 2005, from http://www.ifets.info/journals/3_3/d01.html

Cox, M.; Preston, C.& Cox, K. (1999). What motivates teachers to use ICT ? Paper presented at the *British Educational Research Association: Annual Conference*. Sept 2-5, 1999. Retrieved April 15, 2005, from http://www.leeds.ac.uk.educol/documents/00001329.htm

Dooling, J. (2000). What students want to learn about computers. *Educational Leadership*, 58(2), 20-24.

Doyle, C. S. (2003). *Information literacy a concept for the information age*. Retrieved April 15, 2005, from

http://learning.kern.org/tlc_resources/stories/Story/Reader$25

Ebersole, S. (2000). Uses and gratifications of the web among students. *Journal of Computer-Mediated Communication,* 6(1). Retrieved April 15, 2005, from http://jcmc.indiana.edu/vol6/issue1/ebersole.html

Elliot, J. (1985). *Action research for educational change*. Open University Press.

Ertmer, P. A., Gopalarkrishnan, S. & Ross, E. M. (2001). Technology-using teachers: Comparing perceptions of exemplary technology use to best practice. *Journal of Research on Technology in Education*, 33(5). Retrieved April 15, 2005, from http://www.iste.org/inhouse/publications/jrte/33/5/ertmer.cfm?Section=JRTE_33_5

Ewing, T., Dowling, J. & Coutts, N. (1999). Learning using the World Wide Web: A collaborative learning event. *Journal of Educational Multimedia and Hypermedia*, 8(1), 3-22.

Feldman, A. (1995). *Embedding action research in professional practice.* Retrieved April 15, 2005, from http://www-unix.oit.umass.edu/~afeldman/ActionResearchPapers/FeldmanAtkin1995.PDF

Feldman, A. (2001). *Teacher development and action research: Findings from six years of action research in schools*. Retrieved April 15, 2005, from http://wwwunix.oit.umass.edu/~afeldman/ActionResearchPapers/Feldmanetal2001.pdf

Fulton, K. (2000). From promise to practice: Enhancing student Internet learning.

Multimedia Schools, 8(2), 16-20.

Gallo, M. A. & Horton, P. B. (1994). Assessing the effects on high school teachers of direct and unrestricted access to the Internet: A case study on an east central Florida high school. *Educational Technology Research and Development*, 42(4), 17-39.

Gibson, S. & Oberg, D. (1997). Case studies of Internet use in Alberta schools: Emerging issues. *Canadian Journal of Educational Communications*, 26(3), 145-164.

Green, W. D. & O'Brien, T. (2002). The Internet and the upper elementary classroom: Making a difference? *The Educational Technology Journal*, 11(9). Retrieved April 15, 2005, from http://fno.org/jun02/impact.html

Hack, L. & Smey, S. (1997). A survey of Internet use by teachers in three urban Connecticut schools. *School Library Media Quarterly*, Spring (97), 151-155.

Hammett, F. & Barell, R.C. (2002). *Digital expressions: Media literacy and English language arts*. Calgary, Detselig Enterprises Ltd.

Hammond, M. (2002). Cyber-plagiarism: Are FE students getting away with words? Paper presented at the *ANIC (Association of Northern Ireland Colleges)* June 17-19, 2002. Retrieved April 15, 2005, from http://www.leeds.ac.uk/educol/documents/00002055.htm

Harris, J. (1998). Curriculum-based telecollaboration: Using activity structure to design student projects. *Learning and Leading With Technology*, 26(1), 6-15.

Harris, J. (2000). Online to learn or in line with standards? An illusory dilemma. *Learning and Leading With Technology*, 28(3), 10-15.

Harris, J. (2001). Structuring Internet-enriching learning spaces for understanding and action. *Learning and Leading with Technology*, 28(4), 50-55.

Healy, J. (2000). The I-generation – From toddlers to teenagers. *Educational Leadership,* 58(2), 8-13.

Housego, S. & Freeman, M. (2000). Case studies: Integrating the use of web-based learning systems into student learning. *Australian Journal of Educational Technology*, 16(3), 258-282.

Jiang, M. & Ting, E. (1998). Course design and instruction, and students' online behaviors: A study of instructional variables and students' perceptions of online learning. (From ERIC Document Reproduction Services No. ED421970).

Jonassen, D.H. (1991). Objectism vs. constructivism: Do we need a new philosophical paradigm shift? *Educational Technology: Research & Development*, 39(3).

Kerrey, B. & Isakson, J. (2000). The power of the internet for learning: Moving from promise to practice. *Report of the Web-Based Educational Commission to the President and the Congress of the United States.* (134 pages). Retrieved April 15, 2005, from http://www.ed.gov/offices/AC/WBEC/FinalReport/

Kobler, R.D. (1999). *Computing dictionary* (4th ed). Lincoln, NE: Sandhill Publishing.

Kortecamp, K. & Steeves, K. A. (2002). Teacher research: The key to understanding the effects of classroom technology on learning. *The Journal of Technology Studies*, 28(2), 42-47.

Kubly, K. (1997). *Guiding students in using the World Wide Web for research.* Retrieved April 15, 2005, from

http://www.mtsu.edu/~itconf/proceed97/kubly.html

Kumari, S. (1998). Teaching with the internet. *Journal of Information for Teacher Education*, 7(3), 363-377.

Kuhlthau, C. (1993). Implementing a process approach to information skills: A study identifying indicators in library media programs. *School Library Media Research*, 22(1). Retrieved April 15, 2005, from http://www.ala.org/ala/aasl/aaslpubsandjournals/slmrb/editorschoiceb/infopower/selectkuhlthau1.htm

Langford, L. (1998). Information literacy: A clarification. *From Now On: The Educational Technology Journal*, 8(1). Retrieved April 15, 2005, from http://www.fno.org/oct98/clarify.html

Lenhart, A., Simon, M. & Graziano, M. (2001). *The Internet and education: Findings of the Pew Internet & American Life Project.* Retrieved April 15, 2005, from http://www.pewinternet.org/pdfs/PIP_Schools_Report.pdf

Lewin, L. (1999). "Site reading" the world wide web. *Educational Leadership*, 56(5), 16-20.

Lincoln & Guba, E. G. (1985). *Naturalistic inquiry.* Newberry Park, CA: Sage Publication Inc.

Lynch, J. (1999). Introducing Internet technologies: A study in four Victorian state secondary schools. *Australian Association for Research in Education.* Retrieved April 15, 2005, from http://www.aare.edu/99pap/lyn99492.htm

Marx, G. (2001). Educating children for tomorrow's world. *Futurist*, 35(2), 43-48.

McKenzie, J. (2000). When the book? When the net? *Educational Technology Journal,* 9(7). Retrieved April 15, 2005, from http://www.fno.org/mar2000/whenbook.html

McKinnon, D. & Geissinger, H. (2002). Interactive astronomy in elementary schools. *Educational Technology and Society*, 5(1). Retrieved April 15, 2005, from http://ifets.ieee.org/periodical/vol_1_2002/mckinnon.html

Moseley D., Higgins, S., Bramald, R., Hardman, F., Miller, J., Mroz, M., et al. (1999). *Ways forward with I.C.T.: Effective pedagogy using information and communication technology for literacy and numeracy in primary schools.* Retrieved April 15, 2005, from http://www.leeds.ac.uk/educol/documents/00001369.htm

Moursund, D. G. (1999). IT-assisted project-based learning. Editors Message, *Learning and Leading with Technology.* Retrieved April 15, 2005, from http://darkwing.uoregon.edu/~moursund/dave/LLT-V26-1998-99.html#LLTV26#8

Moursund, D. & Smith, I. (2000). Research on internet use in education. *International Society for Technology in Education.* Retrieved July 11, 2002, from http://www.uoregon.edu/~moursund/dave/research3.htm

Nigohosian, R. (1996). *Scholarly internet research: Is it real?* Retrieved April 15, 2005, from www.westga.edu/~bquest/1997/**internet**.html

Oppenheimer, T. (1997). The computer delusion. *The Atlantic.* Retrieved April 15, 2005, from http://www.theatlantic.com/issues/97/computer.htm

Patton, M. Q. (2002). *Qualitative evaluation and research methods.* (3rd ed.). Newsbury Park, CA: Sage Publications, Inc.

Peha, J. M. (1995). How K-12 teachers are using computer networks. *Educational Leadership,* 53(2), 18-26.

P.E.I. Department of Education (2000). *Building information literacy: Strategies for developing informed decision makers and independent lifelong learners.* Retrieved April 15, 2005, from http://www.edu.pe.ca/bil

P.E.I. Department of Education (2000). *Journey on: Working towards communication and information technology literacy.*

Rakes, G. C. ; Flowers, B. F. ; Casey, H. B. ; Santana, R. (1999). An analysis of instructional technology use and constructivist behaviors in K-12 teachers. *International Journal of Educational Technology.* 1(2), 38-56.

Revenaugh, M. (2000). Toward a 24/7 learning community. *Educational Leadership,* 58(2) 25-28.

Roschelle, J. M., Pea, R. D., Hoadley, C. H., Gordin, D. N., Means, B. M. (2000). Changing how and what children learn in school with computer-based technologies. *Children and Computer Technology,* 10(2), 76 - 101.

Saliba, E. & Shoemaker, K. (1997). Brave the wave: Using the Internet for student research. Paper presented at *"The Universe at Your Fingertips: Continuing Web Education"*. Retrieved April 15, 2005, from http://www.library.ucsb.edu/universe/saliba..html

Schrock, K. (2001). Tapping the Internet for classroom use: Information literacy skills

pave the way. *Multimedia Schools*, 8(2), 38-43.

Shields, M. K. & Behrman, R. E. (2000). Children and computer technology : Analysis and recommendations. *Children and Computer Technology*, 10(2), 4-30.

Shapiro, J. J. & Hughes, S. K. (1996). Information literacy as a liberal art. *Educom Review*. Retrieved April 15, 2005, from http://www.educause.edu/pub/er/review/reviewarticles/31231.html

Sivin-Kachala, J., Bialo, E. & Rosso, J. E. (2000). Online and electronic research by middle school students. *Interactive Educational Systems Design Inc.* Retrieved April 15, 2005, from http://www.mff.org/publications/publications.taf?=293

Slater, T. (1998). The data they are a-changing. Using real-time earth and space science data in the classroom. *Learning and Leading with Technology,* 26(2), 28-36.

Songer, N. B., Lee, H. S. & Kam, R. (2000). *Urban science classroom against a Urban science classroom against a technological world.* Retrieved July 20, 2002, from http://groundhog.sprl.umich.edu/site/about/papers/songer_urban.pdf

Stringer, E. T. (1996). *Action research: A handbook for practitioners*. Thousands Oaks, Cal. Sage Publications, Inc.

Tapscott, D. (1999). The net generation and the school. *Milken Exchange Articles*. Retrieved April 15, 2005, from http://www.mff.org/edtech/article.taf?_function=detail&Content_uid1=109

VanFossen, P. J. (1999). "Teachers would be crazy not to use the Internet!" : A preliminary analysis of the use of the Internet/WWW by secondary social studies teachers in Indiana (ERIC Document Reproduction Services No. ED438205).

Wartella, E.A. & Jennings, N. (2000). Children and computers: New technology - old concerns. *Children and Computer Technology,* 10(2), 31-43.

Watson, L. W. (1999). Webquests in the middle school curriculum: Promoting technological literacy in the classroom. *Meridian.* Retrieved April 15, 2005, from http://www.ncsu.edu/meridian/jul99/webquest/index.html

Wright, A. & Dickerson, V. (1999). Integrating technology into a science classroom. (ERIC Document Reproduction Services No. ED443659).

Wyld, S. & Eklund, J. (1997). A case study of communication technology within the elementary school. *Australian Journal of Educational Technology*, 13(2), 144-164.

Yoder, M. B. (1999). The student webquest: A productive and thought-provoking use of the Internet. *Learning and Leading in Technology*, 26(7), 6-9.

Internet References

Alta Vista Canada. http://www.altavistacanada.com

Interactive Mars Habitat. http://www.exploremarsnow.org

Take a Dip: The Water In Our Lives. http://www.k12science.org/curriculum/dipproj2/en/

Handbook of Engaged Learning Projects.

http://www-ed.fnal.gov/help/Wegley/index.html

A Journey Through Space and Time. http://www.csu.edu.au/telescope/

Kids as Global Scientists. http://www.onesky.umich.edu/kgs01.html

The Webquest Page. http://webquest.sdsu.edu/

Grade 5 Flight Webquest Page.

http://www.edu.pe.ca/montaguecons/website_2004/Teachers_Pages/Grade5/2004

5DB/flight-web-quest/index.htm

Appendix A

Parent Information Letter

Dear Parents and Guardians,

I am your child's grade five teacher at Montague Consolidated School. I am presently enrolled in the Masters of Education program at the University of Prince Edward Island and am working on my thesis entitled *Using The Internet To Research Curriculum-Based Topics At The Grade Five Level.* The purpose of this study is to examine how students at the grade five level utilize the Internet to effectively research curriculum-based topics. The Internet can be a useful tool for gathering information and when used appropriately can enhance classroom learning.

I am seeking your permission to involve your child as a participant in this action research project. Students will be asked to complete a webquest (an inquiry-based Internet activity) in which information comes from resources provided on the Internet. During the process of several computer classes in a four to five week period, and after an initial student questionnaire has been given, students will be asked to keep journals and record their impressions of the particular research strategies used while working on the webquest. In addition, several students will be interviewed by myself with regards to their opinions about the research strategies utilized. The information that is gathered as part of the process will be valuable to the understanding of learning and will contribute to best practices in teaching at this level. Only the researcher and the supervisor will have access to this data during the research period.

This research is strictly voluntary and at no time will your child be at any risk

Appendix B

Student Information Letter

Grade 5B Students:

I am presently enrolled in a Masters of Education program at the University of Prince Edward Island and I am working on my thesis entitled *Using the Internet to Research Curriculum-Based Topics at the Grade Five Level.* The purpose of this study is to look at how you as students gather and use the information you find on the Internet to research topics in our grade five program.

I am asking your permission to become part of this research that I am conducting. You will be asked to look at and examine different ways to use the Internet in the classroom. You will be asked to do a questionnaire designed by me, keep a learning journal, and participate in a conferencing session (interview) with me if you are one of the students chosen for this purpose. The information that can be gathered from this study can help us better understand how the Internet can be useful for better teaching and learning practices. If you choose not to participate in this research, you will still be asked to complete the activities because this is a part of the regular classroom program. However, the information that I collect from your learning logs and questionnaire will not be used.

During this study your real names will not be used so that all the things that you say and do will be kept in strictest confidence by myself and my supervisor. Your part in this study is voluntary and if you feel uncomfortable while you are part of this study or if you feel that you can't participate then it is not a problem, and your data (learning logs

and questionnaire) will not be a part of the study. You parents will be invited to attend an information session at a further date and you are asked to participate also.

Your teacher,

Mr. Bryand

Appendix C

Parent Consent Form

I, (Please print your name)_____ have read and understand the contents of the information letter and hereby give my consent to the participation of my child in the research project entitled "Using the Internet to Research Curriculum-Based Topics at the Grade Five Level". This research study is being conducted by my child's teacher, David Bryand, who is a Masters of Education student at the University of Prince Edward Island. My child's participation in this research is entirely voluntary and I understand that I may withdraw my child from this research at any time without question.

I understand that the study will take place at school during regular instructional time. This action research project will involve both the student and the teacher in the process of analyzing how a technological tool like the Internet can be utilized to research school-related topics. I also understand that the information that is gained from this research will be used to foster a better understanding of how the Internet will be utilized within the grade five classroom. I understand that the information that is collected during this research study will be gathered through the use of a student questionnaire, teacher-observation of classroom activities and a student learning log. I also understand that my child may be selected to provide further information through three, fifteen minute conferencing sessions with the researcher. If my child is invited to participate in an interview, he/she can choose not to answer any questions if so desired.

I have been assured by the researcher that information shared by my child will remain strictly confidential and that measures have been taken to assure his/her anonymity. I understand that pseudonyms will be used in any writing resulting from this study. I have been given the opportunity to ask question regarding this research and know that in signing the consent form I will be giving permission for my child to participate in this study.

If there are any further question or concerns regarding the ethics of this study I can contact the U.P.E.I. Research Ethics Board at (902-566-0637) or e-mail at lmacphee@upei.ca

I understand that I can keep a copy of this consent form.

Signature of Parent: _____ Date:_____

Signature of Researcher: _____ Date: _____

I wish to receive a summary of the research results (Yes / No)

Appendix D

Student Consent Form

I, (Please print your name) _____ wish to become part of my teacher's research project entitled " "Using the Internet to Research Curriculum-Based Topics at the Grade Five Level". My part in this research project is entirely voluntary and I understand that I may stop taking part of this research if I feel uncomfortable at any time during the study.

I understand that the part that I take in my teacher's research project will help other students like me to better understand how to use the Internet to research topics at the grade five level. I understand that I will have to take part in answering a questionnaire and that I will have to write down my own thoughts and feelings and answer questions in a student learning log given to me by my teacher. I also understand that the teacher may select me to take part in a conferencing session. In this session my teacher will ask me further questions on what I did in class and how I got along on my time on the Internet.

My teacher has informed me that whatever I say or write in my learning log will be kept confidential and that I will be allowed to tell my true thoughts and feeling without retribution from anyone. I also understand that my parents can withdraw me from this research at any time.

Signature of student: _____ Date: _____

Signature of teacher: _____ Date: _____

Appendix E

Student Questionnaire:

1.Gender (Please circle) Male Female

2. Do you have a computer at home? Yes No

(If yes please continue)

(If no go to # 6)

3. How do you use your computer at home? (You can circle more than 1)

a. E-mailing friends

b. playing games

c. school work

d. chat rooms

e. Other (please specify) _____

4. What do you use the Internet for? (You can circle more than 1)

A. surfing and browsing

b. on-line games

c. download music files

d. finding information for school projects

e. Other (please specify) _____

5. How much time, on average each day, do you spend on your home computer?

a. less than 1 hour per day

b. 1 - 2 hours per day

c. If more than 2 , then how many more? _____

6. How do you use the computer in school? (You can circle more than 1)

a. E-mailing friends

b. playing games

c. school work (word processing)

d. finding information for school projects

e. CD-Rom or data bases

f. other (please specify) _____

7. Have you ever used the Internet to find information for projects? Yes No

If Yes, for what purpose did you use the Internet? _____

_____

8. Which search engines do you use the most?

a. Yahoo

b. Google

c. Alta Vista

d. Other (please specify) _____

9. Choose one of the following two statements that is closer to your own opinion.

a. In my opinion, using the Internet for finding information is worthwhile.

b. In my opinion, using the Internet for finding information is a waste of time.

Please explain why you choose either A or B _____

_____

Appendix F

Letter to School Board

Ms. Judy Hughes, Acting Director of Instructional Services

Eastern School Division

234, Shakespeare Drive, Stratford

C1B 2V8

Dear Ms. Hughes,

I am a grade five teacher at Montague Consolidated School and am presently enrolled in a Master of Education program at U.P.E.I. I am seeking your permission to conduct research at Montague Consolidated School during the upcoming 2003/2004 school year for my thesis entitled *Using the Internet to Research Curriculum-Based Topics at the Grade Five Level.* During the year the students of my grade five class at Montague Consolidated will be invited to participate in my research.

After receiving parent consent forms for each of the student, as well as their own signed assent forms, I will conduct an action research project. Action research is typically classroom research in which the teacher-researcher examines his/her classroom teaching practices in close detail and reflects on the process of what is happening within the classroom. In this research the strategies and processes that the students and the teacher go through as they conduct research using the Internet as a learning tool will be closely examined. At no time will the students selected for this study be at any risk and all student confidentiality and anonymity will be assured. Data collection for this study will include a student questionnaire, interviews and student and teacher journals.

Appendix G

Letter to Principal

Ms. B. J. Willis

Montague Consolidated School

62 Princess Dr.

Montague, PE

C0A 1R0

Dear Ms. Willis,

As you are aware, I am presently enrolled in the Master of Education program at UPEI. I am seeking your permission to conduct an action research project at Montague Consolidated School during the upcoming 2004 year for my thesis entitled *Using the Internet To Research Curriculum-Based Topics at the Grade Five Level.* During the year the students of my grade five class at Montague Consolidated will be the participants of my research.

After receiving parent consent forms for each of the student, as well as their own signed assent forms, I will conduct an action research project. Action research is typically classroom research in which the teacher-researcher examines his/her classroom teaching practices in close detail and reflects on the process of what is happening within the classroom. In this research the strategies and processes that the students and the teacher go through as they conduct research using the Internet as a learning tool will be closely examined. At no time will the students selected for this study be at any risk and all

student confidentiality and anonymity will be assured. Data collection for this study will include a student questionnaire, interviews and student and teacher journals

This research will allow the teacher-researcher (myself) to draw conclusions based upon how the participants utilize different strategies to conduct research using the Internet at the upper elementary level. It is my belief that such a study will reveal important educational findings that can be applied to classroom use of the Internet as a research tool and that the knowledge gained from this research will be used to enrich and enlighten the educational learning process

If you have any questions regarding this request or of the research process that I am proposing, please contact me at school or e-mail me at dabryand@edu.pe.ca There are two copies of this letter and I would appreciate if you would sign the bottom of the form giving me permission to conduct this research. Please keep the remaining copy for your files.

I hereby grant permission for David Bryand to conduct research in his grade five classroom at Montague Consolidated School for the purpose of completion of a Masters of Education thesis entitled *Using the Internet to Research Curriculum-Based Topics at the Grade Five Level.*

Signature _____ Date _____

Appendix H

Questions Generated for Students Prior to Actual Study

1. What do you enjoy while working on the computers in school?
2. What do you find most difficult when working on the computers at school?
3. What are the differences between working on the Space Theme project and the World Facts Project?
4. What projects did you like or dislike and why?
5. What does "surfing the Internet" mean to you?
6. Is Surfing the Internet a good way to find information for school projects?
7. Would you rather work on "teacher selected" web sites or "surf the Internet" for information?

Appendix I

Questions Generated During Study

1. What things did you find difficult or easy to understand as you started this webquest?
2. Did you have a clear understanding of the tasks in this webquest?
3. Explain how working with a partner may be helpful or not.
4. Do you believe that this webquest provides enough or not enough information?
5. How could your group improve upon what they are doing?
6. How is this webquest different from other projects?
7. What do you enjoy or dislike about this webquest?
8. Do you feel that you have a better understanding of flight? Explain.
9. Has this webquest challenged you in any way?
10. How has this webquest helped you focus on the topic?
11. Do you believe that this webquest can help you become a better learner in school? Explain.
12. Did you have enough time to complete this assignment?
13. Did you find other groups helpful or not as you worked through this webquest?
14. Would you rather work with a partner of the same gender? Explain.

Appendix J

Interview Questions for Participants

1. What kinds of information do you look for while working on the Internet at home or at school?
2. What computer skills does a student need to effectively work on activities in the computer room?
3. In your opinion is finding information on the Internet different than finding information from other sources like the using library or books?
4. Would you rather work alone or work co-operatively with partners on this webquest? Explain. Was working with a partner helpful or not during this webquest? Explain.
5. What computer skills do you need while working on this webquest or on other things in the lab?
6. Did this computer activity (webquest) help you or not help in understanding science topics like flight any better? Explain
7. Was working on the Internet during this activity different than a regular science class? Explain
8. Did you feel that you had enough time to complete the activities? Explain.
9. What was the most positive or enjoyable thing about working on the Internet during this project?
10. What was the most negative or unlikeable thing about working on the Internet

during this project?

11. Was the teacher helpful or not during this activity? If so then in what ways? Was this different from any other classes?

12. If you were to describe this webquest to someone else what words would you use to describe it?

13. Did your group help other groups in any way during this activity? If so how?

14. Did you feel that you were learning more during this webquest than you do in a normal classroom? Did you feel that you were responsible for learning and finding the information for yourself ?

15. As you worked on this webquest were you encouraged you to learn more than you usually do in the classroom? Or was it the same as other classroom activities? Explain.

16. Did you find that there was enough information available to you to complete this activity? Is this different from any other classroom activities that you do? If so explain.

17. If you could do this activity again, what things would you like to do differently and what things would you keep the same? Do you think we could or should do similar things in other classes?

18. Does working on the computer and the Internet help you to become a better student? Explain how this may or may not help other grade five students.

19. Did you enjoy presenting your research information to the class? Did you feel that you had a better understanding of the flight concepts when finished?

20. Did you offer any support to or co-operate with other groups in any way before or during their presentations?

Appendix K

Flight Webquest

INTRODUCTION

Welcome students!

Have you ever wondered how a plane stays in the air even when it weighs thousands of pounds? Have you ever looked at birds in flight and pondered how they manage to fly when we can't? You would not be the first to ever wonder about these things.

From the beginning of time people have wondered how things fly. Primitive people wondered why birds and animals could fly. Over time our ancestors examined these things and quickly understood that if we were to study the principles of flight we might be able to fly also.

In this Quest, you will explore many of these principles of flight and even take a closer look at some of the early explores in this amazing new field of science. Through this Quest you be introduced to some of the many challenges that earlier explores had to overcome.

As you and your partner work through this Quest you will become experts in the science of flight.

TASK

Part of your job in this Web Quest is to thoroughly research the topic of FLIGHT and have a 10 minute presentation ready for the class. This presentation will be outlined on a piece of bristol board or construction paper and then presented to the class for evaluation. In your **class presentation** you will:

1. **Introduce** one of the many famous, earlier flight pioneers.
2. **Discuss** and **explain** how the four forces of flight (thrust, lift, gravity/weight, and drag) help in the process of flight.
3. **Explain** Bernoulli's principle by **doing a simple class experiment**.

In this Web Quest your teacher will provide pre-selected web sites that contains much of the relevant information that your group needs to research each topic. You must spend time reading the sites and discussing this information with your partner. You are to prepare a written report for the class (show the teacher the rough copy) and then present your good copy to the class for evaluation.

Your project will involve the following three components: computer time, group work, and a class presentation.

Are you Ready to Begin?

THE PROCESS

It is important that you go over each of these descriptions of your task. This process will be broken down into clearer steps for your group to follow.

PREPARING THE RESEARCH

- Browse the flight topic page and read the description of the Internet sites that have been selected for your use in this Web Quest.
- Look carefully at the websites and with your partner decide which of the (early pioneers of flight) your group might like to research for the presentation.
- Select the websites that you and your partner would like to work on for gathering information for your research.
- Click on the websites and begin to search for the information that you may need.
- Take notes from the websites, writing down the information using the main idea and supporting details on the organizer sheet that your teacher has provided for you. You can organize your research notes carefully writing down the main ideas and supporting details. Remember that you should never copy research notes word-for-word. Always put notes in your own words or thoughts.
- When you have sufficient research notes you may begin preparing for you presentation. (Make a rough copy first and check with the teacher before you do this.)

PRESENTING THE RESEARCH

- Review your research findings and decide how your group will put this on a final report copy (a sheet of bristol board with pictures and research notes).
- Visit the **student rubric** evaluation page of the Web Quest to see how you report will be evaluated.
- Revise and edit your report if necessary.
- Present your research report orally to the class on FLIGHT DAY (the day selected to present reports).

GOOD LUCK IN YOUR RESEARCH!

RESOURCES

Here is a list of all the selected Websites that you will need. Remember to look at the information in the sites that you have selected carefully and gather the information that is essential for your particular presentation.

How Do Things Fly?

- History of Flight .... Celebrating the Evolution of Flight.
- The Science of Flight ..... Past, Present, and Future history of flight.
- The Marvel of Flight ..... The history of flight and four forces in flight.
- Early Flight ..... Some of the earlier history of the airplane.
- Aviation History .... Canadian museum of Flight

Early Pioneers of Flight

- Amelia Earhart ... One of the first women in flight.
- Charles Lindbergh ... An American Aviator.
- Charles Lindbergh ..... The Spirit of Saint Louis.
- The Wright Brothers .... These brothers flew the first airplane.
- Alcock and Brown .... First to fly across the Atlantic Ocean.
- The Montgolfier Brothers .... First to fly a balloon.
- Early Airmen in History ..... Names of important airmen in earlier flight history.
- Women in Flight ..... Women in Aviation History.

Bernoulli's Principle

- Bernoulli's Principle ... A simple explanation of the principle.
- Bernoulli's Principle .... Some examples of Bernoulli's principle.
- Bernoulli's Principle ..... A simple experiment with cups.
- Bernoulli's Principle ..... Another simple experiment.
- Bernoulli's Principle .... Simple experiments with paper.

EVALUATION

Your project will be evaluated according to the student evaluation rubric form. These will include:

- Your **use of your time** looking at selected web sites and the **skills** that you and your partner used while accomplishing this task. Your use of the organizer sheet

will be examined also.

- Your **understanding of the science concepts** that were studied or researched during this webquest (four forces of flight, and Bernoulli's Principle) and **how well you explained** the scientific terms in your written and oral presentations.
- Your **overall class presentation**: how you used pictures or diagrams in your report and how well you explained the scientific terms and concepts.

Click on the sections below if you need a refresher on either the assessment rubrics or the organizer sheet.

Organizer Sheet

Student Assessment Rubric

CONCLUSION

Congratulations on your success!

You and your partner have now become experts on the principles of flight. In working on these research topics (early pioneers in aviation, four forces of flight and Bernoulli's Principle) you can now cease to wonder about why and how things actually fly! You now understand these principles of flight that amazed mankind since the beginning of time. It is your time to pass this knowledge on to others.

Appendix L

Organizer Sheet

Main Ideas &

Supporting Details

You can use this type of a work sheet to help you to understand how the ideas of a paragraph or passage fit together. This is helpful in finding information for your research topic.

As you read each section look for the sentence that states the main idea or "gist" of the paragraph or passage. Once you have found the main idea then you can write or list some of the supporting details.

Main Idea: _____

_____

_____

_____

_____

Supporting Details:

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

Appendix M

Flight WebQuest Research Rubric

Each of the *three student rubrics* are based on an overall mark of 12. Students can be evaluated based upon four levels of performance (outstanding, meeting standards, approaching standards, and improvement needed). Students could possibly receive an overall mark of **36** based on their evaluation in the three student research rubrics.

Student's Information Processing Skills

Student's Name _____

	Level 4 Outstanding Marks: 12-10	**Level 3** Meeting Standards Marks: 9-7	**Level 2** Approaching Standards Marks: 6-4	**Level 1** Improvement Needed Marks: 3-1
Skills Needed In Research	Student applies all the necessary skills/strategies to research, record, and organize the information for a written report.	Student applies most of the appropriate skills/strategies to research, record, and organize the information for the written report.	Student applies some of the skills/strategies to research, record, and organize the information for the written report.	Student rarely applies the skills/strategies to research, record, and organize the information for the written report.
Use of Research Time	Student uses time wisely and is on task **all the time** during the research process. He/she utilized more than one website to research topic. Student may have used additional resources for this purpose.	Student was on task **most of the time** during the research process. He/she utilized more than one website to research topic.	Student was on task **some of the time** during the research process. He/she utilized one website to research topic.	Student had trouble focusing on the task during the research process. He/she had to be reminded to stay focused on assigned website for researching process.

Student's Understanding of Science Concepts

Student's Name _____

	Level 4 Outstanding Marks: 12-10	**Level 3** Meeting Standards Marks: 9-7	**Level 2** Approaching Standards Marks: 6-4	**Level 1** Improvement Needed Marks: 3-1
Four Forces of Keeping an Airplane in Flight	Student demonstrates a **clear understanding** of the forces that keep an airplane in flight. He/she can explain each of the forces in full detail.	Student demonstrates **an understanding** of the forces that keep an airplane in flight. He/she can explain most of the forces but not in full detail.	Student demonstrates **some understanding** of the forces that keep an airplane in flight. He/she can only provide partial details of the forces involved.	Student demonstrates **limited knowledge** of the forces that keep an airplane in flight. He/she can provide little or no explanation of the forces involved.
Bernoulli's Principle	Student demonstrates a **clear understanding** of Bernoulli's Principle with no misconceptions.	Student demonstrates a **general understanding** of Bernoulli's Prinicple with no significant misconceptions	Student demonstrates a **partial understanding** of Bernoulli's Principle with minor misconceptions.	Student demonstrates a **limited understanding of** Bernoulli's Principle with significant misconceptions.

Student's Class Presentation

Student's Name _____

	Level 4 Outstanding Marks: 12-10	**Level 3** Meeting Standards Marks: 9-7	**Level 2** Approaching Standards Marks: 6-4	**Level 1** Improvement Needed Marks: 3-1
Oral and Written Report	Student communicates clearly and precisely, providing complete explanations of objectives. Uses pictures and diagrams, etc., to illustrate flight concepts. Student constantly uses appropriate scientific terminology in report.	Student communicates with some clarity, providing adequate explanations of objectives. Uses some pictures and diagrams, etc., to illustrate flight concepts. Student usually uses appropriate scientific terminology in report.	Student provides casual explanations of objectives. Adequate use of pictures and diagrams, etc., to illustrate flight concepts. Student sometimes uses appropriate scientific terminology in report.	Student provides inadequate explanations of objectives. Use of pictures and diagrams, etc., is limited. Student rarely uses appropriate scientific terminology in report.
Project Details	Project includes all details of research and offers a thorough understanding of the topics.	Project includes many of the details of research and offers an adequate understanding of the topic.	Project includes some of the details of research and the overall project appears somewhat organized.	Many of the details of the research are missing and the overall project appears disorganized.