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Digital information literacy: What competencies do middle school students need for effective and successful Internet research endeavors?

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A thesis submitted in partial fulfillment of the requirements for the degree of

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In
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We accept this thesis as conforming to the required standard



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Abstract

This study focuses on digital information literacy in middle schools and specifically addresses what competencies middle school students need for effective and successful Internet research endeavors. The study addresses four questions: how can research projects be improved for better learning; what constitutes effective on-line research; what competencies do students need for effective research in general and on-line research in particular; and how can teachers be assisted in helping their students become effective on-line researchers?

The study explores the apparent lack of digital information literacy skills in many middle school students. The claim is made that if educators are not provided the assistance, guidance and support required to embrace the dynamism of the Internet the gap between the structure and operation of conventional "learning institutions" (schools, colleges and universities) and the needs of learners may widen.

The study found that research projects are a valuable tool for learning and that they provide opportunities for student-directed learning, collaboration, peer teaching, critical thinking, and creativity, while fostering increased enthusiasm and information literacy skills.

The study identifies several areas of intervention that could enhance the educational effectiveness of research projects and improve students' information literacy. They include the need to develop structured models of the research process that can be easily transferred to individual situations, including: questioning techniques that engage student critical thinking; planning strategies; gathering strategies; sorting and sifting strategies; synthesis strategies; reporting strategies; and metacognitive strategies. The findings of the study also indicate that research should be focused around critical challenges to inspire thinking and creative problem solving, in contrast with the traditional methods of research that have students simply gather information, organize findings, and present information. In addition, the study suggests that note taking structures and methods that make it difficult for students to plagiarize the ideas and words of others should be devised and implemented. Students should be taught and develop understanding of the ethics of

information use, as well as processes for the critical evaluation of sources and methods for synthesizing information and meaning making.

The study makes several recommendations for schools wishing to develop student digital information literacy through effective research projects, including the increased use of research projects oriented around critical challenges or questions accompanied by a decreased use of topical research projects and the development of school-wide policies and common practices in areas such as note-taking and the citation of sources. The study also supports the role of teacher-librarians as critical to the development of effective digital information literacy skills.

Chapter One – Study Background

The Problem/Opportunity

The Research Question

Digital information literacy: What competencies do middle school students need for effective and successful Internet research endeavors?'

The following are components of the major research question as stated above.

- How can research projects be improved for better learning?
- What does effective on-line research look like?
- What competencies do students need for effective research in general and on-line research in particular?
- How can teachers be assisted in helping their students become effective on-line researchers?'

The Problem/Opportunity

Learning is what adults are going to do for a living in the twenty-first century, and a lot of that learning is going to occur via the Internet. (Broadhead & Carroll, 2001, p. 8)

As a teacher-librarian in a Courtenay, B.C. middle school, I daily observe and interact with students and teachers who are involved in myriad pursuits and the dynamics of learning. I am currently in my third year as a teacher-librarian, and am astonished at the number of students who regularly use the Internet in their learning activities, but have difficulties in:

- Navigating the Internet:
- Planning a research strategy:
- Finding relevant research material:
- Evaluating Web material for its authority and accuracy:
- Note-taking:
- Following Copyright rules and giving credit to those who create the material.

I have had opportunities to work with teachers and their classes on projects integrating the Internet with academic units of study such as Ancient Egypt, Poetry, or World

Religions. The majority of students naturally begin their research process with a search of the Internet. Many students simply type their topics into the Universal Resource Locator (URL), as with www.ancientegypt.com, and sometimes find that this leads them to a Web site about their topic. These students do not question the validity and authority of the Web resource, nor do they bother to find other possible Internet sources.

Some students use search engines for their Internet research, but are often inundated by tens of thousands of possible Web sites, many completely irrelevant to their specific topics. Students frequently find themselves frustrated by the lack of relevance of many of the Web sites, and tend to accept the Web sites that come up first in the return list and that appear to relate to their topics, regardless of the authority of the authors, or the currency of the information.

I am interested in the use of the Internet as a tool to support meaningful learning. I have observed teachers and their students using the Internet on the 60 computers associated with my library, and have witnessed teachers, who have various levels of Internet research experience, attempting to guide students' Internet use, often with limited success. I have not only watched students try to do research in ways that are ineffectual, but have noticed that students tend to accept the validity of information on Web sites as if it had appeared in a published book. I have watched students complete projects with little intellectual engagement, and where a simple reorganization of information (sometimes "cut and paste") and an attractive presentation format yielded acceptable grades.

The perception that the Internet provides easy access to a vast array of information is powerful inducement for students to utilize it for conducting research. However, the ability to separate good information from bad information on the Internet is a complex task. (O'Sullivan & Scott, 2000, p. 2)

Much of the information available on the Web has not had the rigorous editing and verification of facts through which traditional print or even commercial electronic information sources must go. (Kubly, 1997, p. 1)

As the complexity of the Internet increases, and as more and more students “see [the Internet] as a one-stop-shopping place for information and research” (Kubly, 1997, p. 1), it is incumbent on educators to guide students in their on-line research endeavors.

Although Internet use in the classroom is still in its infancy, access to the Internet is almost universal. The British Columbia Ministry of Education completed a study in 1999, which showed that Internet access in schools at that time was 92 percent in cities, and 89 percent in rural areas.

Surveys of tweens (ages nine to fourteen) conducted in 1999 and concerning computer/Internet use reveal that over 70 percent of tween households now own a computer – a growth of about 40 percent in just four years. In this same period, Internet connections among computer owners grew 400 percent to over half of computer-owning households. In 1999, 88 percent of tweens had Internet access at school or at home. These are 1999 figures, and given the almost exponential growth of Internet use, these figures may soon approach 100 percent connectivity (YTV Survey, 1999).

A June 2001 survey conducted by Princeton Survey Research Associates found that 42 percent of young people are on the Internet every day. Ninety percent of the respondents accessed the Internet at home and 64 percent at school. Eighty-eight percent of respondents first started using the Internet before they were 14 years of age. When doing research, 71 percent used sources on the Internet for the majority of their research projects.

Many students... today accept Web use as the norm and cannot really remember a time before wide-spread use of the Internet (Dupuis, 1999, p. 1).

No matter what their topic, students are convinced they can find it on the Internet (O'Sullivan & Scott, 2000, p. 2).

Students' comfort with a medium that they were practically brought up with, and their willingness to use it as a primary source of research, has been quite exciting for educators.

“The Internet (appears to be) viewed (by some) as the ‘end all’ for teaching in the twenty-first century” (O’Sullivan & Scott, 2000, p. 1). But,

instructors sometimes assume mistakenly that students, because they appear at home in online environments, will also understand how to use the World Wide Web as a learning and research tool. (Goett & Foote, 2000, p. 1)

The perception that the Internet provides easy access to a vast array of information is a powerful inducement for students. (O’Sullivan & Scott, 2000, p. 5)

Recently, a fellow teacher asked the students in her class to raise their hands if they thought they knew more about computers than most of the teachers in the school. All of the students raised their hands, perhaps rightfully so. When the Princeton Survey Research Associates (2001) asked young people a similar question regarding the Internet, they indicated that they knew more about the Internet than their parents 64 percent of the time. Many students are keen to experiment with computer programs and with the Internet, while teachers do not often have the time or inclination to “play” with rapidly changing new technologies. *Major Obstacles Affecting the Realization of Schools’ Computer Related Goals for Students*, a 1999 publication of The B.C. Ministry of Education, found that 63.7 percent of teachers lacked skill in using computers for instruction, 57.3 percent did not have enough teacher training opportunities, and 26 percent lacked interest in using the medium.

If teachers are uncomfortable using the Internet as a tool for meaningful learning, they may use it as a simple “add-on” to “pre-Internet” units of study; or, not use it at all. “Given the massive scope of the Internet and the difficulty in finding good, useful, reliable information online” (Broadhead & Carroll, 2001, p. 9), some teachers may have begun to *fear* the Internet as a research tool. But, “the skill to find useful information in the era of the information flood is inherently important” (Broadhead & Carroll, 2001, p. 8). In the *Canadian Internet Directory and Research Guide: 2001*, Broadhead and Carroll talk about the need to be information literate on the Internet in the new century:

If you take the time to learn how to transform the masses of Internet data into useful knowledge, we believe that you will acquire what will be one of the most critical career skills of the twenty-first century...

We are headed into a world of constant career upheaval, in which we will have to continually master new knowledge, not only to advance our careers or exploit new opportunities, but to ensure career survival...

We live in an age that involves unprecedented, relentless technological change. It's been estimated that 80 percent of the technology we will use some ten to twenty years from now has yet to be invented. This means that we must be prepared to cope with continuous, ongoing change fuelled by rapid technological advances. (Broadhead and Carroll, 2001, p. 7)

Broadhead and Carroll feel that digital information literacy will be an essential competency in a world that is only just beginning to see the effects of the Internet on work and education.

Potential Causes of the Problem

Teachers cannot keep up with the dynamic evolution of the Internet and also be expected to run classrooms funded, and often managed, according to an industrial age, factory model. In my experience, although many teachers are excited about the possibilities of the Internet, many are stunned by the tidal wave of change in society, the expectations placed on educators, and the development of interactive technology. All but a few pioneers, who are comfortable with the Internet, use it sparingly and hesitantly in their teaching. Who has the time to learn about and keep up with something that changes so quickly, when the needs of 30 (or sometimes 300) students is often competing with the demands of constantly changing curricular and social expectations?

Teachers are often too overwhelmed with changing curricular expectations, and the immediate needs of their students and schools, to have the psychological time to experiment with the effective use of the Internet as a research tool. Teachers may also

not feel comfortable using the Internet in their teaching when students tend to be far more experienced than they are, and therefore might take advantage of the teachers' inexperience.

As a result of their exposure to computers and the Internet, students are much more comfortable with the new technologies than teachers. However, student computer use generally does not focus on learning. Boys tend to use the Internet as a source of entertainment, and girls as a means of communication (YTV Survey, 1999). When teachers are not aware of the learning possibilities of the Internet, they cannot use their understanding of learning and of curricular content to guide students.

The enormous scope and amount of material available on the Internet makes it difficult to organize research or learning activities unless users understand how to access useful materials. Many students and teachers do not know where to turn when initiating an Internet search: they often rely on limited strategies learned by trial and error, and hearsay. Few students take the time to think about their research questions or plan their research strategies before plunging into research. Few students use the advanced search engine pages or appear to understand the use of Boolean logic in limiting or concentrating searches; their simple search strategies often result in tens of thousands of possible Web sites to peruse, with only a small percentage being of any direct relevance to their specific areas of study. In the *Canadian Internet Directory and Research Guide*, Broadhead and Carroll (2001) state that "few Canadians really take the time to learn (effective research) skill(s)," and that "...inevitably, they get frustrated and give up after finding little of relevance" (p. 6). Trial and error lessons rely on accidental findings of research techniques. Although these techniques may not be the best way of doing things, friends and associates often communicate their findings to others, adding to the confusion and frustration of novice on-line researchers.

Some organizations are attempting to make the World Wide Web (WWW) a safe and organized place for the on-line needs of students and educators by establishing Internet gateways, or portals. The number of these portals has increased dramatically over the last two to three years. Portals are very useful, in that they can do a marvelous job in

organizing the contents of the Web, but they are quite diverse and numerous, with few coming close to apprehending all of the needs of a middle school culture. The complexity of portals has grown with the services they offer. It may take a teacher or student some time to become familiar with each Web portal to determine relevance and usefulness. The Web portals themselves could use a portal.

Teachers and students need help in their on-line research endeavors. I believe that the way to provide students and teachers the knowledge and skills they require for effective on-line research is through "...collaborative efforts among school librarians and teachers (to) promote information literacy throughout the school's curriculum." (O'Sullivan & Scott, 2000, p. 1) If collaboration is linked to a school Web resource that attempts to be the school's "portal", then Internet information literacy has a chance to become an important aspect of school culture.

Significance of the Problem/Opportunity & Possible Solutions

The problem identified as the focus of this study is significant in that if educators are not provided the assistance, guidance and support that embracing the dynamism of the Internet requires, the gap between the structure and operation of conventional "learning institutions" (schools, colleges and universities) and the needs of learners may widen.

Educators have the skills and understanding to take the contents and processes available on the Internet, and transform them into dynamic, meaningful learning experiences.

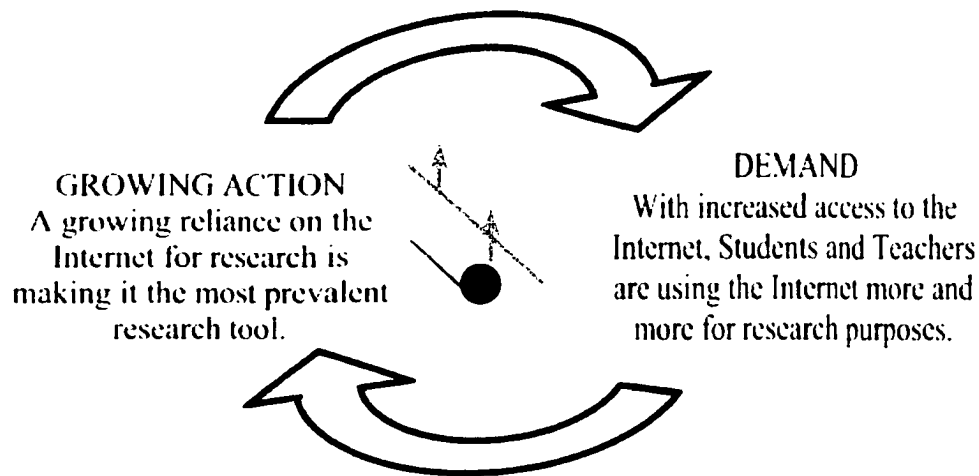
When attempting to integrate the use of the Internet as a research tool, educators are faced with many choices and issues: how to teach effective research skills? What are the differences among search engines, portals, and directories? Which search engines are best for which searches? Should they teach Boolean logic? How shall they teach students to evaluate Web sites?

But do educators have the time and inclination to become experts at teaching on-line research skills? In attempting to see the patterns created by the growing demand and requirement in education for on-line research, and its relationship to student performance, it may be helpful to examine the systems archetype developed by Peter Senge (1990).

entitled "Growth and Under-Investment". (Figures 1.1 – 1.7 build the systems diagram step by step)

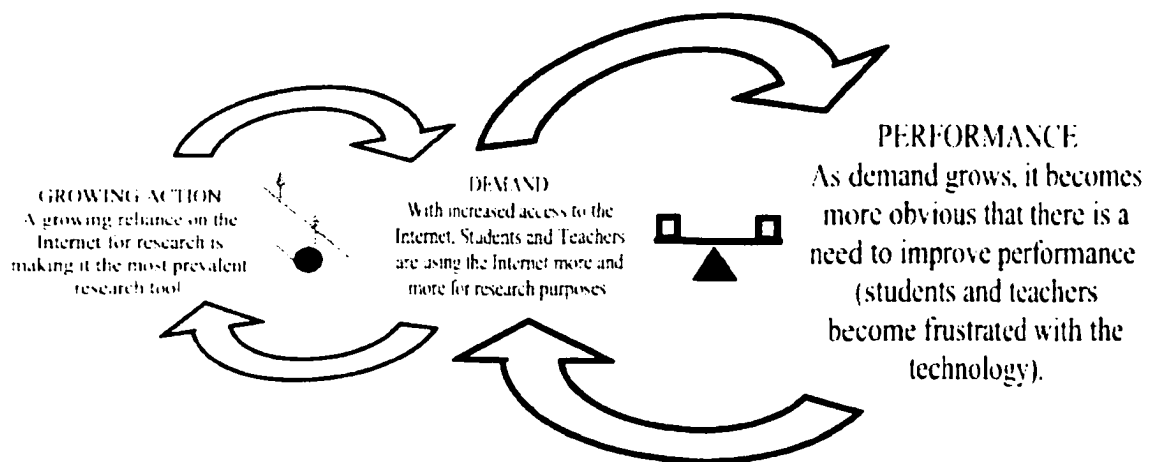
Figure 1.1 diagrams the increased availability of the Internet in schools, and the natural inclination for most students to use technology before they use books. Many students begin research projects by going to a computer and searching for information on-line, creating the *growing action* of the use of the Internet as a research tool. With increased use of the Internet as a research tool, the demand for access by teachers, and therefore students, continues to snowball. (The snowball in the center of figure 1.1 symbolizes a *growing action*.)

Figure 1.1 – Growing Action and Demand



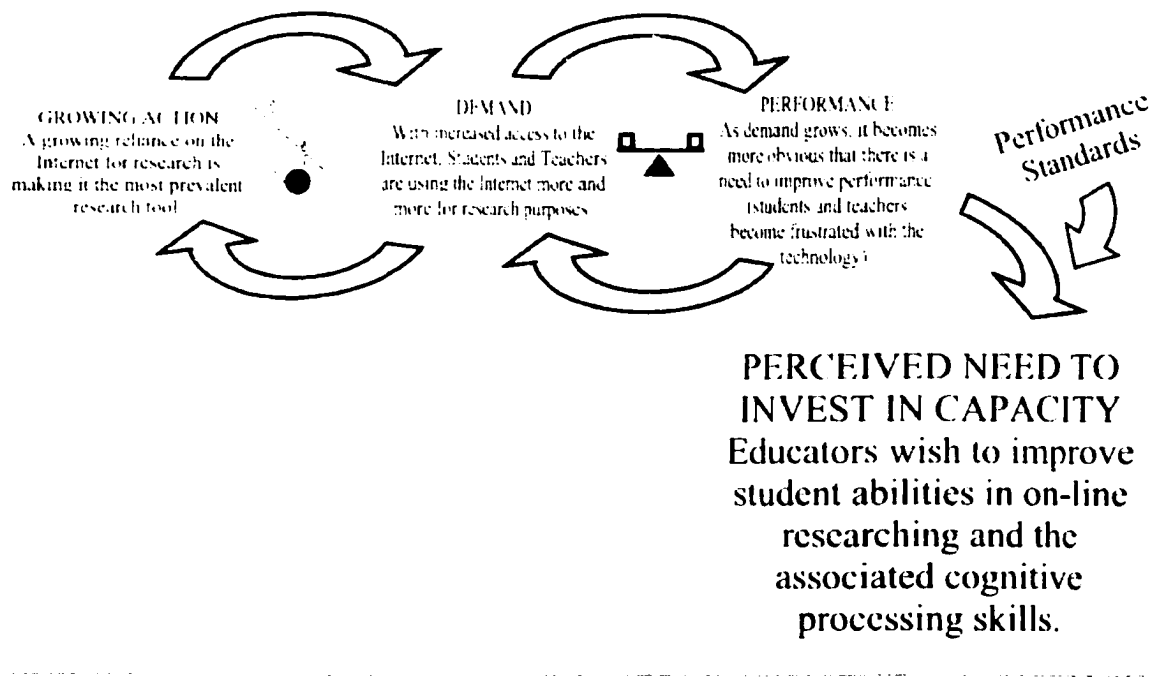
In Figure 1.2, as demand increases, it becomes obvious that performance issues are *balancing* the growing action. Students are using research techniques that are not providing relevance and quality that benefits their learning and are not evaluating the information they find for accuracy or currency. Teachers are observing ineffective research techniques and quite a bit of “cut-and-paste” note taking. Not being research specialists, the majority of teachers do not know what to do about the ineffective research processes and students’ lack of cognitive engagement. They begin to question the value of the Internet as a learning tool. (The scale in Figure 1.2 symbolizes a *balancing action* to growth, or a limitation)

Figure 1.2 – Performance



As Figure 1.3 shows, unless something is done about “performance”, the balancing loop will continue to hold back the potential growth of the use of the Internet as an effective research tool. If the growing action is continuously balanced by poor performance, students may be denied what Broadhead and Carroll think is “the ability to develop...one of the key career success factors of the twenty-first century.” (2001, p. 6). Teachers will perceive a need to invest in the capacity of students to engage in the “cognitive processing” (McClaren, personal communication, July 31, 2001) necessary for effective on-line research and activities.

Figure 1.3 – Perceived Need to Invest in Capacity



As shown in Figure 1.4, a perceived need to invest in capacity instigates action by the educators. Performance standards provide added pressures and guidance. Some of the potential investments in student and teacher capacity may include:

- Teachers working with teacher-librarians in collaborative units that integrate use of the Internet with curricular subject areas. Teacher-librarians are the research specialists, and can help teachers see the potential for increasing students' cognitive processing capacities with regard to thinking about research and effective on-line research.
- Students work with teacher-librarians during class projects or library orientations to increase awareness and understanding of the Internet, as well as learning to conduct research on-line effectively.
- School Web resources provide the tools (tutorials, guides, activities...) for teachers and students to increase understanding of the Internet and to improve on-line research skills.

Figure 1.4 – Investment in Capacity

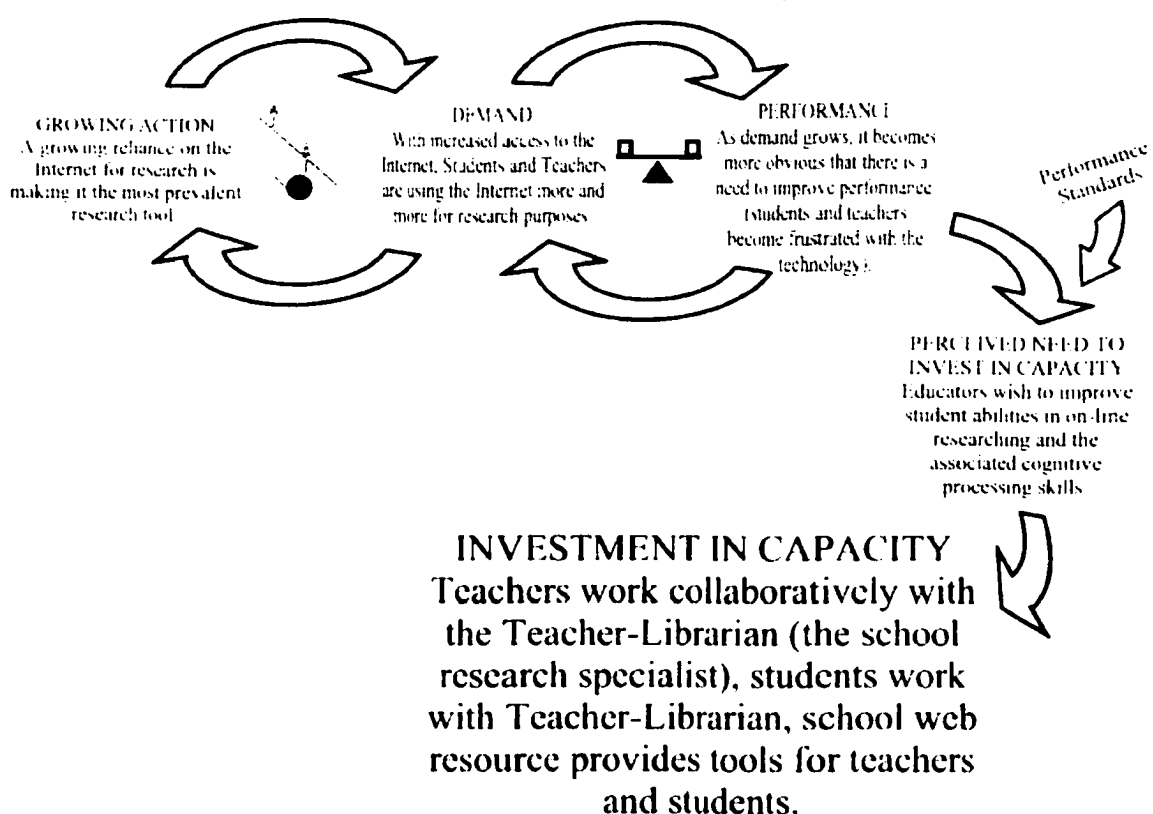
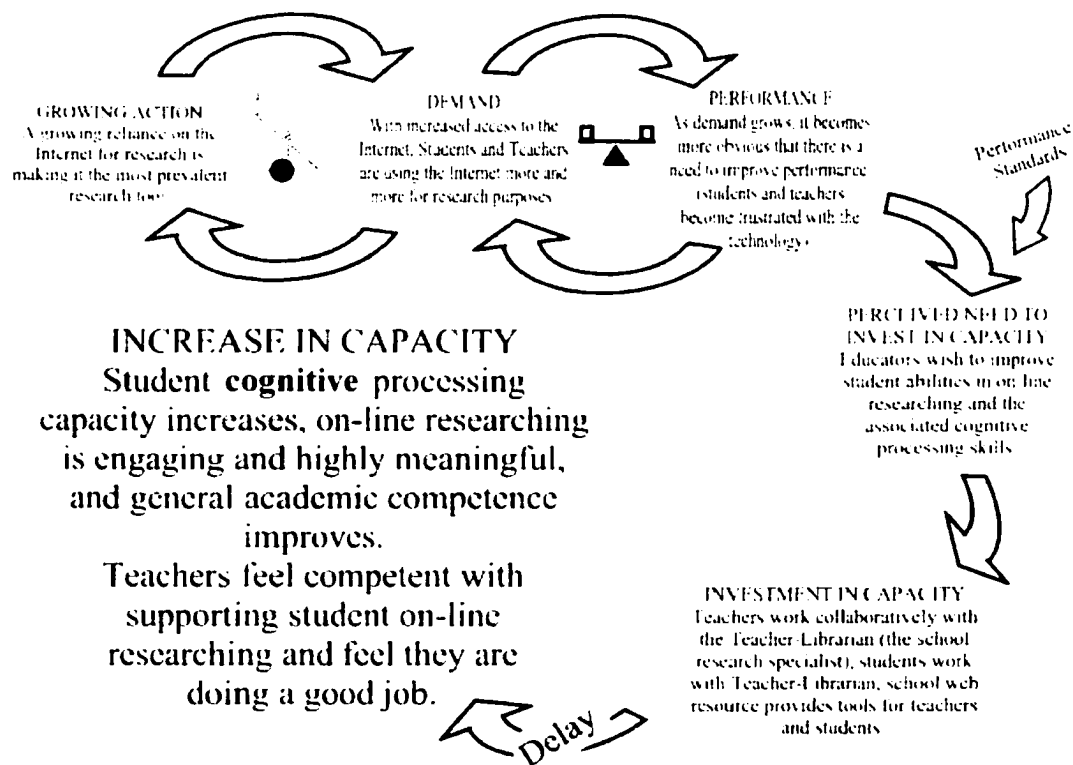


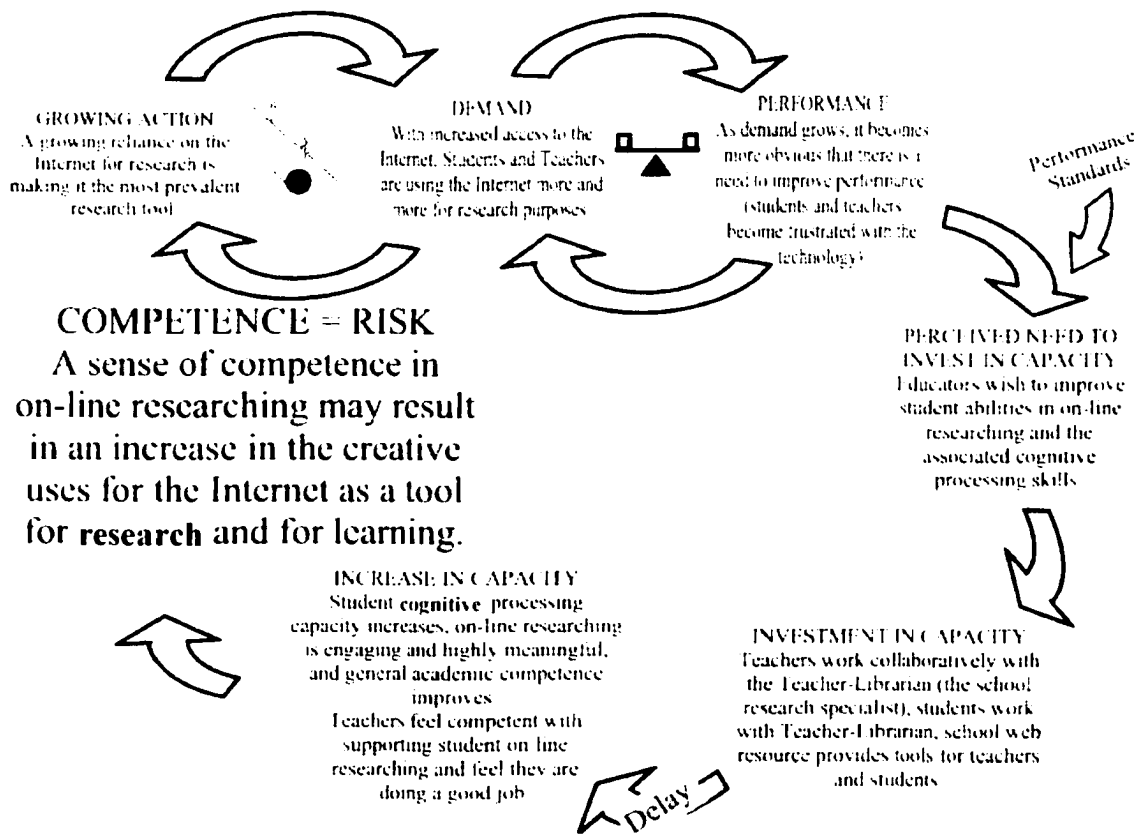
Figure 1.5 shows that, after a delay, in which teachers work on collaborative units with teacher-librarians, their understanding of on-line research increases: frustration and uncertainty are replaced with a sense of competence and feelings that a good job is being done. Students become competent at on-line research and there is an increased capacity for cognitive processing that makes research projects highly meaningful and engaging activities.

Figure 1.5 – Increase in Capacity



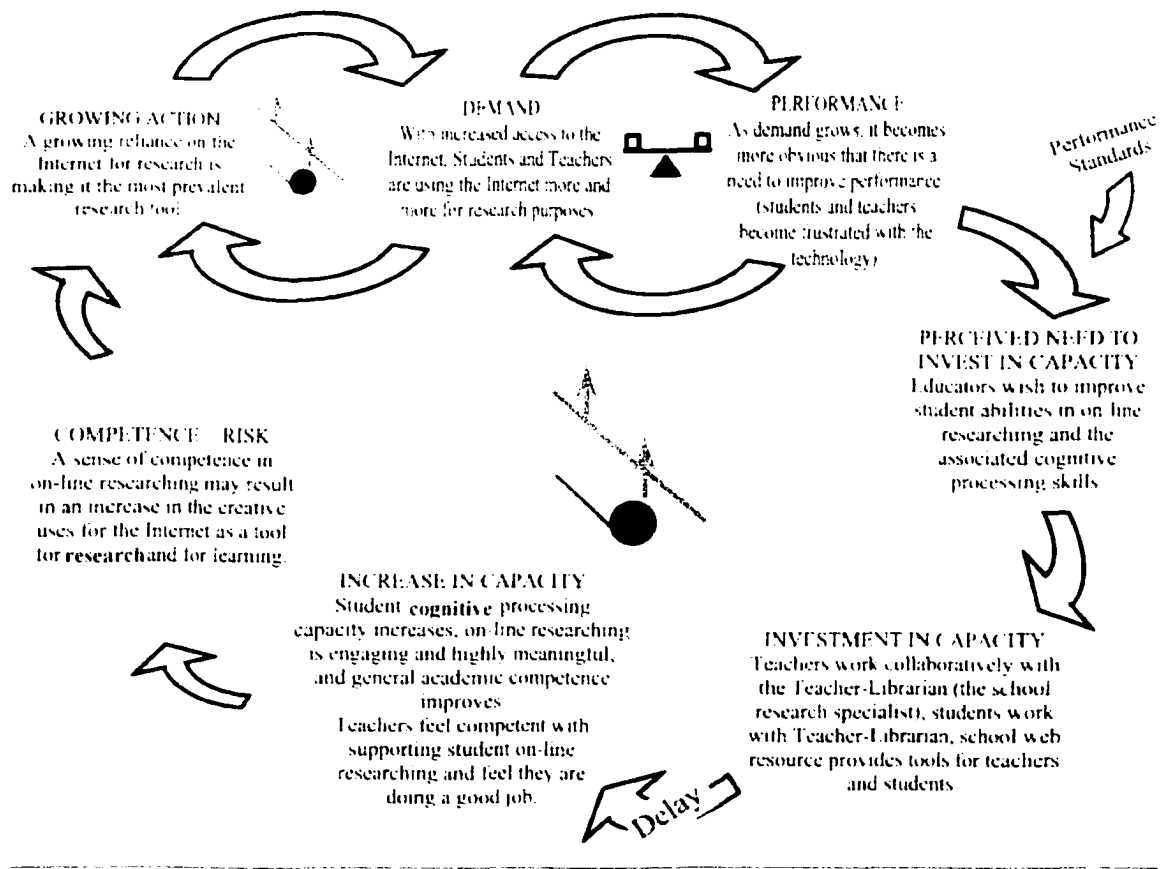
In Figure 1.6, as teachers and students become more competent at using the Internet effectively, there is an increase in creativity in how students and teachers use the Internet for research and as a support for learning.

Figure 1.6 – Competence = Risk



Finally, in Figure 1.7, it is quite likely that an increase in competence in on-line research, and an increase in willingness to use the Internet in creative ways, will support the growth of effective Internet use in schools, will likely result in new demands for higher, more sophisticated research projects and skills, which in turn will lead to demand for the development of even greater capacity, becoming a virtuous spiral supporting development of the skills needed for success in the twenty-first century.

Figure 1.7 – Supporting a Growing Action



The ability to evaluate and manage information and continuously adapt to “career upheaval, technological advances, and an explosion of information” (Broadhead & Carroll, 2001, p. 4) will be a key to future success for our students.

A school Web site, backed with workshops and seminars on using it effectively, can provide activities and information that fulfill Broadhead and Carroll’s ideas about “just in time” knowledge and knowledge management. Resources for effective research

strategies, information evaluation, effective writing, and citation, might all be readily available without the need for teachers and students to search among myriad possibilities. Time can be used more efficiently, and guesswork can be eliminated from strategies chosen. Teachers, with effective activities and methodologies at the tips of their fingers, can focus on teaching rather than searching.

In summary, the need for increased focus on and support of digital information literacy in schools is significant in that if educators are not provided the assistance, guidance and support in using the Internet effectively as a tool for learning, the gap between the needs of the learner and the education provided by "learning institutions" may widen.

Chapter Two - Literature Review

In attempting to determine the needs of middle school students with regard to Internet research competencies, I first had to explore the provincial and local expectations regarding the use and integration of information technologies in schools, as well as what has been reported concerning the successes and obstacles to the integration of computers and information technologies with the general school curriculum in Canada and the United States.

In discussing the issues around students' research endeavors, commentators used terms such as information literacy, digital information literacy, and information technology. This review attempts to define these terms and concepts, demonstrate the need for improved student competency in research, determine the standards and competencies which educational organizations and commentators claim are important to students' research endeavors, and look at some models for effective research, whether on-line or off.

Computers, the Internet, and Education – Organizational Documents

The goal of integrating student use of the Internet with other classroom work is a subcategory of a larger educational initiative: the integration of computers and information technology in schools and other educational institutions. A number of important policy documents have been produced in Canada and the United States concerning these issues. In reviewing policy documents for this study I have attempted to discover the answers to a number of questions that are relevant to the focus of this study. The questions are listed below.

- What are the perspectives and goals of the British Columbia Ministry of Education and School District 71 (Comox Valley) regarding computer integration?
- What is known about the current status of integrating computer use with other curricular areas in Canada and the United States?

- What has been reported concerning the successes and obstacles to the integration of computers and information technologies with the general school curriculum in Canada and the United States?

British Columbia Ministry of Education Reports, Directives, and Resources.

In June of 1999, the Teaching, Learning and Education Technology Advisory Committee of the B.C. Ministry of Education published *Conditions for Success*. This report cited available research about the use of computer technology in schools and provided new directions for the use of information technologies in schools.

Conditions for Success cited data about B.C. school principals' views on technology use, noting some of the obstacles to the integration of computers with the school curriculum. The principals agreed that some of the obstacles to computer use and integration in the middle school grades were:

- An insufficient number of computers – 77.2 percent
- Teachers' lack knowledge and skills – 69.4 percent
- Problems scheduling computer time – 68.5 percent
- Insufficient time for teachers to prepare lessons – 61.3 percent
- Not enough training opportunities – 58.9 percent
- Difficulty in integration of computers with classroom work – 57.1 percent
- Not enough time in the teachers' schedule to explore WWW – 49.1 percent
- Not enough types of software – 45.6 percent (B.C. Ministry of Education, 1999b)

The *Conditions for Success* committee went on to recommend eight points that reflect the general direction of their findings.

1. Education must incorporate computers not only because of their ubiquity in contemporary social practice and economic activity, but also so that we can benefit from the

promise of Information and Communication Technology (ICT):

2. Integration with curriculum is central to successful implementation, teacher support and commitment, and student learning:
3. Electronic delivery should be a school district option for learners:
4. Teachers require support for integration:
5. Equity must be a high priority:
6. Decision Making -- If change is to be widespread, many teachers -- not just enthusiasts -- must be engaged in the decisions and the activities:
7. Research is an essential part of the process of effective change, and:
8. Adequate funding is central to achieving the integration of ICT into the curriculum (B.C. Ministry of Education, 1999b).

In November of the same year (1999), the B.C. Ministry of Education published a revised five-year technology plan, titled *Information Technology in Education: Plan for 2000 and Beyond*, to expand on some earlier directives. The new plan states that "there has been rapid development and integration of ICT [Information and Communication Technology] into daily life. Parents, teachers and the business sector have increased their expectations that schools ensure students are 'ICT literate'."

Among the new plan's initiatives, there was a clear intent to focus on improving student ICT skills, integrating ICT with the curriculum, supporting teachers in their ICT integration, and measuring "the effectiveness of ICT on improving student performance" (B.C. Ministry of Education, November, 1999c).

In the Kindergarten to Grade 12 Education Plan (Revised September 2000), The B.C. Ministry of Education states that:

- "Students need access to a range of resources to develop the information literacy skills demanded in the workplace and at home."
- "All Integrated Resource Packages (IRPs) promote the use of appropriate technology to achieve prescribed learning outcomes."

The Plan goes on to discuss ways in which the Ministry will support these needs; namely, through ensuring that all districts have a technology plan, and through the connection of all schools to the World Wide Web (WWW).

Digital Information Literacy

Perceptions of the need for information literacy have undergone a revolution since the Internet became so popular in student research projects. Although the principles of information literacy have not changed, easy access to research material on the Internet has created new challenges in teaching students effective research methods and processes.

“Five years ago you might have spent 90 percent of your research time in libraries and archives and 10 percent searching the Internet. Today, that ratio, for many people, is reversed” (McClaren & McIntosh, 2000, p. 3-22). It is easy to see why the Internet has drawn so many researchers. McClaren and McIntosh (2000) note that “two years ago the search string ‘technology AND change’ revealed more than 100,000 hits. Today the same search string retrieved more than 1,166,025 hits” (p. 4-9). A growth of almost 1200 percent over two years is quite substantial. As more and more information becomes available on the Internet, more and more researchers will be drawn to it.

O’Sullivan and Scott (2000) state that “the Internet has become a definitive resource for students conducting research” (p. 2). “No matter what their topic, students are convinced they can find it on the Internet” (p. 2). In an action research project that integrated the Internet with Social Studies curriculum, O’Sullivan and Scott found that

...the perception that the Internet provides easy access to a vast array of information is a powerful inducement for students. Many students have developed an infatuation with information: any information is good information – the more of it, the better, as long as it is easy to obtain. (O’Sullivan & Scott, 2000, p. 5)

In discussing their observations of student behavior, O’Sullivan and Scott often “witnessed students gravitating to the Internet, no matter what their topic of study” (2000,

p. 5). In her address at the Mid-South Instructional Technology Conference, Kristin Kubly (1997) noted that "... many students see [the Internet] as a one-stop-shopping place for information and research" (p. 1). As a result, students gravitate toward the Internet before even thinking about what the best resource for their project might be.

Many teachers are quite interested in the potential of the Internet. "The Internet is an increasing presence, as teachers use it for research by students..." and is becoming "...viewed as the 'end all' for teaching in the twenty-first century" (O'Sullivan & Scott, 2000, p. 1). The Internet has created added pressure for education to focus on developing information literacy, and especially digital information literacy. McClaren & McIntosh (2000) state that:

The organizations and cultural/social institutions of the industrial era will not serve adequately in a world of networked computer telecommunications and a digital economy. (p. 1-34)

It is becoming more and more important for teachers to provide students with skills and knowledge that will empower them to find and think about needed content. If today's teacher shows students various cognitive processes for different situations, students will be more able to use the flood of information available on the Internet, rather than being overwhelmed by it. But, educational institutions, like large ships, do not change directions easily.

Education is not immune to technological change and, being an institution that serves society, this is just as well. Unfortunately, the education system has never outgrown its roots in the Industrial Age where, like other factories, it was set up to mass produce minds... If education is to survive into the 21st century change is inevitable. (McClaren & McIntosh 2000, p. 2-11)

Paul Gilster (2000) discusses the need for digital information competencies in a world that is being changed by the Internet:

The skills of the digitally literate are becoming as necessary as a driver's license. The Internet is the

fastest growing medium in history... [and] will create priceless resources for learning and self-advancement. If these won't overwhelm your life overnight, they will change it, subtly, continually, and with irresistible force (Gilster, 2000, p. 216).

Gilster defines *digital information literacy* as an extension of *information literacy*:

Digital literacy is the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers. The concept of literacy goes beyond simply being able to read: it has always meant the ability to read with meaning, and to understand. It is the fundamental act of cognition. Digital literacy likewise extends the boundaries of definition. It is cognition of what you see on the computer screen when you use the networked medium (Gilster, 2000, p. 215).

In *Digital Literacy*, Gilster (2000) describes the different skills required for a person to be information literate on the Internet. He discusses the need to understand the editing rigor that many Web sites lack, and the ability of a Web author to "load" information by simply offering hypertext links to Web sites that support his or her views. He states that:

Acquiring digital literacy for Internet use involves mastering a set of core competencies. The most essential of these is the ability to make informed judgments about what you find on-line, for unlike conventional media, much of the Net is unfiltered by editors and open to the contributions of all (Gilster, 2000, p. 216).

Gilster views the Internet as a double-edged sword. Although he sees its great potential for learning, he is concerned about the consequences of a lack of general digital information literacy. Gilster is not alone in his assessment of the Internet. O'Sullivan & Scott (2000) also feel that "the paucity of research related to the use of the Internet in secondary and elementary classrooms... should be cause for reflection and concern on the part of all educators" (p. 3). In their research they found that "...nearly 85 percent of [their] total sample, evaluated their Internet search skills as either excellent or good. Yet, as [the] qualitative data ... show[ed], many students expressed difficulties navigating

Web sites...[and] many of [the] students were frustrated when conducting research on the Web” (O’Sullivan & Scott, 2000, p. 4).

Gilster, O’Sullivan, Scott, and others are concerned at the difference between young learners’ concepts of themselves as competent Internet researchers, and the reality of the poor digital literacy skills they demonstrate when actually doing Internet research.

Elizabeth Dupuis (1999) agrees with Gilster, O’Sullivan, and Scott, when she notes that young people...

...have grown up in a world already adorned with VCRs, compact disks, and computers.... Most can ‘get on the Net’, but their computer competencies vary widely and few understand the more elusive, conceptual fundamentals of information literacy (Dupuis, 1999, p. 290).

In a paper presented at the *Third International Forum on Research in School Librarianship*, Jinx Watson (1999) compared student abilities in using the Internet as a communication tool and as a research tool. He stated that “...students do not show the same kind of confidence in using the Web for school research [as they do for communication, they] ...claim some frustrations around locating and trusting ‘official’ information required for their school assignments” (p. 7). Thus, some studies seem to be finding a pattern in young peoples’ use of the Internet: on the one hand young users feel that they are proficient at doing on-line research, but when they are actually observed in their research endeavors they are found to be frustrated by their inability to locate relevant or authoritative material.

Often students do not know how to begin on-line research, and will simply go directly to a search engine, without thinking about or planning a research strategy. In her action research with middle school students and on-line research, Leona Carper (1996) found that “...many students were unfamiliar with any specific sequence for research topics. In addition, it appeared that students were generally unaware of why a specific sequence of research would be helpful” (p. 12). She continued by listing some of the essential digital information literacy competencies that the students lacked:

Children were generally not familiar with why a specific research sequence might be helpful. ...Children did not know how to obtain primary information from online services. ...children did not know how to narrow the scope of information obtained. [and]...instruction had not been devised to integrate technology research activities (Carper, 1996, p. 12).

Carper claims that students need a sequence of research activities, need to think about and plan their research, and need strategies for effective searching and evaluation of relevant Web material.

Barron and Ivers (1998) have worked with and for teachers to develop pedagogy in digital information literacy. In their concern about the lack of student competencies in gathering and evaluating relevant Internet material, they mirror some of Carper's concerns. They warn teachers that:

Students often believe if they see something in print or on the computer, it must be true. Instead of blindly accepting and reporting information, students must learn to investigate its source and validate the information (Barron & Ivers, 1998, p. 42).

It would appear from the sources cited that there is a need to focus on developing the students' essential competencies in digital information literacy. But, why is digital information literacy so important? Broadhead and Carroll (2001) are convinced that the ability "to transform the masses of Internet data into useful knowledge...will be one of the most critical career skills of the twenty-first century" (p. 7).

These authors clearly feel that digital information literacy is more than just on-line research in schools. For them it is a set of competencies focused on obtaining the needed information in the time that it is needed. They see these competencies as essential for adults as well as young people.

Barron and Ivers (1998) make an equally strong case for digital information literacy.

The Internet offers tremendous potential [for] education. Used appropriately, it can enhance instruction, stimulate thinking, and facilitate communication among students, educators, scientists, researchers, and others around the world (Barron & Ivers, 1998, p. 2).

It opens the door to multicultural education:
establishes real-world learning experiences:
encourages higher order thinking skill: helps to
improve writing skill: and increases motivation,
achievement, and positive behavior (Barron &
Ivers, 1998, p. 2).

The Internet provides a natural setting for inquiry skills, including collecting information for analysis and communicating with experts (Barron & Ivers, 1998, p. 4).

Although Barron and Ivers (1998) agree with Broadhead and Carroll's (2001) view that competencies in digital information literacy are as necessary for adults as they are for young people, they also discuss other benefits, such as motivation, positive behavior, and higher thinking skills. In discussing the benefits of digital information literacy, Barron and Ivers (1998) cite a...

... study conducted by the Center for Applied Special Technology [which] compared the work of 500 students in fourth-grade and sixth-grade classes in seven urban school districts – half with online access and half without. Experimental groups with online access attained significantly higher scores on measurements of information management, communication, and presentation of ideas (Barron & Ivers, 1998, p.4, Citing Follansbee, et al., 1996).

Barron and Ivers (1998) feel that the skills of information management, communication, and presentation of ideas are essential for future success. They also feel that:

Information literacy empowers students to be independent learners, recognize relevant information, use technology when appropriate, and communicate using multiple media. Information literacy skills are useful in adult life and pertinent to all careers (Barron & Ivers, 1998, p. 45).

Barron and Ivers (1998), and Broadhead and Carroll (2001), have similar views regarding the benefits that strong digital information literacy can have on adult lives. Both sets of authors see the competencies of digital information literacy as essential for the twenty-first century.

Writers about digital information literacy agree that it is important that educators "...guide students in using the World Wide Web appropriately by teaching them to evaluate Internet resources using criteria designed to weed out the authoritative sources." (Kubly, 1997, p. 1). If students are unable to find relevant material that is current and authoritative, then they may find themselves continually frustrated with irrelevant material and use questionable sources. O'Sullivan and Scott (2000) state that "without systematic instruction in information literacy, students cannot realize the potential of the Internet" (p. 1).

Students require some structure to support on-line research. Goett and Foote (2000) feel that students should be able to "choose appropriate starting points for research; use search and query engines; take notes in digital form; evaluate the quality of online materials; and cite electronic documents" (p.1). They go on to discuss the need for students to understand the basics of copyright when doing research on the Internet.

How do students and teachers develop the competencies required for effective on-line research? In attempting to determine how to strengthen student skills and understanding of research on the Internet, Watson (1999) states that we should "...consider individual teachers and librarians collaborating in teaching information literacy." (p. 9)

O'Sullivan and Scott (2000) agree with Watson (1999); they feel that "...collaborative efforts among school librarians and teachers can promote information literacy throughout the school's curriculum" (O'Sullivan & Scott, 2000, p. 2).

In conclusion, a review of the literature on digital information literacy reveals that while the Internet is becoming more and more prevalent as a research tool in schools, educators are witnessing a lack of digital information literacy among students. Because digital information literacy will continue to grow in importance to adult lives and careers, it is

the job of educators to build student digital information literacy. Teacher-librarians can be a powerful collaborative force in support of the on-line research endeavors of teachers and their students.

Digital Information Literacy Education

Technological advancements have had and will continue to have significant effects on society. Central to educational goals and programs are the changes occurring in communication technologies, information storage and retrieval, and data processing capabilities. These developments make it crucial that students acquire the skills to locate, gain access to, evaluate, and utilize vast amounts of information. Since it is now impossible to learn or retain all there is to know about even one small area of human knowledge, knowing where to locate information and, more importantly, knowing how to evaluate and process information becomes of paramount importance. Literacy is no longer simply a matter of learning to read, write, and calculate. It is a matter of knowing how to critically examine and creatively use information. (British Columbia Ministry of Education, 1995, p. 3)

Information Literacy Standards

The American Library Association defines information literacy as a set of abilities that allow an individual to "...recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information." (1989) "Information literacy, while showing overlap with information technology skills, is a distinct and broader area of competence." (Association of College and Research Libraries, 2001, p. 16)

In a discussion of information literacy competency standards, the Association of College and Research Libraries (ACRL) warn us that "...uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively." (2001, p. 16) The association describes an information literate person as one who is able to:

- Determine the extent of information needed:
- Access the needed information effectively and efficiently:
- Evaluate information and its sources critically:
- Incorporate selected information into his or her knowledge base:
- Use information effectively to accomplish a specific purpose:
- Understand the economic, legal and social issues surrounding the use of information, and access and use information ethically and legally. (Association of College and Research Libraries, 2001, p. 16)

Each item on this list is seen by the ACRL as a “standard” against which to measure progress toward information literacy. The ACRL continues to describe performance indicators and outcomes for each standard (a complete list of performance indicators and outcomes is available at the ACRL Web site - <http://www.ala.org/acrl/ilcomstan.html>).

“The Boyer Commission... recommends strategies that require the student to engage actively in framing of a significant question or set of questions, the research or creative exploration to find the answers, and the communications skills to convey the results...” (Association of College and Research Libraries, 2001, p. 17)

The Ontario Ministry of Education defines information literacy as the “...ability to solve information-based problems”. It includes the following competencies:

- Acquisition of information;
- Critical evaluation of information;
- Selection of information;
- Use of information;
- “Communicate information in ways which lead to knowledge and wisdom.” (Ontario Ministry of Education, 2000)

The Conference Board of Canada, in discussing information literacy skills in the world of work, presents some of the skills students need to be better prepared for work, and include the abilities to:

- Read and understand information presented in a variety of forms:
- Share information using a range of information and communications technologies:
- Locate, gather and organize information using appropriate technology and information systems:
- Access, analyze, and apply knowledge and skill from various disciplines:
- Plan, design, or carry out a project from start to finish with well-defined objectives and outcomes:
- Understand and work within the dynamics of a group. (Conference Board of Canada, 2000)

The information literacy standards and recommendations from these organizations have much in common. They all describe the need for an information literate person to plan a research endeavor (with the best type of research endeavor being one that involves critical thinking and problem-solving), to locate needed information effectively and efficiently, to understand what is being read, to be critical about the material being used, to be able to analyze and synthesize material, to make meaning from the research, and to present findings effectively.

Critical Thinking Skills

There was a time – not so long ago, actually – when some teachers attached minimum length requirements to papers and reports, as if length were directly related to adequacy and quality of thought. Of course, most of these reports were topical in nature, requiring “information-moving machines” like the building-sized equipment we see pictured in quarries. The idea was to gather as much information about a country or state or city as one could in one month’s time and then lay out

paragraph after paragraph of badly twisted prose
produced by changing one word in each sentence.”
(McKenzie, 2000, p. 114)

The literature reviewed often mentions the need for student research endeavors to incorporate elements of problem-solving or critical thinking research processes in order to be valuable and successful. The literature on student research provides several scenarios in which critical thinking is tantamount.

Educators such as Roth and McKenzie place a great deal of importance on the need for researchers to be critical of the material they are using as a source of information. Roth states that “seeking instant information gratification, students can be indiscriminate and uncritical in evaluating information.” (1999, p. 42) They agree with the British Columbia Teacher-Librarians’ Association in the belief that the “... teacher’s task is to create opportunities that encourage the development of skills and techniques that instill critical and creative thinking into the handling of a wide range of information.” (2001, p. 3)

In discussing more traditional research models, McKenzie (2000) suggests that “...students set out with a basket and enjoy an information binge...[selecting information]... conveniently available in containerized forms within some encyclopedia or book devoted to the subject. This kind of school research...demands little thought, imagination or skill.” (p. 65) “If we hope to see inventive thought infused with a critical judgment, questions and questioning must become a priority of schooling and must gain recognition as a supremely important technology.” (p. 6)

“As teachers, we help our students to identify the choices, quandaries and dilemmas embedded in life. They wrestle with the important (essential) questions. They manage irony, paradox and ambiguity.” (McKenzie, 2000, p. 35) In providing opportunities to develop competencies around questioning, “...we give students skills to create meaning where many would find nothing but fog.” (p. 6)

McKenzie (2000) states that “...mere gathering of information is old-fashioned and obsolete.” (p. 41) His view of critical thinking in the research process matches the findings of the Boyer Commission (1998), in stating that research endeavors should begin

with a research challenge, in which the student has no choice but to think critically about where to start, what to look for, what is relevant, and how it all fits the problem or challenge.

Structured Approaches to the Research Project

Leona Carper (1996), writing on the effective use of technology in research by middle school students, noted that many "...students were unfamiliar with any specific sequence for research topics. In addition, it appeared that students were generally unaware of why a specific sequence of research would be helpful." (p. 6) Carper found several factors contributing to students' lack of research success, including:

- Children were generally not familiar with why a specific research sequence might be helpful;
- Children did not know how to obtain primary information from online services;
- Children did not know how to narrow the scope of information obtained;
- Instructions had not been devised to integrate technology research activities; and
- Research instruction had not identified specific areas within which to locate sources or topics.
[Bullets not included by author] (Carper, 1996, p. 7)

In a discussion of the literature on research instruction, Marlene Asselin (2000) noted that given "...the amount of time students spend in research activities during their school years, it is surprising how little attention is paid to... [research instruction]" (p. 64). She warns that without effective instruction in research, students tend to research in a way that reflects their *individual perception* of research, with most students seeing it as simply the need to gather and present information. Although research endeavors are an extremely common and regular school experience, Asselin observes that "research process instruction is mostly incidental with teachers assuming that students' skills are in place as long as they appear on task." (p. 65) She summarizes some of the findings in the literature by reporting that "...when instruction is carefully scaffolded and students learn

about the research process, not just do research, they are able to transfer these skills into independent tasks.” (p. 65)

Several models of research, with or without the use of the Internet, are available today. I will now look at three popular models: Jamie McKenzie’s *Research Cycle* (2000), Eisenberg and Berkowitz’s *Big6™* model (1988), and *WebQuests* Model (Creator unknown, but popularized by Bernie Dodge in 1995).

McKenzie’s *Research Cycle*

As the information landscape shifts to offer far more information in an often befuddling manner that some have called “data smog,” many schools are learning that traditional approaches to student research are inadequate to meet the essential learning goals set by most states or provincial governments. (McKenzie, 2000, p. 63)

McKenzie (2000) describes three basic components in research projects: Prospecting, “...the discovery of pertinent and reliable information” (p. 41); Interpreting, the translation of “...data and information into knowledge, insight and understanding.” (p. 42); and, “Creating Good New Ideas” (p. 42). McKenzie (2000) also suggests that research projects should be team endeavors: “Effective inquiry with vast resources suggests group research rather than solo flights. This is the model in the workplace. It should become a frequent school experience. Groups make sense when exploring vastness, and they also make sense when online time may be limited.” (p. 76)

McKenzie’s views on the need for team research endeavors is shared by the Conference Board of Canada (2000), which includes the ability to work in teams as an essential skill needed by students to be better prepared for work.

McKenzie presents his “*Research Cycle*” as a model schools can adopt for effective student research. He points out: “The ***Research Cycle*** (author’s emphasis) differs from some models in its very strong focus upon essential questions and subsidiary questions early in the process. It also rejects topical research as being little more than information gathering unworthy of a student’s time.” (McKenzie, 2000, p. 65) While topical research, such as a research project on everyday life in Ancient Greece, has students

simply gathering information and rearranging it into a presentation. the *Research Cycle* "...requires that students make up their own minds, create their own answers and show independence and judgment." (p. 65)

McKenzie's *Research Cycle* consists of seven steps:

1. **Questioning:** McKenzie (2000) suggests the development of prime, or "essential" questions intended to engage critical thinking, by requiring "analysis of cause-and-effect" (p. 7) relationships, problem solving, and decision making as essential to the *Research Cycle*. These prime questions include "Why" questions: "Why do things happen the way they do?" (p. 8), such as "Why do some people steal?" (p. 7) or "Why do some people treat their children badly?" (p. 7) McKenzie's second type of essential question is "How": such as "How could things be made better?" (p. 8), "How can I improve my memory?" or "How can I improve my Internet skills?" McKenzie's third type of prime question is "Which": such as "Which do I select?" (p. 8), or "Which city would be a better place for my family to live, Ancient Athens or Ancient Sparta?"

McKenzie (2000) submits that the "... most important questions of all are those asked by students as they try to make sense out of data and information." (p. 10) In order to make his prime, or "essential" questions answerable by students, McKenzie proposes a "Question Toolkit" that school districts can develop to help guide student research. He suggests that the "Question Toolkit" include "Subsidiary Questions", which "...are questions that combine to help us build answers to our Essential Questions." (p. 16) As an example, if we take the "Which" question from above: "Which city would be a better place for my family to live, Ancient Athens or Ancient Sparta?", Subsidiary Questions might include: "Which city has the better entertainment possibilities?", and "In which city would my mother be treated better?"

Some of the additional questions suggested by McKenzie (2000) include: Hypothetical Questions, which are "...designed to explore possibilities and test relationships" (p. 18); Telling Questions, which "...lead us (like a smart bomb) right

to the target” (p. 19); Planning Questions, which “...require that we think about how we will structure our search, where we will look, and what resources we might use...” (p. 20); Organizing Questions, which “...make it possible to structure our finding into categories that will allow us to construct meaning” (p. 21), rather than take mindless notes; and, Sorting and Sifting Questions, which guide the culling of information that is not needed.

2. **Planning:** Since there is a tendency for students to equate quantity of research findings with quality and relevance to the research question, McKenzie (2000) recommends that students use Subsidiary Questions to guide their research.

After a student team has mapped out the research to be conducted [essential and subsidiary questions], the next step is to think strategically about the best ways to find pertinent and reliable information that will help them to construct answers to these subsidiary questions (McKenzie, 2000, p. 68)

Organizing information gathered into categories created by the questions themselves, whether in table format or digital database, “...dissuade[s] students from wholesale cutting and pasting. By planning ahead they will have an information storage system that will eventually support concept-based retrieval, synthesis, and analysis.” (McKenzie, 2000, p. 71)

Once students have created subsidiary questions, they can predict results, tapping into previous knowledge and conceptions of the topic. Prior to the Gathering phase of the *Research Cycle*, students quickly browse for the best resources to answer their questions, then, “...they begin matching resources to questions and they begin thinking about how they will collect their findings as they proceed.” (McKenzie, 2000, p. 82)

3. **Gathering:** McKenzie (2000) sometimes calls the *gathering phase* of the *Research Cycle* “hunting”, for hunting “...suggests a more thoughtful and more aggressive approach – one imbued with the tension arising from the building of meaning out of scattered pieces...” (p. 85)

"If the planning has been thoughtful and productive, the team proceeds to satisfying information sites swiftly and efficiently, gathering only that information that is relevant and useful." (McKenzie, 2000, p. 71) McKenzie warns that if students do not organize information as they gather, they may be in danger of being overwhelmed by "info glut".

Discussing hunting on the Internet, McKenzie (2000) notes the importance of knowing the "tricks of the trade" with regard to keyword searching, rather than relying on "natural language searching". He expresses concern that "...few schools have instituted effective student learning experiences that would help them become skillful searchers." (p. 87) Among the necessary tools of the trade, McKenzie mentions Logical Operators, such as AND, OR, NOT, and NEAR, as well as the use of truncation, wild cards, and a thesaurus (to expand keyword vocabulary).

McKenzie (2000) reminds us that the "how" of the hunt still relies heavily on students "...acquiring data in a dynamic, generative fashion with an open minded intent upon developing insight and new knowledge." (p. 93) Students, especially those who have selected a challenging question where there was difficulty in developing a research plan, will more than likely revisit the plan as they find out more about their topic: they may add, remove or change subsidiary questions; or, perhaps they may change their minds about sources. "Growing insight shifts the researchers' views of how and what to explore." (p. 95)

4. **Sorting and Sifting:** Although there is much sorting and sifting occurring as the students are gathering information and organizing by the subsidiary questions answered, they must now move "...toward even more systematic scanning and organizing of data to set aside and organize those nuggets most likely to contribute to **insight** (author's emphasis)." (McKenzie, 2000, p. 72) McKenzie discusses the importance of sorting and sifting as "...less a matter of finding answers than the challenge of constructing them from bits and pieces, odds and ends." (p. 99)

5. **Synthesizing:** McKenzie (2000) makes an interesting analogy for the move from sorting and sifting to synthesis, one that mirrors Kirby and McKenna's (1989, p. 57) notion of creating a "thought cloth". He states: "The process of combining and considering findings is somewhat like weaving, embroidery, tapestry and quilting." (McKenzie, 2000, p. 103) Synthesis is the natural consequence of effective sorting and sifting: patterns emerge, deductions are formed, new questions are formulated, conclusions are made.

McKenzie (2000) discusses three levels of thinking that must occur (simultaneously) for successful synthesis: Envisioning possibilities, inventing solutions, and rearranging, where the student "...arranges, blends, combines, integrates, tests, and adjusts the thought fragments until new pictures emerge..." (p. 109)

6. **Evaluating:** In this step students decide whether they have enough understanding to answer the research question and move to the reporting phase. McKenzie states that "...students must usually complete several repetitions of the **Cycle** (author's emphasis) since they usually do not know what they don't know when they first plan their research." (p. 72)

The above six steps are repeated until there is enough understanding to form fresh ideas or come to a decision regarding the essential question. Students then move to:

7. **Reporting:** McKenzie (2000) differentiates between traditional forms of reporting and what he terms as the "new report". He notes that there

... was a time – not so long ago... [when] reports were topical in nature, requiring 'information-moving machines' like the building-sized equipment we see pictured in quarries. The idea was to gather as much information about a country or state or city as one could in one month's time and then lay out paragraph after paragraph of badly twisted prose produced by changing one word in each sentence. (McKenzie, 2000, p. 114)

McKenzie (2000) views the “new report” as more persuasive in nature than the old, requiring the research team to present their “answer(s)” in a way that assures the “audience” that theirs is the correct course of action or decision. The students must decide which data will clearly and efficiently assist them in persuading the audience, and show the logic of their thinking. While in the more “traditional report” almost all of the information viewed was used in the report, in the “new report”, much of the data gathered will not be visible to the audience.

McKenzie (2000) discusses the need for organization on the part of teachers in order for students to experience success in their research endeavors. He states that “...exploration by students progresses most effectively when those students have been well equipped, well prepared and well guided along the path.” (p. 155) “Without clear structure and precisely stated expectations, many students are vulnerable to a kind of educational ‘wanderlust’ that pulls them far afield.” (p. 156)

McKenzie (2000) warns that “...even though we may offer clarity and structure, the students must still conduct the research and fashion new insights. The most important work is done by the student. We simply provide the outer structure.” (p. 156) McKenzie calls this structure “Scaffolding”; for it provides the support that students need to work on their research projects safely and efficiently, without being misconstrued for the research itself. His views on the need for scaffolding are supported by literature in the field, which is succinctly summarized by Marlene Asselin: “When instruction is carefully scaffolded and students learn about the research process, not just do research, they are able to transfer these skills into independent tasks. (2000, p. 65)

McKenzie (2000) lists the characteristics of educational scaffolding to support research:

1. Scaffolding provides clear directions to the students, offering “...step-by-step directions to explain just what students must do in order to meet the expectations for the learning activity.” (p. 156)
2. Scaffolding keeps the purpose of the research clear and at the forefront with essential questions.
3. Scaffolding keeps students on task by “...providing a pathway or route for the learner...” (p. 158)

4. Scaffolding offers pathways to success by providing clear assessment expectations and examples of success.
5. "Scaffolding points the way to worthy sources..." (p. 159)
6. Educators, to eliminate uncertainty and frustration for the students, trial scaffolded projects.
7. Scaffolded projects move smoothly and efficiently.
8. Scaffolding channels energy, creating momentum and drive to answer the essential question.

Eisenberg and Berkowitz's *Big6*TM Research Model

The *Big6* approach to student research skills and competencies, created by Mike Eisenberg and Bob Berkowitz (1985), is a widely used research structure that is popular with teacher-librarians. It is difficult to avoid references to the *Big6* approach when looking into research structures and strategies.

The *Big6* approach breaks "information problem-solving" into six stages, which students can use in various scenarios:

1. The first stage of information problem-solving is "task definition", which includes two components:
 - a. Defining the problem. Eisenberg (Sept/Oct 1997) points out that "...students often have trouble understanding what's expected of them." (p. 25) He encourages scenarios where the student must question for expectations. "One tip to encourage student responsibility is to purposely give assignments without much explanation...[which] forces the students to find out the details and can lead to a stimulating exchange of options, key aspects and grading." (p. 25)
 - b. In the *Big6* model, Task Definition also includes "...identifying the information requirements of the problem: here, we want students to consider various aspects of the information they will need to solve the task/problem before they turn to thinking about specific resources." (Eisenberg, Sept/Oct 1997, p. 25) At this stage, we want students to

consider the type of information needed, the amount of information needed, and the format of the information that might be most appropriate.

2. "Once students understand their task and information requirements...their attention should turn to the..." (Eisenberg, Nov/Dec 1997, p. 22) second stage in the *Big6* model: Information Seeking Strategies, which has two components:
 - c. Determining the range of possible sources, and
 - d. Evaluating different sources to determine relevance and priority.

In this stage, "...we want students to brainstorm all possible information sources to meet the task, and then to critically determine the best sources for completing this particular task..." (Eisenberg, Nov/Dec 1997, p. 22) Eisenberg discusses the need to have students go beyond the typical sources used in school research projects to sources such as community resources, experts, and videotapes. He also warns that with "...more information sources available than ever before, the 'narrowing' part of information-seeking strategies is more important than ever before." (p. 23)

Eisenberg feels that teachers would be pleasantly surprised if they asked students for criteria in making information source selections. His list of what students will more than likely come up with as criteria includes: accuracy, completeness, reliability, preciseness, validity, and currency.

3. The third stage of the *Big6* model deals with locating and accessing information, and has the two components:
 - e. Locating sources, and
 - f. Finding information within the sources.

Eisenberg (Jan/Feb 1998) discusses the need for students to start their search looking at the larger picture and then narrowing down to more detailed information. He feels that when searching the Internet, students might begin by looking at

indexes for general information, then move to using keyword searches with search engines, and then move to Boolean Logic to narrow the search.

4. The fourth stage in the *Big6* process moves from the selection of the sources to “Use of Information”, where there are two components:
 - g. Engaging in the information source. Eisenberg states that this “...is ‘where the rubber meets the road’ because it requires heavy-duty ‘critical thinking’ as students engage the information in a source in order to recognize relevant information.” (March/April 1998, p. 43) Eisenberg reminds us of the importance of the ability to skim and scan for relevant information, and feels these skills should be taught and assessed.
 - h. Extracting relevant information in a note-taking process that makes sense to the project.
5. The fifth stage in the *Big6* process is Synthesis, which Eisenberg (May/June 1998) states is where the information gathered is organized and presented. Eisenberg mentions the strong link between the task definition stage and the synthesis stage, for the presentation of findings should somehow match the original task. This view of the synthesis process closely matches that of McKenzie, where students compare findings with the essential and subsidiary questions.
6. The final stage in the *Big6* model for information problem solving is the Evaluation Stage, where students evaluate the effectiveness of how they did “...in meeting the goals of the information problem-solving process.” (Eisenberg, Nov/Dec 1998, p. 35) At this stage, students “...assess the efficiency of the process they use[d] to reach decisions and solutions.” (p. 35)

The similarities between McKenzie’s and Eisenberg and Berkowitz’s models for the research process are numerous. Both methods, the *Big6* and McKenzie’s *Research Cycle*, emphasize that students define the task or question, plan their research, find sources with the critical mind engaged, have a system for gathering information, organize the information, and present the findings.

The differences in the two approaches are also numerous. Eisenberg has students engage their critical thinking by defining a task, while McKenzie focuses on developing the task into an essential question. McKenzie has the students spend quite a bit of time with questioning: having them ask subsidiary questions that will lead them to answer the essential question. Because the questions are the focus of the research, in that they become a natural filter for information and a natural organizer for note taking and synthesis, the questioning approach may require less teacher intervention while students are seeking relevant information (the students simply ask: "Does this help me to answer my question?").

The *Research Cycle* has a built-in step for evaluating whether there is sufficient data and understanding to warrant presenting of findings, while the *Big6* approach has students meta-cognitively evaluating their performance after the research process is complete.

(*Big6* is a trademark of *Big6 Associates*)

WebQuests

WebQuests are a recent addition to the research models available and have gained popularity in recent years, with more and more *WebQuests* appearing on the Internet. The *WebQuest Page*, an Internet site created "...by Bernie Dodge, the father of *WebQuests*" (Braun, 2000, p. 32), provides several links to *WebQuests*, as well as instructions on developing them. When looking at the structure and underlying philosophy of a *WebQuest*, it becomes apparent that they are very similar to McKenzie's *Research Cycle*.

Linda Braun (2000), an Education Technology Consultant for *Librarians & Educators Online*, discusses the benefits of *WebQuests* in a recent article as a means "...to teach students about a particular topic while at the same time increasing their information literacy skills." (p. 32)

A "...*WebQuest* is an activity in which students use Internet resources, along with other materials, to answer a particular question." (Braun, 2000, p. 32) *WebQuests*, like McKenzie's *Research Cycle*, begin with a question or a problem, and are organized much

like his *scaffolding*. The process of the *WebQuest* begins with an introduction, which is usually written as a scenario, question or problem, and has a description of the task. The students are provided the resources for their task or directions to the resources, much as *scaffolding* a research project supplies the resources. The process section of a *WebQuest* "...outlines the steps students need to take to finish the *WebQuest*." (p. 33). Frequently, students are organized into research teams with each student taking a particular research role. "Roles become an important part of the *WebQuest* as they allow students to look at the topic from a variety of perspectives." (p. 33) The process section of the *WebQuest* is usually followed by an evaluation phase, where students receive information about how they will be evaluated, and a conclusion section, which provides the students with a summary of the experience.

"*WebQuest* roles provide students with an authentic collaborative learning experience." (Braun, 2000, p. 33) They are much like McKenzie's *Research Cycle*, in that they assume that, "if students are required to make a decision based on evidence gathered and presented, then they are being required to think critically about the topic at hand." (Braun, 2000, p. 33)

Although *WebQuests* are scaffolded much like McKenzie's *Research Cycle*, students are not required to construct essential and subsidiary questions. The *Big6* research model also places the responsibility for questioning on the teacher rather than the students. McKenzie (2000) feels that "questions enable us to make changes in life, to invent new and better ways of doing things." (p. 2) "Without strong question skills, you are just a passenger on someone else's tour bus. You may be on the highway, but someone else is doing the driving." (p. 7)

Competencies in Using the Internet in Research Projects

Searching for Sources

In many cases, students confuse 'hits' on a search engine with progress toward insight and understanding. Since there was some tendency to reward length in times past and to confuse the quantity of information with the quality of the

research, students may watch their accumulating mountain of 'hits' with glee, not appreciating that they have been constructing the equivalent of an information landfill with any treasures concealed from view. (McKenzie, 2000, p. 70)

Richard Wiggins (2000), Senior Information Technologist at Michigan State University, in discussing the size of the World Wide Web, infers from various search engine indexes that the size of the Internet in the fall of 2000 was "...roughly one billion pages and that it is doubling in size roughly every year or two." (p. 26) Wiggins claims that search engine capability to return relevant hits is diminishing as the WWW grows exponentially. He reports that many search engines use a means of indexing which, although it may provide enough relevant hits now, will soon not be able return relevant hits in a way that makes the material easily accessible to researchers. Using the example of *Google*[®], a very popular search engine which uses numbers of links to a URL (Uniform Resource Locator, or the address of a Web site) as a weight in relevancy ranking, Wiggins states that its "...penchant for finding the popular will marginalize ever more material, and as more people use it to find sites that they link to, *Google*[®] perpetuates this marginalization." (p. 27)

Search engines that organize returns differently might better cope with larger and larger numbers of hit. Wiggins (2000) specifically mentions *Northern Light*, which "...splits the result set into separate virtual 'piles' divided by category and by document source." (p. 27) This means of returning hits allows the researcher, with a few clicks, to follow the most relevant category to material that may be useful.

Wiggins (2000) believes that search engines will continue to be used with regularity, but that "...specialized search engines will become increasingly useful and used in lieu of the general-purpose engines." (p. 27) In a summary of a conversation with Lou Rosenfeld, author of the book *Information Architecture for the World Wide Web*, Wiggins discusses Rosenfeld's notion of the growing need for researchers to select other means of finding relevant sources than simply relying on search engines. Rosenfeld feels that even the specialized search engines and filters have great limitations. He claims that researchers may become, "...less concerned about large, unusable search results and more dependent

on serendipity. A byproduct will be minimized concern over the quality of results. In fact, this seems to have already begun to happen.” (Rosenfeld in Wiggins, 2000, p. 28)

Many educators share Wiggins’ perspective on Internet based research. McKenzie (2000) summarizes much of the literature concerning student research on the Internet:

The Internet is a vast hodgepodge of information resources thrown together with very little planning, structure or quality control. Wandering aimlessly across the Net’s shimmering surface or delving haphazardly through its labyrinthine menus may be addictive, but students can easily squander hours without gaining any new insight or valuable information. (McKenzie, 2000, p. 75)

The needs of students and educators for safer and more efficient means of conducting research on the Internet have resulted in the development of numerous organizational aids. Many metasites, or gateways, now offer both search engines and directories of Web sites categorized into subtopics. Many organizations have developed “educational Web portals” as a response to the need for controls over student searches of the Internet. Librarian Randy Meyer (2000) recently offered a review of twenty education portals, including *Bigchalk*®, *Aol@School*®, and *Electric Schoolhouse*®. He found that many education portals are good sources for students and teachers doing research on general education topics, and include many other tools, such as calendars, message boards, e-mail services, and templates. Educational portals are often seen by educators as being very useful because they appear to offer “tried and true” links to resources. There is very little need for the students or teachers to wander endlessly in search of useful, relevant and safe information, because the education portals supply links to sites that other educators have already found useful.

But even with the use of education portals and search engines that categorize hits, students and teachers need a basic understanding of how Internet searching works and some basic research techniques to know how and where to find what they want. The number of available Web portals and Web directories appears to grow daily, each with a

different set of “rules of engagement”. At times they can offer as much confusion and frustration to the researcher as do general-use search engines.

Another potential problem with Web portals is that they embody a form of censorship, not only over pornographic or racist sites, but also more subtle censorship in which some sites are omitted because of their political or religious orientations. In some cases this censorship is fairly innocuous, but in others it is not, with the result that research is structured to favor student discovery of particular realities or truths, which have in effect been pre-selected. Although there are several benefits in the use of educational Web portals for research, they cannot replace the critical thinking that permits students to appreciate when what they are permitted to see has in fact been “filtered”.

Ken Haycock, in an article summarizing research findings on digital information literacy, finds “...the use of search engines is not intuitive...” (Feb 2000, p. 34) “Successful use of search engines by young people requires content knowledge, appropriate language skills and adult intervention.” (p. 34)

When discussing Internet research using search engines, McKenzie provides ten items of advice for students and teachers:

1. Students should think before they search by making a list of questions, keywords and phrases. Use of a thesaurus would be appropriate for development of search vocabulary.
2. Teachers should select a search engine that is currently deemed “best” by search engine evaluators or that fits criteria important to the research, such as speed and Boolean Logic capabilities.
3. Learn the rules and defaults of the search engine by viewing the “help” option.
4. Learn the features and tools of the search engine, such as filtering sites by language or domain.
5. Start the search with broad searching, and then filter down to desired areas with Boolean Logic and other search engine filtering tools.
6. “Browse before you graze”. McKenzie (2000) compares the first broad search as a “...potluck supper with a 400 foot long table”. (p. 125) and asks us: “Would you step up to the very first dish and start heaping food onto your plate? Or would you browse and graze before making choices?” (p. 98) By browsing the first 100 sites.

and by reading the descriptions, students can choose areas of irrelevance to exclude and areas of relevance to target.

7. McKenzie (2000) observes that some of the best Internet sites are not indexed by search engine spiders (the search engine software that searches and indexes sites). He mentions that the best place to start might be:
 - a. With an authoritative Web site that might be found by viewing an Internet guide (book or Internet);
 - b. With an online database, such as Eric, where authoritative articles on various topics are available;
 - c. With the various directories available that index Internet sites by topic; and,
 - d. With a librarian.
8. Use logical operators (Boolean logic) to focus the search from the broad subject to specific areas.
9. Use logical operators (such as "AND NOT") to cull findings that are irrelevant to the research questions.
10. Follow intuition and be playful with the search.

The Media Awareness Network (1996) also provides advice for researchers using search engines. In an article, *How to Search the Internet Effectively*, they state that a researcher "...can maximize the potential of search engines by learning how they work, and how to use them quickly and effectively." (no page number) Their views on Internet research mirror much of the digital information literacy literature, in that they see the "...challenge is to ask your question the right way, so that you don't end up overwhelmed with too many search results, [or.] underwhelmed with too few..." (no page number) The Media Awareness Network provides the following advice:

- Define your topic as completely and succinctly as possible.
- Most users submit 1.5 keywords per search, which is not enough for an effective query – the recommended maximum is 6 to 8 carefully chosen words, preferably nouns and objects.
- The most powerful keyword combination is the phrase.

- Boolean searching...is a powerful technique that can narrow your search to a reasonable number of results, and increase the chance of those results being useful...The three most commonly used Boolean commands...are AND, OR and AND NOT.
- Check the 'Help' functions of the particular search engine you're using, since they all have their own quirks and preferences. (Media Awareness Network, 1996)

Web Evaluation

"The internet has made the life of charlatans much easier." (McKenzie, 2000, p. 3) "Prior to the Internet, 'experts' usually had to pay dues and win various licenses or credentials." (p. 3)

One area of concern that is omnipresent in the digital information literacy literature is the need for students to analyze Web resources critically prior to using them. McKenzie (2000) hopes that when "...we come to a Web site or online article, we immediately ask who put it there and whether their ideas can be trusted...What is their background? Their experience/ their bias/ their funding/ their track record/ their reputation?" (p. 3)

My review of ten Web evaluation tools from The American Library Association, Kathy Schrock's *Guide for Educators*[®], The Media Awareness Network, New Mexico State University Library, University of Wisconsin McIntyre Library, University of Southern Maine Library, Wolfgram Memorial Library, Multnomah County Library, CyberGuides, and *Showme*[®] Multimedia Ltd. reveals patterns of advice for the evaluation of Web sites:

Authorship – Who wrote the site? Is the person an authority on the topic? Can the author be reached for questions or comments?

Sponsorship – Who is paying for the site and what is their motivation? Are there links to information about the organization or to make contact with someone in the organization? (Five of the Web Evaluation tools reviewed, including The Media Awareness Network and the American Library Association, recommend that

students read the URL of the site to determine what kind of organization sponsors the page or whether the page is an individual's site.)

Purpose – What is the purpose of the existence of the site? Is it to educate? Persuade? Sell?

Bias/Objectivity – Does the site promote a specific point of view (gender, racial, religious...)? Does it rely on loaded language or emotion to make a point? Does the site offer more than one viewpoint or links to other viewpoints?

Design – Is the site professionally designed for easy navigation? Does the site take too long to load or require additional software (*plugins*)? Do graphics get in the way or do they enhance topic understanding? Are there many "dead" links (hypertext links that do not work)?

Content – Is there enough information to make visiting the site worthwhile? Is the content easy to follow and read? Is the content professionally written, with no spelling or grammatical error? Does the information seem complete? Is the information useful to you? Are there citations for the sources that the author used for this Web site? Are there links to other sites for more information? Is the information factual or opinion? Is there another print source that can provide the same information?

Currency – Is there a date on the site informing the viewer of when the material was published and the last time the site was updated?

Each of the ten Web evaluation sites has a particular format for use: some simply list Web evaluation criteria and some attempt to break the evaluation down into memorable formats.

Kathy Schrock's "Critical Evaluation of a Web Site: Middle School Level", uses language that is easily understandable by the majority of middle school students and takes students through a series of questions and writing activities designed to help them

evaluate Web sites. Although this seems an easy system to use, it is time-consuming and might be more useful as a Web evaluation lesson activity. Schrock's guide is the only one of the ten reviewed that is in a "fill in the blank" format; the other Web evaluation sites rely on the user creating his or her own means of tracking answers to the questions they ask.

The majority of the Web evaluation tools listed above attempt to break up the evaluation process into steps described by general headings, such as the ones listed above, and create checklists for students to follow. Only one of these, *CyberGuides*, has students give each aspect of a Web site a grade, and then asks students to give reviewed Web sites an overall grade.

The Media Awareness Network attempts to make the main headings of their criteria memorable by placing them into simple and easy to remember categories: Who, What, When, Where... There are benefits to the Media Awareness Network approach, because being easy to remember it increases the possibility of transfer to individual and personal use, without the need to access complex forms or checklists. However, in using the Media Awareness Network approach for serious research projects, teachers may wish to make simple forms for the students to record where a Web site succeeds and where it fails. The *CyberGuide* notion of "grading" Web sites forces students to summarize their findings regarding a Web site and make a final judgment.

Note Taking

Teaching the ethical use of information is becoming a necessary and vital role of education. (British Columbia Teacher-Librarians' Association, 2001, p. 3)

The literature on information literacy is fraught with concerns regarding the tendency of students to take the ideas of others and present them as their own. With the growth of the Internet and its increasing access in schools, concern regarding wholesale plagiarism has increased in intensity. The British Columbia Teacher-Librarians' Association (2001) states that with "... the advent of digital information and seemingly free access we have to information today, there is a tendency on the part of all people to treat information as

simply there for the taking.” (p. 2) Lori Roth, Senior Director of Academic Services and Professional Development at California State University, (1999) states that people “... who would never dream of stealing a necklace or a CD will cut-and-paste a passage from the net into their paper without a moment’s hesitation and complete ignorance of any prohibition.” (p. 42)

Jamie McKenzie (2000) feels that the “... New Plagiarism may be worse than the old because students now wield an **electronic shovel** (author’s emphasis) that makes it possible to find and save huge chunks of information with little reading, effort or originality.” (p. 129)

Ken Haycock (Feb 2000) states that “synthesis – especially summarizing and making decisions rather than copying someone else’s ideas and conclusions – must be taught to students in order for them to apply and use this skill set.” (p. 34) The British Columbia Teacher-Librarians’ Association (2001) agrees with McKenzie and Haycock. They state that research projects

...must show the student’s own thinking and not just a compilation of “cut and paste” phrases conveniently borrowed and meshed together from numerous sites of dubious quality and content. It is negligent to just send student surfing through thousands of Internet sites without the necessary techniques and processes, in the faint hope of eventually finding one that meets their educational needs. (British Columbia Teacher-Librarians’ Association, 2001, p. 4)

McKenzie (2000) warns that “cutting and pasting can be the enemy of thinking and reading: Make sure your students are selective in their collecting. Better to paraphrase than cut and paste.” (p. 101)

McKenzie (2000) describes seven antidotes for plagiarism:

1. Differentiate between three levels of research: Level one, where students are simply rearranging facts; level two, where the questions being researched might be important, but the students are gathering and reporting the “ideas of others”; and

level three, where students "...cannot find the answers but must make the answers." (p. 131) McKenzie feels that if students work on issues that have not been fully answered, and are asked to make a decision or hypothesize solutions, the chances of plagiarism are diminished substantially.

2. "Transform topical research into projects that demand that students move past mere gathering of information to the construction of new meanings and insight." (McKenzie, 2000, p. 132)
3. Emphasize essential questions that "...touch upon basic human issues or touch matters of the heart and the soul." (McKenzie, 2000, p. 132)
4. "Require and enable students to make their own answers" (McKenzie, 2000, p. 133) through questioning and synthesis.
5. Students should gather only information that answers their questions (essential and subsidiary) and store the information in a systematic way...allowing for easy synthesis.
6. Code the thinking of others differently than original thinking by using a different ink colour or formatting for the original thinking.
7. Teachers should monitor every step in the research process, where criteria and regular assessment for note taking is used (and that rewards original thinking).

Role of the teacher-librarian

Even though students once rushed around and past the librarian on the way to the computer and the Internet, a few hundred hours of fruitless searching often seems to reduce student enthusiasm for random prospecting and surfing. Eager to get on with their project or inquiry, they turn to more reliable and well-organized sources and they begin to welcome the 'pointers' offered by a good librarian. (McKenzie, 2000, p. 69)

The British Columbia Ministry of Education (1995) provides three broad principles to guide the learning process necessary for a successful information literacy program:

- Children need the "...knowledge, skills, and dispositions which will enable them to become skillful, thoughtful users of information in an information era." (p. 4) This principle includes the need for critical thinking and problem-solving skills, and improvement of student facility with information skills:
- Children need active involvement in their learning, a variety of learning resources, and development of student decision-making skills:
- Information literacy can be developed through collaboration with teacher-librarians and other educators in developing meaningful programs.

The Association for Teacher-Librarianship in Canada and the Canadian School Library Association, in *Competencies for Teacher-Librarians*, place information literacy and the need for collaborative work with teachers as primary areas of focus for teacher-librarians. They state that students

...in Canada today need to be able to think rationally and logically. With more and more sources of information, both print and electronic, and the increasing difficulty of ensuring that students can derive meaning from this information, the role of the teacher-librarian becomes central. (Austrom, et. al., 1997, no page number)

They found that "...several studies have established that teachers collaborate more in schools with a teacher-librarian and more students...access and use information more effectively." (1997) They also found that "...integrated library programs impact positively on collaboration, leadership and student achievement when the teacher-librarian... works collaboratively with teachers in flexibly scheduled programs to integrate information problem-solving skills and strategies." (1997)

Lori Roth (1999) claims that the "...explosion of information has made it impossible for subjects to be 'covered' in the classroom. As it is no longer possible to teach students a

static subject that can be mastered [during their school careers], (p. 42) educators...”are turning their attention to the lifelong skill of learning how to learn: how to...find, evaluate, and effectively use information that is constantly changing.” (p. 43) Seeing information literacy as an essential life skill, Roth discusses the need for collaboration between teachers and teacher-librarians in designing programs that integrate information literacy into various scenarios.

McKenzie (2000) feels that in “...order to support broad-based adoption of effective questioning and research strategies, a district team comprised of teachers, teacher-librarians and administrators should conduct a search for an effective research model.” (p. 63)

Eisenberg (March/April 1998) discusses the need for “...teacher-librarians, reading specialists and classroom teachers ... to work together to help students improve their ability to sift through lots of information and recognize what’s relevant to their specific task, problem, or need.” (p. 2)

Eisenberg and Johnson (May/June 1996) feel that “teacher-librarians know that successful integrated information skills programs are designed around collaborative projects jointly planned and taught by teachers and themselves.” (p. 12) “Over the past 20 years, teacher-librarians have worked hard to move from teaching isolated library skills to teaching integrated information skills.” (p. 12)

“As a result of automation projects, electronic research resources and computer labs located in or adjacent to resource centers, teacher-librarians have played central roles in technology planning and implementation.” (Eisenberg and Johnson, May/June 1996, p. 12) “Teachers and administrators are recognizing that computer skills should not be taught in isolation and that separate computer classes do not really help students learn to apply computer skills in meaningful ways.” (p. 12)

Lance, (2001) in discussing the ability of teacher-librarians to work collaboratively with teachers in the integration of information literacy skills, summarizes the findings of four

studies on the impact of school library media programs. Lance makes the following points:

- Library media specialists cannot do their jobs effectively unless they have support staff who free them from routine tasks and enable them to participate in a variety of one-to-one and group meetings outside the library media center.
- Library media specialists have a two-fold teaching role. They are teachers of students, facilitating the development of information literacy skills necessary for success in all content areas, and they are in-service trainers of teachers, keeping abreast of the latest information resources and technology.

In conclusion, a review of the literature on information literacy and digital information literacy reveals that while the Internet is becoming more and more prevalent as a research tool in schools, educators are witnessing a lack of information literacy and digital information literacy among students. Because digital information literacy will continue to grow in importance to adult lives and careers, it is the job of educators to develop and support students' abilities to seek meaning and understanding in ways that are relevant and useful. In encouraging students to be competent at research, on-line or off, educators can focus on critical challenge to provide meaningful context to information gathering, provide structure for the various steps of a research process, provide tools for finding relevant, authoritative sources, and processes for *plagiarism-free* note taking.

The information, concepts and tools reviewed in the literature acted as catalysts for improving personal practice and as compasses in determining a direction of inquiry for this study.

Chapter Three – Study Methods

The original intent of this study was to conduct a *needs assessment* focusing on the competencies that middle school students require for effective use of the Internet for research. The natural course of *action research* consists of a cycle of inquiry, reflection, planning, acting, observation and further inquiry, reflection, planning, acting... As this study developed through the *action research* cycle its focus was somewhat modified.

Personal correspondence with Dr. Milton McClaren (my project supervisor), and the assimilation of literature read during the course of this study, led me to take a step back from the initial concepts of the inquiry. It is difficult to look at student competencies and attitudes concerning on-line research without also taking into account the sorts of research projects that the students engage in. Students' experience of successes and failures in their on-line research endeavors was closely linked to the structure and dynamics of the research projects assigned by teachers. It became apparent to me that student and teacher attitudes and beliefs about research projects, the presentation and structure of the projects, the dynamics of the research process and presentation, and the organizational processes dictated by teachers played as large a role in the success of student on-line research as did the students' competencies in Internet research.

Research Methodology

The research methodology chosen for this study was an *action research* cycle of inquiry, reflection, planning, acting, observation and further inquiry, reflection, planning, acting.... The results of my literature review interacted with the findings of my inquiry to create a process of evolution that will continue after completion of this document.

The study methodology relied on both qualitative methods, such as interviews, observations and personal reflections, and a quantitative method involving the use of an on-line survey. The interviews, observations, and reflections provided depth and richness to the data, while the survey, involving responses from 100 participants, provided breadth.

The research was quantitative in that it used a questionnaire that was designed to collect specific types of data which are capable of being represented numerically. The qualitative aspects of the research included interviews, and an exploration of personal experiences, observations, and reflections. This part of the study provided a phenomenological perspective.

It was my intention that the four data gathering tools (interviews with teachers, interviews with students, an on-line survey of students, and personal observations) helped to “triangulate” data gathered, making the results more reliable.

Data Gathering Tools

Interviews with Teachers

Interviews were conducted with four teachers. The interviews were intended to reveal teachers’ personal attitudes and experiences toward research projects and the trends they may have noticed in students’ use of the Internet for research. The interview format allowed teachers to share their aspirations for improving research projects and their ideas about the effective use and integration of the Internet in research projects.

Interviews with Students

Interviews were conducted with four students. The student interviews were intended to permit students to discuss personal attitudes toward and experiences with research projects and trends in their use of the Internet for research.

Personal Observations

As a teacher-librarian, I have had the opportunity to work collaboratively with teachers and their students on integrated projects with Internet research components. While engaged in this work I have had numerous opportunities to observe research project dynamics and on-line research tendencies.

As an Information Technology teacher, I have had an opportunity to explore the concept of digital information literacy and to attempt to apply ideas from the literature read on this subject to my teaching practice. The major focus of the Information Technology

Seven class at our school is to provide students with the competencies and understandings that will allow them to delve into areas of interest and apply their skills. While teaching this course I was able to use the *action research* model in an attempt to improve my teaching practice and to observe student research habits.

On-Line Survey of Grade Seven Students

An on-line survey was used to gather information from a sample of 100 Grade Seven students enrolled in the Middle School that was the locale for my study. The survey consisted of twenty-nine questions designed to provide information regarding student attitudes toward research projects and especially their attitudes and beliefs regarding the Internet as a research tool. The survey also contained questions designed to provide an indication of students' on-line research competencies.

Synthesis

All data gathering approaches involved data categorization into themes and comparison between approaches. Synthesis of data was followed by an evaluation of the relevance and importance of the data to the research question, summaries of the synthesized data, and recommendations made based on the findings.

Ethical and Methodological Considerations

This study was conducted according to the Ethics Protocols for research involving human subjects in the Policies of Royal Roads University. In all information-gathering participants identity was protected. Interviews were conducted with the utmost sensitivity and subjects were informed of their right to withdraw from the interviews at any time without penalty or criticism.

To protect the identities of participants a code was used for each person being interviewed. Interviews were taped, transcribed and analyzed for emerging patterns and themes. The names of the Interviewees do not appear in any document related to the gathering of data, including the original interview tapes and the transcripts of the tapes. All interviewees signed consent forms protecting their rights to withdraw from the research at any time prior to the publication of this document, and guaranteeing privacy

and confidentiality. Parents or guardians signed student interviewee consent forms. (See Appendix A for consent forms)

This research project, including interview questions, survey questions, and consent forms was pre-approved by the School District #71 Board of Trustees, and the Superintendent of Schools for School District #71 (Comox Valley).

Conduct of the Study

Project Participants

The study involved 100 students who volunteered to participate in the on-line survey (out of 260 students in the school where the study was conducted). Four lunch hours were scheduled in a computer lab for student volunteers, with a volunteer teacher to supervise. Some students chose to take the on-line survey at other times, and were able to access the on-line survey through the school Web site. The on-line survey was conducted during the month of November 2001. (See Appendix A for the on-line survey questions)

On-line survey results were compiled through the services of *WebSurveyor*®. Results were downloaded from the *WebSurveyor* Web site using *WebSurveyor* software, which is capable of comparing, sorting, and sifting results. Charts were created with *WebSurveyor* software. Some of the questions in the on-line survey asked students to comment while the multiple-choice questions were structured in the manner of a Likert scale, with the scale consisting of five possible descriptors:

- Always
- Most of the time
- About half of the time
- Sometimes
- Never

Four teachers were recruited from a staff of ten teachers. The four teachers interviewed for the study all had experience with the use of the Internet as a research tool and volunteered to participate in the interviews. Interviews were conducted in a semi-private corner of the library with a barrier maintaining visual privacy. The interviews were

conducted during “low-traffic” hours. Interviews were forty-five minutes to one hour, and were conducted from a prepared list of questions (See Appendix A).

Four students were randomly selected for the interviews from a group of more than twenty volunteers. Interviews were conducted in a semi-private corner of the library with a barrier maintaining visual privacy. The interviews were conducted during “low-traffic” hours, with a library staff member close by to ensure student comfort. Interviews were thirty to forty-five minutes, and were conducted from a prepared list of questions (See Appendix A).

Chapter Four – Study Results

I try to follow the learning outcomes; I try to follow what [my community] expects; and, I try to follow the students' interests to guide me in my teaching. So that's one reason I do a lot of research projects with the kids.

Grade Seven Teacher T002

Why Research Projects

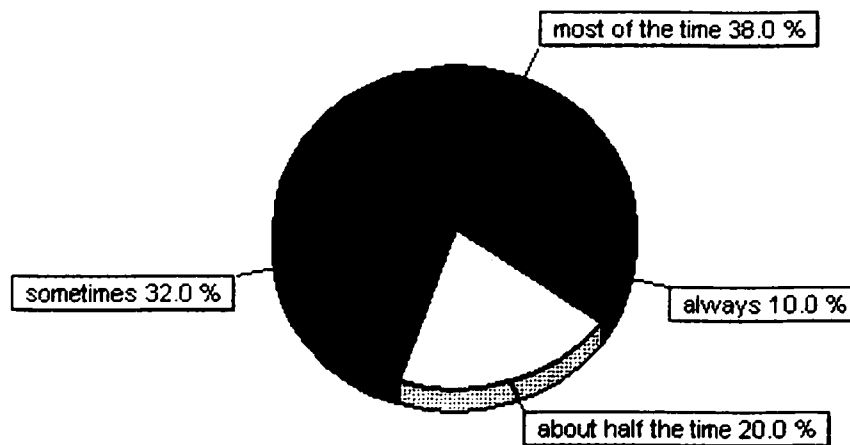
Student Perspectives from the On-Line Survey and Interviews

"Welcome to school, you kind of have to do research projects, it comes with being a student"

Grade Seven Student ST001

All of the 100 Grade Seven students who participated in the on-line survey completed it in full, answering every question and commenting in the provided spaces when asked to. Although a few of the 100 student survey respondents considered research projects to be tedious and irrelevant to their lives, a large majority saw research as an opportunity to delve into a topic of interest in a manner that allowed more independence than typical classroom activities. They also viewed research projects and as an opportunity to present findings in creative and personal ways. Forty-eight percent of the 100 grade seven survey respondents stated that they enjoyed research projects most or all of the time. (Figure 4.1)

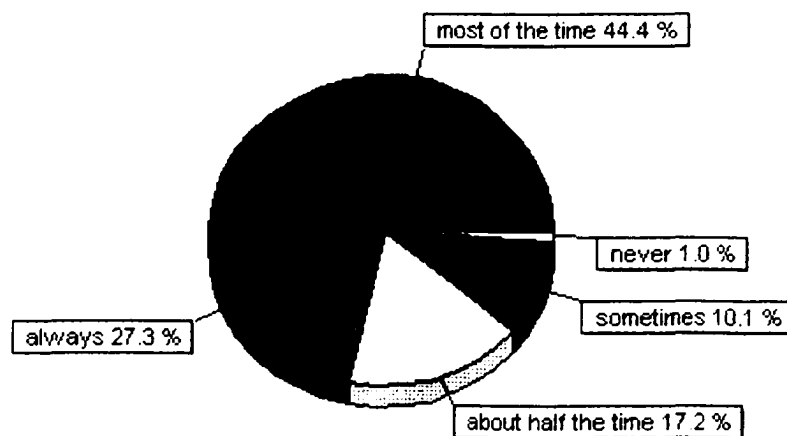
Figure 4.1 Student responses to the question, "Do you enjoy doing research projects for school?"



An interviewed student stated that a research project “gets kids more excited than just sitting in a classroom.” (Grade Seven Student ST001) When asked to define “research”, students who were interviewed all agreed that research was about “finding information about the topic you’re doing and copying it in your own words, writing it out into a project. Mainly just getting information.” (Grade Seven Student ST002)

Surveyed students also tended to assume that research was about facts and information. Almost 72 percent of the 100 grade seven students surveyed felt that research projects are a good way to learn most or all of the time. (Figure 4.2)

Figure 4.2 Student responses to the question, “Do you think that research projects are a good way to learn?”



When asked to comment, twenty-one of the 100 students who commented felt that research was about learning facts about a topic, with two of the 21 students mentioning that research projects “...make you get in depth with what you are researching.” (On-line student survey) One student stated that “...you skim through so many articles in a search, you could become an expert just looking for a topic.” (On-line student survey)

Eighteen of the 100 on-line survey participants repeated in their comments that research is an effective way to learn. Many of them considered research to be a “hands-on” process, with four of the eighteen students stating that research made them “think”. Some of the students felt that the process of “seeking” information was what made research a good way to learn, rather than being provided information by the teacher.

Five of the 100 surveyed students stated that research was a fun way to learn. Six students felt that student buy-in to the topic and independence during the activity made research an effective way to learn. One of these students stated that research projects "...help you learn on your own." (On-line student survey)

Five surveyed students felt research is a good way to improve computer skills, and four students felt that investigating topics in school is a good way to learn and practice *the process* of research.

Those students who did not feel that research was a good way to learn (11 percent) felt that research was an irrelevant process, that research projects often took too long or were often so numerous that they became tedious, and that student interest in the topic was of immense importance in making school research projects have relevance and value.

When asked why they thought we do research projects at school, the **four interviewed students** spoke about research as a different way of learning, that it was a break from the regular routine of the classroom for the teacher and the students. They also mentioned that research projects were more student-directed, allowing students to manage their own time and do things in a more personal way than is typically associated with regular classroom activities. All four of the interviewed students felt positive about research projects as means of learning, and spoke with some excitement about the projects in which they had been fully engaged.

Selected quotations from interviews with four students on why we do research projects:

A research project is more interactive, and [students] get more interested in the stuff, so it's easier to teach.

Grade Seven Student ST004

It's a break for the teachers and it's also a break for the kids... it's a different way of learning. Teachers want to teach kids the best they can...

Grade Seven Student ST003

You learn more things and it's a fun way of doing it because... you have to look around and find your information.

Grade Seven Student ST003

They're more interesting than sitting in class.

Grade Seven Student ST004

Teacher Perspectives on the Value and Nature of Research Projects (Interviews)

I think [research] is a really important skill for kids to [have] because they are going to have to do that their whole lives. basically make choices based on all the information that's out there.

Grade Seven Teacher T001

The four teachers interviewed are fairly regular users of research projects as means of teaching and have all used computers and the Internet at least a few times as part of the structure of their research projects. All four teachers expressed a philosophical affinity toward research projects as an effective tool for learning, but all felt there were areas of concern.

On the whole, the teachers who were interviewed felt that students enjoyed research projects, and that there was value in students being involved in research projects. One pattern that developed in the conversations was the understanding that there is the potentially great benefit to be gained by having students work independently to gather information on topics and create meaning for themselves. The teachers enjoyed providing opportunities for students to create products from the understandings gained during research, and were especially interested in the types of products students could create using computer technology.

One teacher felt that the typical results expected of research projects actually got in the way of the enjoyable process of students simply exploring a topic or question. He compared his own experiences in daily research on topics of interest with the experiences of his students. He felt that when he did not have a required or necessary product for his own research it was a more natural and enjoyable process.

On the whole, the teachers interviewed felt that research projects provided students with opportunities to practice working independently, and to demonstrate effective time-management. They appreciated the fact that research projects put the responsibility for learning on the students.

Almost all of the teachers expressed the view that they can obtain more student “buy-in” to learning by having them do research projects. They felt that students would rather work independently of teachers and textbooks. In their view, research projects not only provide students with an opportunity to take “a break” from the regular classroom routines, they also provided opportunities for students to work in collaboration with others. One teacher mentioned that she relies on the various experiences of the students in her class to provide information or competencies in areas where she feels she is not an expert. She felt that collaborative ventures provided opportunities for a less *teacher-driven* classroom dynamic.

Two of the interviewed teachers expressed concerns regarding the speed at which we push students to complete research projects. They felt that the external pressure of provincially legislated learning outcomes often require classes to move through units of study at a pace that did not allow for reflection and depth of understanding. These teachers also mentioned the limited availability of resources, diminishing the time available for resource-based learning (such as research projects).

Selected quotations from interviews with four teachers on why they use research projects:

We try to teach kids how to grab information from a bunch of different sources, pull it together into a meaningful piece of information that stands on it's own – that they created.

Grade Seven Teacher T001

I think that you're putting the onus on [students] for their learning: centering the learning on their interests.

Grade Seven Teacher T003

[Research] increases the students' interest in what's going on, rather than textbook learning.

Grade Seven Teacher T003

I think a lot of it is the process, of working with other people. It's a joy too – it's sort of opening minds instead of closing them. It's really neat to see kids get to the stage when they realize they have a perspective on something.

Grade Seven Teacher T004

Problems with Student Research Projects

Student Perspectives from Interviews and On-Line Survey

Interviewed students expressed frustration when they were bored with the topics that they were asked to research. They found focusing on topics that they felt were irrelevant to be a painful process. Students sometimes felt that there was really nothing to engage in, or that they were simply going through the motions of finding facts and re-writing them: completing tasks that were “not important”.

Time constraints were mentioned as recurring complaints in unsuccessful research project. In these cases students felt that not enough time was provided for engagement and completion of projects. As a result, they were not able to fully engage with the projects and enjoy them. Students mentioned that they desired structure and concrete measures of success, but not at the expense of interest, choice, or space for creativity.

Selected quotations from interviews with four students on problems with research projects:

When I get bored on a subject, I read and I read... I haven't taken in anything, because I keep getting off track, my mind is on “what am I going to have for dinner tonight”.

Grade Seven Student ST001

We didn't have enough time, so we could barely get enough information.

Grade Seven Student ST002

I didn't like it because it was... a topic that...wasn't important.

Grade Seven Student ST003

Last year we had to pick a topic on a country in Europe and I wasn't too thrilled because... I found them boring... Madrid's the capital of Spain – yahoo that's a fact - we needed 90 facts to get an A. And I'm like – sweet – I've got 91.

Grade Seven Student ST001

Perspectives on Problems with Research Projects from Interviews with Four Teachers

The four teachers interviewed for this study were unanimous about why research projects are sometimes unsuccessful. They based these observations on their teaching experiences. They expressed their greatest disappointment with projects where students did not feel intellectual engagement or excitement, where there was not the time or

resources available for successful engagement, where students completed topical studies that did not engage their critical thinking skills (but simply regurgitated information that they really did not understand), and where they felt students were simply “putting in time”. Teachers felt frustrated when research projects, which they felt were an opportunity for students to learn independently, were not as time-effective as classroom activities, and where student learning was questionable.

Selected quotations from interviews with four teachers on problems with research projects:

[I feel] frustration...[when] I have to rush kids through or because when I am ready and the students are ready to work on something we can't work on it because there's somebody else using the resources that are available.

Grade Seven Teacher T003

[The] mundane [research project], it's almost like you're filling space, you're filling time...like colouring title pages...make-work.

Grade Seven Teacher T004

The classic, we are going to do a country RP study... It winds up just being an exercise in copying from books and they don't really learn what you want them to learn. I think some kids [see] it as something to get through.

Grade Seven Teacher T001

More regurgitation... find this and present it, rather than having them think...

Grade Seven Teacher T002

Research Projects: The Structure of Success

With a critical thinking question, with a critical thought...[students] have to analyze what they're doing and why they're doing it... that's going to create your thinkers in society and I think that's important.

Grade Seven Teacher T002

Student Perspectives from the On-Line Survey

When asked how teachers can make research projects better, 20 of the one hundred Grade Seven students surveyed stated that students would be more interested in research projects if they had a choice of topics. A few of the 100 students stated that a choice to

work in groups and the ability to choose a presentation mode would also help students be more engaged.

Another 20 of the 100 students stated that research projects could be improved if the assigning teacher made the projects more fun, interesting, and exciting. One student stated that, for him, a research project would be better if the teacher could “make it hands on” (Grade Seven student from on-line survey).

Seven students stated that they would like less writing and note taking, and fewer expectations. When talking about a large research question, one student stated that she would prefer “to research four different aspects of the question and not the whole thing. You would still discover the same information but you wouldn't be quite so overwhelmed by one huge question.” (From the on-line survey)

Five students stated that they would like more time to complete research projects. One student stated the opinion, shared by several of the students interviewed and others observed during the research process, that: “teachers can [make] research projects a little more enjoyable for the kids by giving us more time to finish it. I hate being rushed”. (From the on-line survey)

Eleven students noted that they would like some of the useful sources or some information to be provided for them, while two others stated they would rather have free access to any sources they wished to use with no information provided in advance of searches.

Five students stated that they would like the expectations for research projects to be clear, with three of these students directly requesting stated criteria for how to “get an A”.

The Structure of Success: Group Work

Perspectives from Interviews with Four Teachers

I don't think that I as an individual can always explain things in a manner that all children can understand.

Grade Seven Teacher T003

The teachers interviewed for this study were unanimous about the value of group research projects. The teachers felt that when students worked together on projects they were more apt to become involved in ways that are not typical of the normal classroom routine. In group projects, several students can take leadership roles and help to organize and manage group dynamics. Students can experience a sense of true collaboration, where the combined efforts of the members of the group result in a product that would not have been possible for an individual student.

Teachers felt that practice in group dynamics represented a very valuable opportunity for students and a necessary competence for the students' future lives. The teachers interviewed all seemed to enjoy the peer teaching and support that they witnessed and encouraged during group research projects. The teachers interviewed were happy not to *know everything* that the students needed for the successful completion of group projects. They stated that they had as many teachers in the classroom as there were students.

The teachers enjoyed the self-organization that had to occur during the group research process and felt that the competencies learned during these sessions, although hidden in the background process of the final product, were well worth the problems that might sometimes occur during group work.

Some of the teachers felt frustration about group work with what one called "hitchhikers": "those kids who want to go along for the ride to get the mark and don't want to do any of the work" (Grade Seven Teacher T003). However, the teachers were all willing to continue to try new ways to deal with this frustration so that the majority of the students could reap the benefits of collaborative research projects.

Selected quotations about group work in research projects from teacher interviews:

They had to discuss...who was going to do what... as a group. I thought [about the] dynamics of groups and how leaders come out... and how you can still coax other people to have a major input even if they're shy.

Grade Seven Teacher T002

There's only one of me – if they're in a group – they're responsible to go to each of those group members before they come to me... in the end, you've got 30 teachers in the classroom...

Grade Seven Teacher T002

I think that we are social beings as such: I like the idea that the kids can learn to live cooperatively, collaboratively... instead of just one person's brain trying to figure out what to do... I think you get a better product and more learning goes on if it's a group activity.

Grade Seven Teacher T003

Personal Observations Regarding Group Work in Research Projects

Personal observations I make in this report are from my experience in general and from observations made during this study.

When teachers were asked about research projects, they talked naturally about group dynamics and research project teams. Although students frequently worked in teams on their research projects, it was not something that students brought up when asked for positive or negative research project experiences.

As a teacher and a collaborating teacher-librarian, I have had numerous opportunities to observe students working in groups on research projects. My observations are very similar to those of the teachers interviewed, in that I have witnessed student collaboration yielding very positive results. However, like the interviewed teachers, I also have some concerns about group work (including some that were not mentioned by the teachers).

Student responses to the possibility of working in groups during research projects vary from a very determined negative groan, to a very delighted "Yes!" I have observed that students with a history of high academic achievement sometimes speak of group work negatively, for they dread having to do the extra work that results when the less academically driven students do not complete their fair share of the work, or do not complete work that is up to the expectations of the high academic achievers. A common question from high achieving students to teachers is: "Are we marked together?"

Students who are more socially driven (most middle schools can boast an abundance of these students) are delighted to work in groups, because this means that they will have more opportunity to socialize. I have observed numerous situations where a group of students, with books open and pens poised, will appear from a distance to be working happily...but on closer inspection and some eavesdropping, are chatting about unrelated

topics, and are completely unengaged in the research. When approached about their “off-task” behaviour, these students claim to be achieving quite a lot, and will have several notes on a sheet of paper to prove it. These students do not see the need for total concentration when “simply finding facts and taking notes.”

Students who tend to be unmotivated by research projects will do little, which often means that the other group members will have to do more to compensate. I have witnessed students who are more motivated to do their best gritting their teeth in frustration when they have to “pick up the pieces” of a partner’s ineffectual or non-existent work.

The Structure of Success: Choice

Student Perspectives from Interviews and the On-Line Survey

Whether research entails completely self-chosen topics or choices made from among several topics that teachers have provided, all of the students interviewed stated that the element of choice was important to them in their consideration of research projects. The students interviewed felt that choice increased their interest in the research, and might improve the calibre of their learning and the quality of the products of the research. When asked how teachers can make research projects better, the first response of 20 of the one hundred grade seven students surveyed in the on-line questionnaire was that students would be more interested in research projects if they had a choice of topics. A few other students stated that a choice of group dynamics and presentation modes would also help them be more engaged and “to shine”.

Selected quotations about the element of choice in research projects, taken from interviews with four students:

I got to CHOOSE my animal and I just had so much fun learning about this animal, learning how big it could get, learning how it was born, learning how many of them die, learning that people poach them. I love learning that.

Grade Seven Student ST001

I like the intelligence studies - when you get to choose what you want to do. Saying how you’re going to make it.

Grade Seven Student ST002

Maybe [students will] choose something that they're more interested in, that if they don't like it then maybe they don't do such a good job on it, but if they do like it they'll do a better job.

Grade Seven Student ST002

I think kids learn better when... it's on a topic that they choose. I understand there's a curriculum you have to follow – but we come back to the tornado project – it wasn't an assigned project, you had a wide variety of things you can choose from – kids will choose one they're most interested in so they might want to learn about it.

Grade Seven Student ST003

Teacher Perspectives on the Element of Choice in Research Projects from Four Interviews

I try to make it as interesting as possible by allowing the students to use a variety of learning styles and intelligences...

Grade Seven Teacher T003

The four teachers interviewed for this study were unanimous in stating that one of the more important aspects of a successful research project results from providing the students with some choice of topics and/or of presentation modes. They stated that it is not important whether the students were given a large degree of choice, and that the element of choice may only be between two or three aspects of a project, but that it is important for the students to have some degree of choice.

The teachers felt that providing some choice to the students increased the chances of student *buy-in*, and therefore decreased their need to manage every aspect of the learning. Teachers noted that, when provided with choices, not only did the students participate more and spend more time on-task, but also that choice provided opportunities for students of various academic competencies to shine by using their areas of personal interest and expertise. The teachers who were interviewed became quite animated when describing exceptional work completed by students who are not normally successful in the classroom. They described moments of great pride and success both for the students and themselves.

Selected quotations about element of choice in research projects, from interviews with four teachers:

A chance to be creative... if you give them options in a research project and let them choose from options and how they present.

Grade Seven Teacher T001

I remember John... he built the cannon off that Renaissance project...he and his grandpa... it was a model. I think he understood... a fair bit more about the workings of a 16th - 17th Century cannon than I will ever know.

Grade Seven Teacher T004

I find the students participate more... because there [are] a variety of activities that they could be doing. Not everyone has to draw, not everyone has to write the play...[and] so they've learned to divide the responsibilities up.

Grade Seven Teacher T003

Because they've got the choice, they're doing something that they want to do. So right away you've got them hooked...

Grade Seven Teacher T002

The Structure of Success: Interest and Enthusiasm

Student Perspectives from Four Interviews and the On-Line Survey

Students interviewed were unanimous in their desire to do research projects that are important and interesting. When discussing research projects that they felt were the most successful, they described projects presented to them in ways that invited complete engagement. The interviewed students talked enthusiastically about projects that had personal relevance. Some mentioned projects directed toward their "intelligence" (kinesthetic, musical, logical...), others described projects that linked them to the world outside schools, or that could be connected to a larger unit of study in which they were engaged. In each case, although the students completed individual assignments, there was a driving force keeping the whole class "humming" with momentum. In each case it also appeared that teacher enthusiasm about a topic inspired and motivated the majority of students.

Two of the students interviewed also discussed the importance of the organization of the project by the teacher. These students expressed appreciation for a teacher that "had

everything perfectly organized” (Grade Seven Student ST003) for the students, including expectations and criteria for excellence.

Selected quotations about the role of interest and enthusiasm in research projects from interviews with four students:

It’s the way you give it to the kid. Teachers should really want to bring [the] kid out.

Grade Seven Student ST001

We were actually doing a thing for B.C.TV – we were checking the barometer and... testing the rainfall... and then we submitted it to B.C.TV... We were watching the news and we were like – oh, we feel so special.

Grade Seven Student ST003

We were doing projects and we got to choose them, and right before we started, we had watched a movie on chess – our class was right into chess, so I did a project on it. You had to actually dig for the information, you didn’t just go to a search engine and it was there. You had to scan through the article, find out what you really wanted ...

Grade Seven Student ST004

Teacher Perspectives on Interest and Enthusiasm from Four Interviews

The teachers who were interviewed spoke with animation about projects in which they and their students were enthusiastic. In descriptions of research projects that went very well for both teacher and students, the teachers described their personal enthusiasm about units of study. One teacher described a favorite research project, where he was not only interested and enthusiastic about the topic, but where he felt that he knew enough about the topic to steer the students to interesting and dynamic research activities. His enthusiasm was transmitted to the students so that even an unmotivated student would have to work hard not to get involved in the activities that occurred. This teacher was not only pleased at the effortless learning that occurred, but felt moved by the depth of understanding of the material demonstrated by the students.

Whether it was having students design their own Web sites on their research topic, or creating a game to be played by other students, or retelling a movie scene from the perspective of a person of a different religion and culture, the engagement of the students was enhanced when the enthusiasm of a teacher was transmitted to the students. Each of

the scenarios discussed by the teachers and students had students using the information they discovered to teach others, to entertain, to share with the world, or to create a product with a purpose that was important.

Selected quotations about the role of interest and enthusiasm in research projects from interviews with four teachers:

I was enthusiastic and... we transformed our whole classroom into a rainforest and the kids were into it... I got them excited thinking: "Oh, could we really try to make a waterfall in the classroom?"... It had the greatest impact for the kids. It wasn't just a research project, it was a whole unit of study, and so they had their parents coming in and touring our classroom... kids could talk off the top of their heads about the rainforest... they just started explaining everything.

Grade Seven Teacher T001

I've never seen students so into what they're doing, just having them create their own Web site and share with other students.

Grade Seven Teacher T002

If they find something that they are enthusiastic about or that interests them... this becomes more than just a school project...

Grade Seven Teacher T004

I... have them make up a game, a small board game and we take a day and they play each other's games. It works out really well: they have a fun time...

Grade Seven Teacher T003

Information Gathering

Teacher Perspectives on Information Gathering from Four Interviews

All of the teachers interviewed felt, although with varying levels of intensity, that the process of note taking, assimilating, synthesizing, and using research information was an area of frustration for them. Teachers felt that the majority of students do not know how to take notes effectively. As a result, teachers were concerned that too many students choose to copy material directly from information sources.

Teachers mentioned that it is difficult to ask students to write notes "in their own words", because the students are unable to think of words that are any better than those in the sources. This inability to use their own words resulted from students' lack of understanding of the materials.

All teachers interviewed mentioned that they have had varying degrees of success teaching information gathering processes. All have tried different approaches to note taking, organization of notes, utilization of notes in demonstrations of understanding, and different citation methods, with varying degrees of success. Teachers mentioned that it would be a positive thing to have standards for processes such as citation of sources and note taking that students can apply and follow throughout their schooling.

Two of the interviewed teachers mentioned an experiment from the previous year:

Sandra Kirby and Kate McKenna, in *Experience, Research, Social Change: Methods From the Margins* (1989), discuss the concepts of the library as a “playground for the mind” and the notion of research as creation of a “thought cloth”. Blending their ideas with my own, I developed a strategy, I call: *Weaving a Thought Cloth* (from Kirby and McKenna), where middle school students doing research on a topic do not take notes while reading material. The information gathering sessions begin with 20 minutes of silent reading of source material. Students must extract meaning from the material, but without writing any notes. The silent reading is followed by 10 to 15 minutes of silent writing, where the information sources are not available for reference. The students write their understandings of the material in any form that works for them. The silent writing session is then followed by small (like topic) group discussions, where students help each other fill in the holes in their logic and understanding, and where they are allowed to take notes. These conversations make the students’ understandings transparent. Students work collaboratively to help each other make meaning. (See Appendix C for the instructions for this activity.)

Both interviewed teachers who experimented with *Weaving a Thought Cloth* were intrigued with the results and mentioned it in the interviews.

[Students] read the books – no notes or anything, shut the books up and just started to take notes, so after 20 minutes reading and research, they just take whatever notes they have and it’s amazing what they remembered... [then] they get together and discuss what they’ve found out; you should see how their notes grew. And it was all notes, it was not...

taking something down or pasting it... it was their own words in the end.

Grade Seven Teacher T002

One other method of note taking came up during interviews. In this approach students read sources and use keywords and phrases to remind themselves of important information. The students then put away the sources and write sentences and paragraphs using their keywords and phrases for reference. One teacher was very pleased with this method, and found that plagiarism was almost eliminated while understanding of the material increased.

Selected quotations from interviews with four teachers about the role of note taking in research projects:

We try to get around plagiarism...put it in your own words: the kids just fall apart at that. 'What do you mean by own words – what's another word for this?' So they take a word, a synonym, and put it out of context and it totally doesn't make sense. That's the part I've always hated about research projects.

Grade Seven Teacher T001

[When you] know as a teacher they have plagiarized certain portions, but they've strewn that in with their own words here and there, so it becomes very difficult to make an accusation: to say hey, this isn't your own – well yes it is – this is mine, this is mine.

Grade Seven Teacher T001

Trying to get the kids to read the information from the computer before taking notes... to think about what they're saying and... not just writing down what's on the screen... going to a couple of different sites on the same topic, seeing the different opinions, being able to write notes about each and pull it together – form their own opinion. That's what I think is so incredible if kids could do it.

Grade Seven Teacher T001

I don't think they understand how to take notes to begin with and I also think that it's easier to plagiarize than... to take notes in the proper form, and then write your own paragraph from it. It takes less time to plagiarize than it does to take notes, form your own sentences, edit – and then to rewrite.

Grade Seven Teacher T003

They need to learn... proper note form taking techniques; what to do with the information once they've gathered it; how to put it together; identify and keep track of the resources that they've used...

Grade Seven Teacher T003

Personal Observation

In observations made during the course of this study and from my general experience, many students I have observed struggle with note taking when told to “put it in your own words”. I’ve observed students attempting to take information from books or Web sites, changing a word or phrase, and then calling the results their own. They do not see a better way of putting it themselves.

As a teacher-librarian, I have had ample opportunity to observe students as they gather information and take notes for their research projects. A common library image is that of a group of students sitting together at a table, with books and binders between them, pens poised, and engaged in conversations about various topics unrelated to their research. When I roam the room and look at their papers, there are indeed notes. I wonder: “How can they be taking notes and be talking at the same time?” The answer is quite simple: The information is making its way from the book to the notepaper with minimal intellectual engagement. Often, students are simply gathering information from books or Web sites that are related to their topics, much like a person picking strawberries in a strawberry patch: choose, pick and place in the basket, and all while the mind is engaged elsewhere.

The easy availability of the Internet has added another dimension to the problems of plagiarism. On several occasions I have read the work of students I am teaching in a collaborative unit and wonder where I have gone wrong. Very few of the words and thoughts I read are the students’ own. There are several students who do not shy at simply “cutting and pasting” the words and ideas of others they have found on the Internet. Although there are quite a few students who *do* understand the material, make meaning from it, and write down their own understanding of the material, the number of students who do not make meaning or develop understanding from the information seems quite high.

It was in response to these observations that I developed *Weaving a Thought Cloth* from the work of McKenna and Kirby. Two of the four teachers who volunteered to be interviewed for this study chose to experiment with *Weaving a Thought Cloth* last year

(2001) and had some interesting results. Students were no longer looking for facts with which to create notes; rather, they sought understanding – for that was the best way to remember. The students wrote more in the 15-minute silent writing session than most student researchers did in two periods of “traditional” note taking. Also, the group sessions were rich discussions about the material, deepening understanding and memory. Students were actively creating their own learning. One student, who was challenged by reading, used illustrations to obtain information. The teacher (T004) described with delight, how in the student’s group discussion, this “non reader” was able to contribute to the group’s understanding of the material.

Another system of note taking was needed for students working on their own. I have designed a note taking form that allows students to only take down keywords and phrases while reading source material. (I have tried to find a reference or source for this approach in order to check the originality of my work, but so far I have been unable to find the origin of similar methods.) The students then remove themselves from their sources and use only the keywords and phrases as reminders while they write down their understanding of the information in paragraph form.

It took a session or two to teach my Information Technology students this system. But once they became familiar with it, most were able to write original paragraphs that expressed their understanding of the material they read. Other teachers in the school, who are finding it useful, are now using this approach. (Appendix C)

Research Using the Internet

Student Perspectives From the On-Line Survey (Including Some Personal Observations)

The greatest portion of the on-line survey of 100 grade seven students dealt with attitudes and practices around using the Internet for research projects. Eighty-two percent of the surveyed students used the Internet for their research projects in school most or all of the time (Fig. 4.3). None of the students who responded to the survey stated that they never used the Internet for research projects.

Figure 4.3 Student responses to the question, "Do you use the Internet to find information for school research projects?"

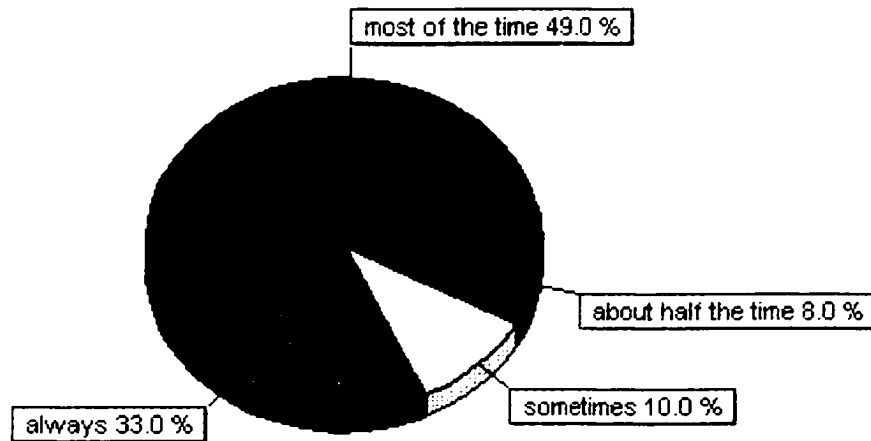
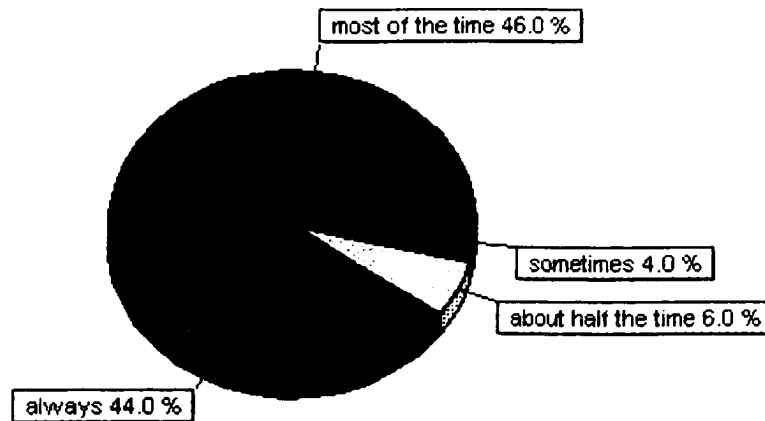


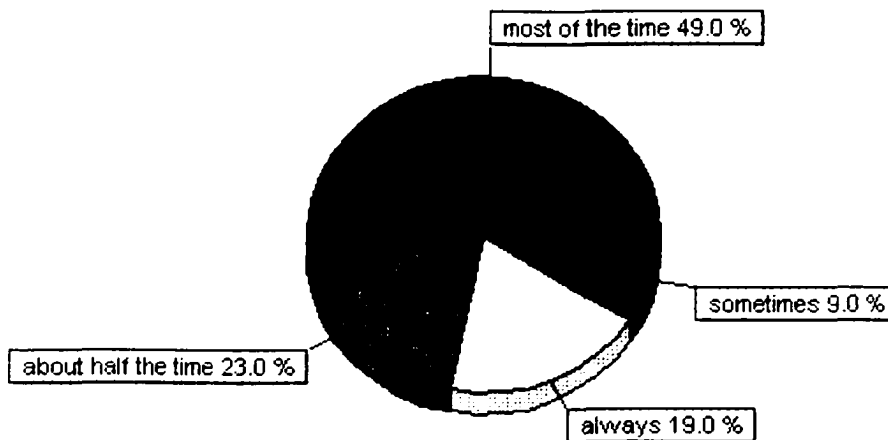
Figure 4.4 shows that 90 percent of the students surveyed felt that the Internet was a good source of useful information for research projects most or all of the time. No students thought that the Internet was never a good place to find information for research projects.

Figure 4.4 Student responses to the question, "Do you feel the Internet is a good place to find useful information for research projects?"



Of the students surveyed, 68 percent felt they could find the information they wanted quickly and efficiently most or all of the time (Figure 4.5). This general student opinion was different from the views of the interviewed teachers, who felt that students tended to take quite a bit of time finding information they wanted and could use.

Figure 4.5 Student responses to the question, "Do you feel you can find the information you want quickly and efficiently on the Internet?"



Students surveyed were asked the steps they would take in answering the question: "Why did the Ancient Egyptians mummify people?" Fifty-one of the 100 students who responded stated that the first thing they would do is go onto the Internet. This response was consistent with my own observations of several grade seven and eight classes. When the classes were given a research topic or question the majority of the students immediately gravitated toward the computers and the Internet. I have observed several students, who before giving the topic any thought or consideration, simply went to a search engine and typed in "mummy" as their search term. Other students go to natural language search engines and type the whole research question, as provided by the teacher.

Five students from the survey group stated that they would brainstorm and define keywords as the first step in the process of research. A second step for these students was to go on to a favorite search engine on the Internet. Ten of the 100 students surveyed stated that they would first clarify the question or expectations. Part of the clarification process took the form of asking the teacher for what she or he expected, while a couple of students stated that they would brainstorm ideas on how to find information. Four students stated that they would look at what they already knew about the topic.

Fifteen of the 100 students surveyed stated that they would likely go to the library for a book or to talk to the librarian. This figure matched closely the number of students who

tended to speak to the librarian or search the library collection before going elsewhere. The situation changed somewhat when books were pre-selected by the librarian. My observations of Grade Seven classes who had a choice between using the computers and the Internet or a variety of pre-selected books showed that approximately half of the students chose to use books.

In almost all cases, when Grade Seven students were provided with only a topic or research question, and little in the way of guidance about how to engage in research, they followed the route that their experiences had shown to be the shortest path to the information, with little scanning for the alternative appropriate sources. Students typically began to take notes from their first choice sources right away.

Based on both the on-line survey results and my observations, it appeared that only a small percentage of students took the time to consider possible approaches and options before plunging into information searches and note taking from the first, most available or obvious sources. Fifteen of the 100 students surveyed stated that they thought about "the whole" before they acted. One student's strategy was to visualize the desired end result, then to seek the information needed for that result.

Figure 4.6 Student responses to the question, "Do you feel that you know which Web sites you can trust for accurate information?"

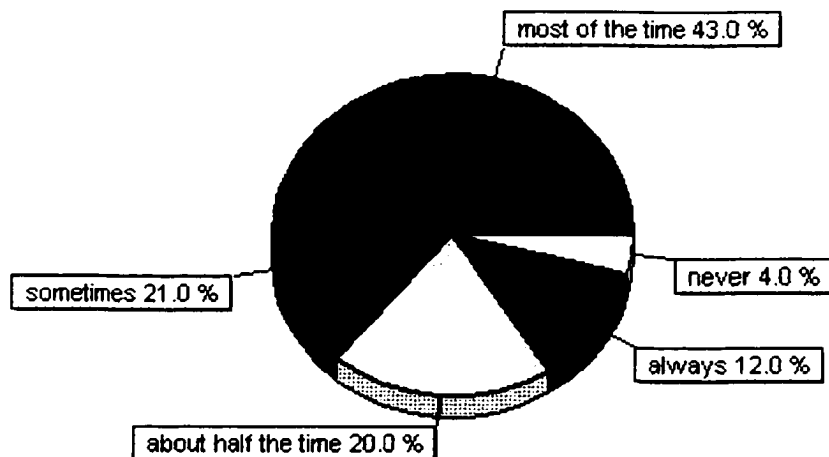


Figure 4.6 summarizes the distribution of responses to the questionnaire options concerning the question, "Do you feel that you know which Web sites you can trust for

accurate information?" Fifty-five percent of the 100 students who responded to this question felt they knew which Web sites they could trust for accurate information. This percentage does not reflect the views of teachers or students interviewed, nor my personal observations. These sources of information revealed that only a small number of students actually check Web site accuracy. The on-line survey question asked students if they "felt" they knew which Web sites they could trust, so the lack of correlation among the different information source categories could be due to varying student perspectives concerning the nature of the question.

When students were asked this question in a different way ("When viewing a Web site on a topic, how often do you check who wrote or sponsored the site?"), the results compared closely with the data from interviews and personal observations. When students were asked how often they checked who wrote or sponsored a Web site during their research (Figure 4.7), only 12 percent responded that they checked authorship or sponsorship most or all of the time, while 40 percent stated that they never did so. When asked if they checked the reputation of Web site authors (Figure 4.8), 53 percent of students stated that they never checked, while 12 percent stated that they checked authors' expertise most or all of the time.

Figure 4.7 Student responses to the question, "When viewing a Web site on a topic, how often do you check who wrote or sponsored the page?"

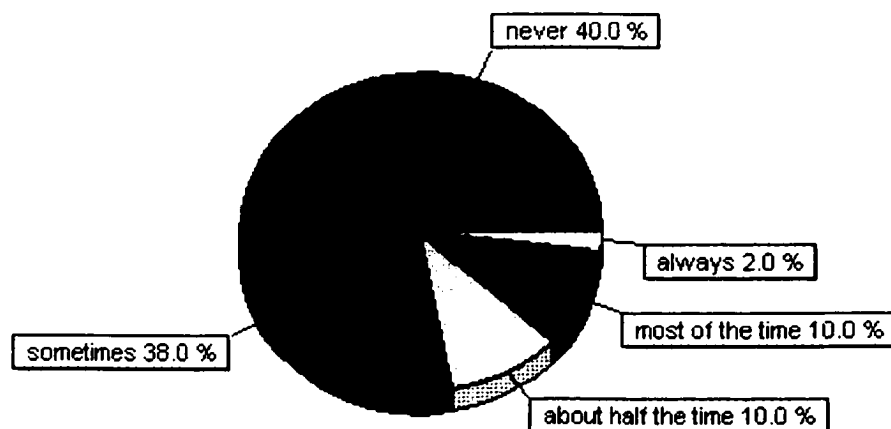
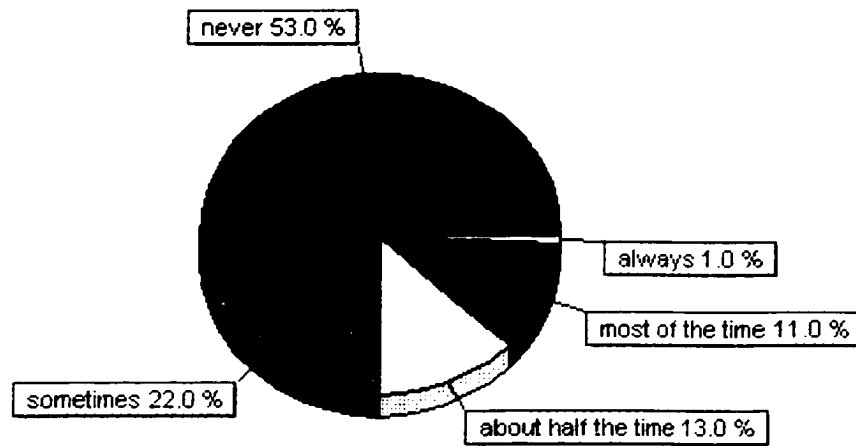


Figure 4.8 Student responses to the question, "Do you check the reputation of the Web site author: How much of an expert is the author?"



The data summarized in Figures 4.9 and 4.10 reveal students' preferences for the Internet as a research tool rather than books. Sixty-seven percent of surveyed students stated that they preferred the Internet for research most or all of the time, and 61 percent of respondents stated that they felt that the information on the Internet was as good as or better than print resources most or all of the time.

Figure 4.9 Student responses to the question, "Do you prefer the Internet for your research rather than books and other print material?"

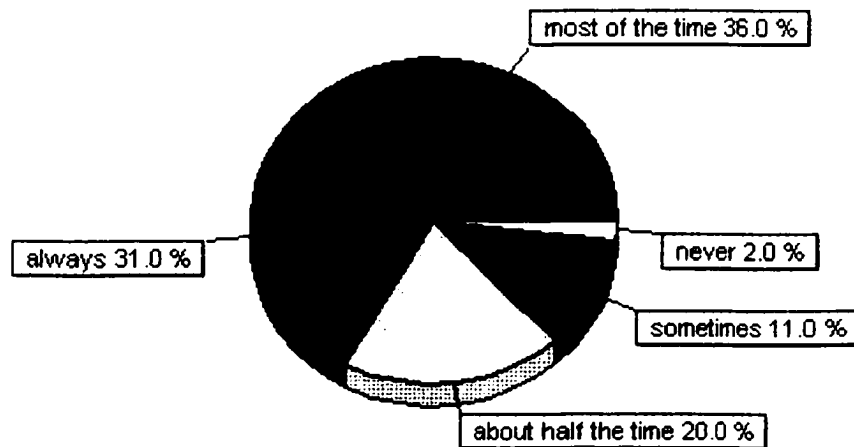
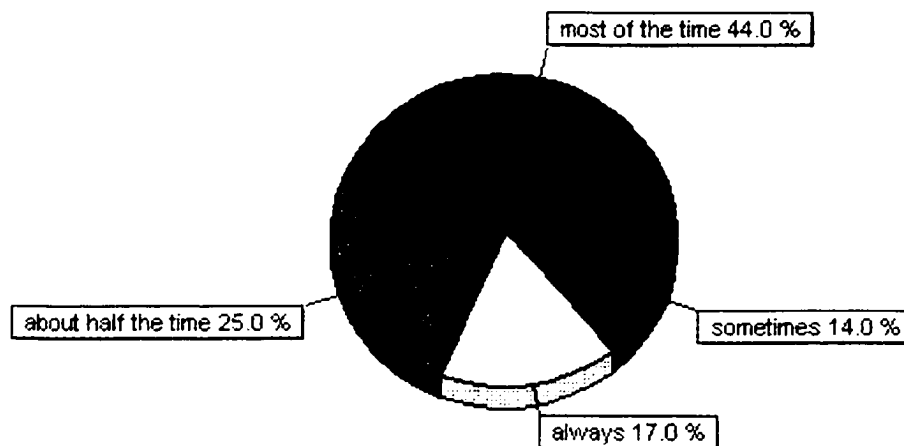


Figure 4.10 Student responses to the question, "Do you feel that the information on the Internet is as good as or better than information in books and other sources?"



In open-ended questions asking students participating in the on-line survey to compare the Internet with books (and other print material) for research purposes, students expressed a definitive preference for the Internet as a research tool. Forty percent of the 100 students surveyed mentioned that they felt that they could locate information faster on the Internet than in books while 45 percent stated that they found the Internet to be far more convenient and easy to use than books. Several students mentioned the ease of doing Internet research from home and 29 percent mentioned that they found far more variety and quantity of information available on the Internet than in other sources. Ten percent mentioned the currency of the information on the Internet in comparison with that found in books, three percent stated a preference for the interactivity of the Internet as a research tool, and two percent noted the ease of contacting authors and experts on the Internet.

When asked to comment about what feature of books might be better than the Internet sources in the research process, 19 percent of surveyed students stated the opinion that books could be trusted for accurate information above that of the Internet. Twenty-five percent stated various reasons why they could find information faster in books than the Internet. A few students mentioned that books have indexes. Several students stated that books are less confusing because they are more topic specific or more "to the point" than Internet sources. Seven students commented that school library books were easier to

read, in that they were chosen for specific reading levels, and that students could always receive help from the librarian. Seventeen students noted physical reliability, portability, and cost as reasons for their preferences for books. These students mentioned that they could always go to the library for books, that "you can research no matter where you are" (Grade Seven Students from the On-line Survey), and that information in books would still be there the next day.

Eight students felt that there was nothing better about books than the Internet. There were several who said that they couldn't think of anything – which might mean that they felt that there was nothing better about books than the Internet for research or that they could not think of anything – so this figure may indicate that as much as 15 – 20 percent of the respondents felt books were inferior to the Internet for research. Nineteen percent of surveyed students felt that books offered more detailed information about specific topics. One student stated that books allowed a person to take their time with research, and not feel that they were being rushed.

Selected quotations from Interviews with students and from on-line survey of 100 Grade Seven students on the comparison of books and the Internet for research projects:

I like the Internet... about a thousand times better, cause it's so much more quick. I know you're reading on the computer, but it almost feels as though you aren't.

Grade Seven Student ST003

You can always trust the books and some times the Internet is written by someone who is not that reliable.

Grade Seven Student from On-line Survey

Books [go] through a more detailed process of editing before they go to the publisher, unlike the Internet, where sometimes they don't even spell check!

Grade Seven Student from On-line Survey

Books – old information. I've had first hand experience with this – last year – I did a project on Czechoslovakia, it was a project where we got to choose the country and I quickly realized it was no longer called Czechoslovakia, it was called the Czech Republic and Slovakia.

Grade Seven Student ST003

As summarized in Figure 4.11, forty-six percent of the surveyed students felt frustrated most or all of the time with the number of Web sites returned during Internet searches, and 59 percent felt frustration most or all of the time at the number of irrelevant Web sites returned (Figure 4.12).

Figure 4.11 Student responses to the question, "When you use the Internet for research, does the huge numbers of Web sites that come up in a topic search ever frustrate you?"

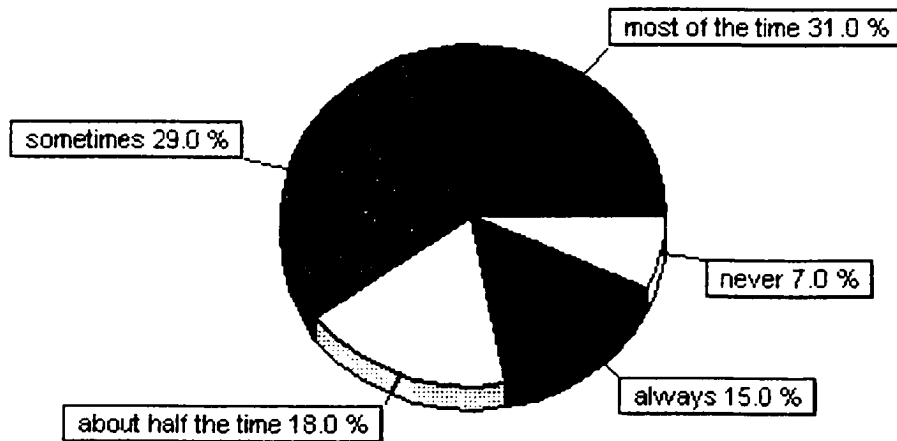
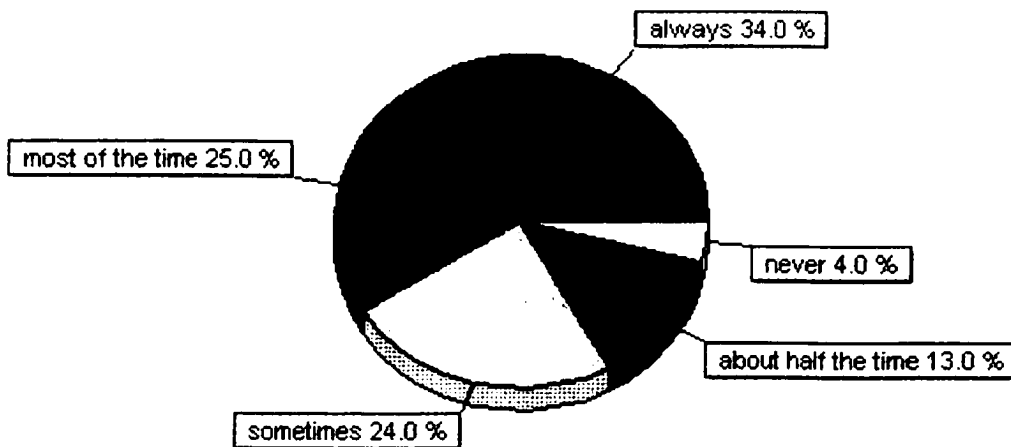


Figure 4.12 Student responses to the question, "When you use search engines for research on the Internet, are you ever frustrated at the number of Web sites that are not really what you want?"



When asked about the use of two common Boolean logic tools used to limit the number of sites returned in searches and to increase the relevancy of returned sites, 35 percent of surveyed students stated that they used the term "AND" all or most of the time (Figure

4.13), and 28 percent stated that they used "quotation marks" to bind phrases in search terms (Figure 4.14). Thirty-seven of the 100 students surveyed had learned how to use Boolean logic tools in the Information Technology class. This probably affected the results somewhat as compared to the possible results from a survey of students who had not taken Information Technology.

Figure 4.13 Student responses to the question, "When using a search engine for your research, do you ever limit the number of Web sites that are found by using AND to link two words? (Example Egypt AND mummies)"

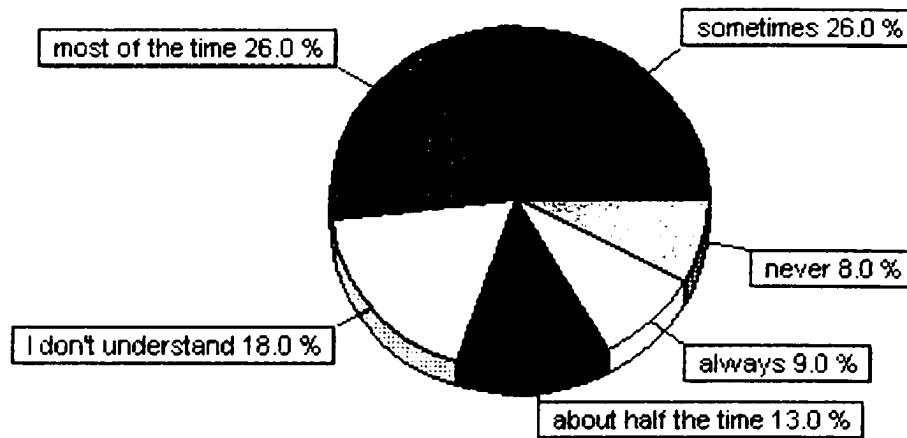
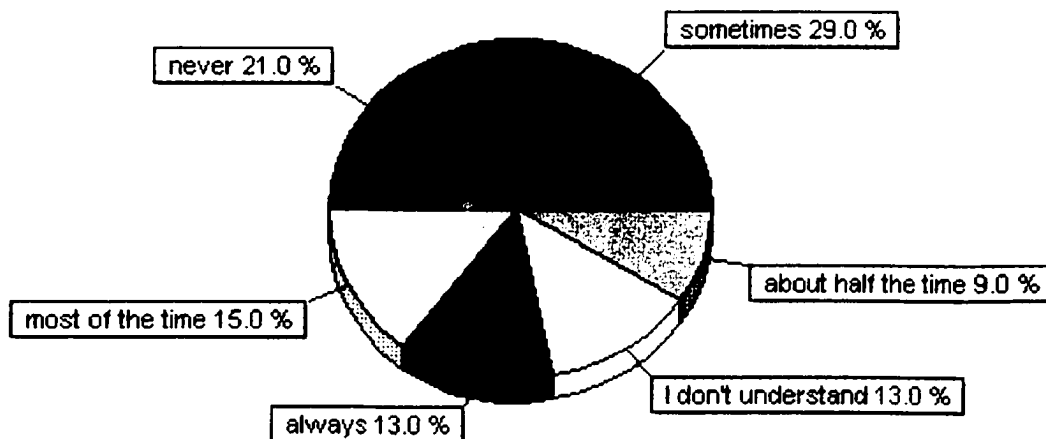


Figure 4.14 Student responses to the question, "When using a search engine for your research, do you ever limit the number of Web sites that are found by using "quotation marks" to keep words in a phrase together? (Example: "Ancient Egypt")"



Student Perspectives from Four Interviews

The interviewed students all agreed that they preferred computers and the Internet as sources of information for research projects. Although the potential for *aimless wandering*, and the frustration with following site links was mentioned by these students, they all remained faithful to the view that the Internet was a good source of information for research projects. When searching for Web sites on a topic, each student had a personal search method. Some used encyclopedias (electronic and print) to find clues about the topic prior to searching for other sources: some used keywords and phrases in search engines; some used simple Boolean logic in their searches; one student liked to find Web sites that were created on the topic by schools or classes because she felt that "they could tell you where to go." (Grade Seven Student ST004)

When dealing with the mass of Web sites that search engines often return on a topic, all of the students started at the top of the resulting lists of "hits" and moved from description to description. Students attempted to weed out the pages that were not on the topic, but on the whole, they relied heavily in the particular search engine's return structure.

All of the students interviewed understood that Web sites may be of questionable authority on a topic and each had different ways of dealing with the issue of Web site accuracy. When wondering about the accuracy of Web sites, students compared the information they found on Web sites with that of other sites and with the information that teachers often provided as basic starting points (textbooks, handouts, pre-study...). Web sites that were obviously commercial were avoided. One student stated that researchers should try to determine the validity of Web sites by name and description, but remarked, "sometimes you just have to guess, sometimes its just part of the process." (Grade Seven Student ST003)

Selected quotations from interviews with four students about their use of the Internet in research projects.

I'm more the person that would go on line or use a computer to do a lot of my research – 80 percent at least of my research is on the computer
I have 2 computers in my house. I use them 24/7. I use them a lot.

Grade Seven Student ST001

I think mostly of the Internet when going to get research on a topic.

Grade Seven Student ST003

I would go to the Internet first. I just always do. I do everything on the Internet...Especially... if you're working on it at home, like we don't have a wide variety of books... at home.

Grade Seven Student ST003

First, I think I would look for books in the library. There are tons of books here, and then, that give me a lead to look for something else that would help me to find something.

Grade Seven Student ST003

I'll go a couple of pages, scan through the titles, find the ones I want, and if I'm not finding what I want, then I'll just go to a different search engine.

Grade Seven Student ST004

As long as you know what you're doing and where you're looking for it.

Grade Seven Student ST002

See I don't know that I can, but I think I can [trust a Web site]: if it's put on the Internet, they have to have some proof of it. Usually you see... the information over and over again – so if you see it over and over again, it's got to be true, unless 50,000 people are like lying.

Grade Seven Student ST003

You can tell sometimes by their name [of the Web site]...if it's good, and sometimes you just have to guess, sometimes it's just part of the process.

Grade Seven Student ST003

Sometimes you can go somewhere that you don't want to go and you didn't even know you're going there.

Grade Seven Student ST002

When you [search for a Web site], it's hard to stay on topic especially if all the Web sites you're going to aren't necessarily your topic.

Grade Seven Student ST003

Teacher Perspectives from Four Interviews

I think we've got to live with the fact that it's the computer age – we've got all of these tools – when we've got this many computers in the school, we've got Internet available – access to all the students – then we have to teach them to use it wisely.

Grade Seven Teacher T002

All of the teachers interviewed had classroom experiences using computers as tools for research on the Internet, and as tools for demonstrating understanding. When asked about using computers and the Internet in research projects, they all demonstrated excitement at the possibilities combined with a certain degree of discomfort. They felt that the ready

availability of information at the touch of a hand was a real benefit to their students. They mentioned the availability of up-to-date information and the attraction that computers and the Internet have for students, as well as the potential draw for students who are not always academic high-achievers.

I think the kids have learned to use the Internet the way I have – hit and miss.

Grade Seven Teacher T003

Although teachers were excited about the possible uses of the Internet for research, they also expressed some personal frustrations. The majority of teachers interviewed expressed concern about the amounts of extra time required to prepare for Internet research. They also expressed frustration at the times that they had attempted to use the Internet for student research projects and had numerous things go wrong with the computers, networks, or the consistent availability of Internet.

All four teachers mentioned how frustrating it is when they had not provided one or two prepared Web sites for the students, and the students were expected to use research skills to find information on the Internet. The teachers also mentioned that many Web sites draw students through use of hyperlinks that call out to the students (and teachers) to click them and see what is around the corner. Although the exploratory nature of the Internet is one of its major benefits, the ability of hyperlink to capture students' attention has caused some problems when teachers are attempting to have students accomplish a task in a timely and effective fashion. This difficulty has been likened to a student attempting to focus on schoolwork while friends are outside playing in the sun. The teachers expressed several concerns about students who, after working for some time, accomplished little or nothing. They noted that some students tend to seek visual information and to ignore sites that do not appear interesting or lack visual appeal at first glance, but are full of useful and relevant information.

Some teachers felt that students picked up Internet research skills as they went along by observing friends or receiving advice from them. If the technique they learned worked, students will not only often use the same technique again in unrelated situations, but will teach the technique to their friends, and so on.

One teacher mentioned difficulties with the physical reliability of the Web resources. A Web site may not be the same as it was yesterday, and it may not even be available. This creates problems when teachers attempt to check sources and watch for plagiarism.

I don't think grade sevens ask lot of critical questions about the sources – is this good information. is it valid information, where did it come from.... They go to a site and they believe it.
Grade Seven Teacher T003

The interviewed teachers felt that once students have found Internet sites that they think will answer their research questions, they no longer think critically about the authenticity of the sites, or about whether these sites are the best ones to answer their questions. All teachers interviewed expressed concerns regarding student lack of critical thinking when using Web resources. Teachers felt that students should be taught how to determine the validity of sites, the relevancy of sites to projects, and the appropriateness of sites to their research projects.

When provided the freedom to find their own sites during research projects, students often find or encounter commercial sites, or sites that are sponsored by individuals and organizations with specific agendas. Many students appear to have difficulty distinguishing educational sites from others, and are often lost as they hyperlink from site to site. The teachers mentioned that students do not know how to stay organized as they search and gather information. They claim that students will often simply start to copy information from the screen, or cut and paste materials from sites directly in to word processing documents. Students sometimes simply print the site pages as they find them, often printing far more than they need. As a result, the students are left with a mass of information to sift.

The teachers also noticed that once students have the information they think they need, they do not really know what to do with it. In many instances, students will simply rearrange the information they have found and present it, with very little evident intellectual engagement. These teachers claimed that the Internet has made it even easier

for students to plagiarize, and that this is a very large problem for them as they assess the results of research projects.

Selected quotations from interviews with four teachers about the role of the Internet in research projects.

Now that kids are able to access information from the Internet and use computers to build their projects, they're learning skills that will take them forward to the future.

Grade Seven Teacher T001

You can find anything on the Internet. So, as far as information, it's tremendous, but I think it has to be directed.

Grade Seven Teacher T002

I just really like the access kids have to up-to-date, world events. When you get into an encyclopedia, and it tells you the population of a country, and it's 1995 encyclopedia, well that's 7 years ago

Grade Seven Teacher T001

When I have used the Internet, [and have not] had enough time to research sites...they've wasted that class hour just trying to find a site.

Grade Seven Teacher T003

The part I don't like about computers is that I just don't spend enough time, or don't seem to have it, to do all the preplanning necessary to have an effective program.

Grade Seven Teacher T001

The thing that I find very upsetting for myself as a teacher is when a student asks me for help and I can't give it to them and there's no one available that I can turn to who's available right then and there... I feel if a student needs my assistance and I have the time to give them, then I should be able to provide the information they need. And when it comes to a skill like using the Internet, I think that would be very important.

Grade Seven Teacher T003

You have to put in a lot of time to make sure you know what sites the kids are going to, you have to have some type of control over how the research is going to happen.

Grade Seven Teacher T001

I was trying to save some Seattle Sea Hawk logos, and I'd go 'Oh, I wonder what's in here?' I look around for a while, next thing you know, I've spent ten to fifteen minutes just looking at the Sea Hawks schedule... 'I've got work to do. What am I doing?' There's a definite pull for kids to do that.

Grade Seven Teacher T001

Because they skip from site to site...I can almost guarantee you that 99 percent of [students] won't have anything down by the end of the class.

Grade Seven Teacher T002

[Internet research can be] frustrating because [students have] wasted that class hour just trying to find a site.

Grade Seven Teacher T003

[Students will] go into Yahoo and then just start to type words... and it could lead them anywhere... many of them look for visual things, but if you're looking for factual things, sometimes it's just all writing... It's too overwhelming... they'll spend all this time and not accomplish a thing.

Grade Seven Teacher T002

I think the frustration sometimes is when a student has marked down that they've used a certain site to get information and I go onto that site and I can't find it, so there's not a lot of stability in the system for follow through, from a teacher's point of view.

Grade Seven Teacher T003

We have to teach them how to screen information, how to look at what's going to be good for them, what's not biased, that's going to be factual enough that we know it's going to answer what they need to find out.

Grade Seven Teacher T002

[As] far as using the Internet goes, I have concern with authenticity of the resource.

Grade Seven Teacher T003

[Students] take things for granted – at face value – they don't look any further.

Grade Seven Teacher T004

They need the... time for training and for implementing the practices that they've learned. But I also think that they need more than that. They need to learn... proper note taking techniques, research on the Internet, what to do with the information once they've gathered it, how to put it together, identify and keep track of the resources that they've used, how to take information and use it to the best potential that they're able to use. I don't think that sometimes we always do that: I think that sometimes we try and find the easy way out.

Grade Seven Teacher T003

[Students] copy out information from the screen and it becomes very similar to having an encyclopedia in front of them and copying things out of the encyclopedia that they don't really understand.

Grade Seven Teacher T001

I think they lack the ability to know how to store information. I think they need to have a greater knowledge of how to create files and store files and sort information into files.

Grade Seven Teacher T001

I strongly feel it's important to teach the children time management.

Grade Seven Teacher T003

Personal Observations

The complexity of the computer network in the school where I conducted this study, and the nature of computers used in the school, requires that a person be on hand who can

help when computer problems occur. In the average class computer session, there will be more than a few computer problems or issues that students cannot handle themselves. Teachers find themselves racing around trying to put out technical fires that they do not feel qualified to handle. Almost every day, I walk into the computer lab and observe teachers moving from problem to problem, with several students slumped in their chairs with their hands up waiting for help. Although I consider myself to be ill qualified, I am the person who usually helps teachers and students with computer issues in the school. As I walk around I notice that the majority of the issues *are* technical...that the teacher is not coaching students toward successful completion of educational tasks, but is putting out "computer fires". Frustration builds because the teachers do not feel knowledgeable enough to complete computer tasks with students. It is a wonder that teachers are willing to put themselves through such discomfort for the benefits of integrating technology with other forms of instruction and learning.

For the past three years, in my role as teacher-librarian, I have observed students using the Internet as a research tool. On numerous occasions during the current academic year (2001 – 2002), I have watched students using the Internet for research. As a teacher of Grade Seven Information Technology, I have, during the course of this study, taught and observed over 150 students as they complete self-selected research projects that result in the construction of informative Web sites on their chosen topics. The students design their own research questions and focus on the various tools available on the Internet to complete the research. Students seek Web sites with search engines, directories and Web portals, check magazine databases, and use email to contact experts in their topic areas and to survey others in the school and beyond.

While instructing the students in the Information Technology Seven course, I have applied an action research process of trying, observing, reflecting and reading, planning, and trying again. By doing so, I have been able to observe certain trends and tendencies when grade seven students at our school do research on-line. The following points summarize my observations.

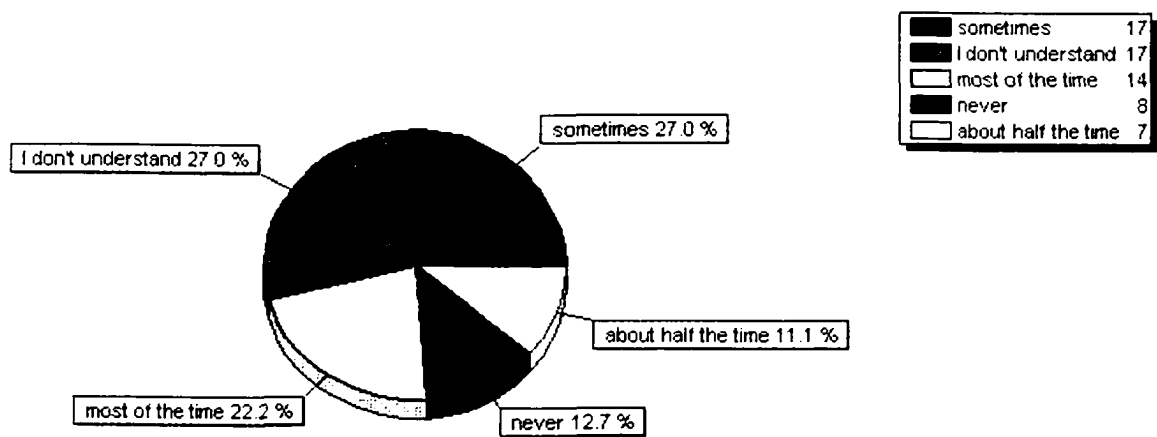
- When provided with a choice between books and the Internet for research project sources, the majority of the students will go immediately to the Internet.
- Students (just like many of their parents and teachers) learn Internet research techniques largely by trial and error and by watching or being instructed by peers, siblings, or other friends and family members. Once a student has found a technique, search engine, directory, or Web site that has been useful as a source of information for a certain topic, that student will return to that technique or site for different uses, regardless of its appropriateness for the new topic. For example, many students have come to rely on natural language search engines, such as AskJeeves™, for they are not required to think about what terms to use in the search engine, they simply ask entire questions. I have observed numerous students typing full sentence questions in to search engines that do not use natural language (the majority of search engines). These students then rely on the particular search engine's default handling of non-Boolean search strings. For example, AltaVista™ will treat spaces in a sentence as "AND" unless there are quotation marks around the sentence.

Students share the lessons they have learned through trial and error with others who are having difficulties in their searches. If the techniques transmitted by another student do not work in a situation...the student who is recipient of the instructional tip will usually not try it again in another situation. They will simply assume the tactic provided by the peer does not work.

- The majority of students find that their Internet research skills improve after being taught Boolean logic by a person they see as an authority (and Information Technology teachers are good examples of teachers who are viewed as "authorities"). This can be seen when students are taught to use the AND operator in search terms to limit the number of Web sites that will be returned. Of the 100 students who volunteered for the on-line survey reported above, 37 had just completed the Information Technology Seven class, and had been taught the use of the AND operator in searches.

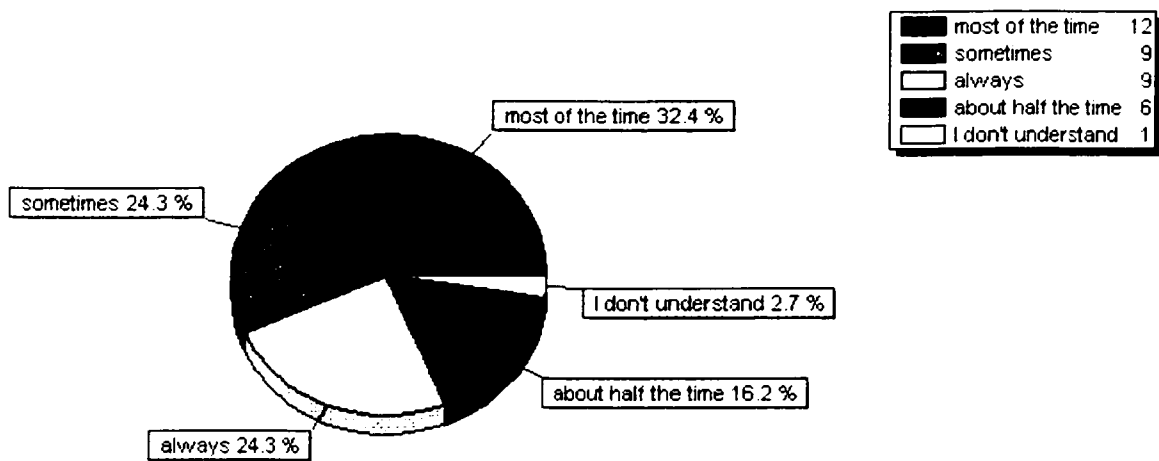
When the responses of the 63 students surveyed who were not in the Information Technology class are reviewed, almost 40 percent of the students either did not understand the question about the use of search term operators or stated that they had never used AND in an Internet search. Twenty-two percent of the students stated that they used AND most of the time. No students stated that they *always* use AND in searches. (Figure 4.15)

Figure 4.15 Student responses to the question, “When using a search engine for your research, do you ever limit the number of Web sites that are found by using AND to link two words?” **Non-Information Technology Students**



Results from the 37 students surveyed who had completed Information Technology Seven, revealed that almost 57 percent stated that they used AND terms in Internet searches all or most of the time. There were no students who stated that they never used AND, but one student stated that he or she did not understand the question. (Figure 4.16)

Figure 4.16 Student responses to the question, “When using a search engine for your research, do you ever limit the number of Web sites that are found by using AND to link two words? (Example Egypt AND mummies)” **Information Technology Students**



- There are almost as many techniques for seeking information on the Internet as there are students. The majority of students I observed do not plan their research strategies. Many students simply go to a search engine and type in some keywords or sentences. As mentioned in connection with the results of the on-line survey, a few students will seek to clarify research problems and then brainstorm some keywords to use in Internet searches. For example, in a discussion with an Information Technology student about his preferences for research start-up, he stated that when he knows little about a topic, his first choice is to go to an encyclopedia (electronic or print) for some basic “directing” information about the topic and for possible keywords and phrases he might use in an Internet search. However, in my experience, this student is an exception to the approaches taken by most students.
- Students have difficulty selecting Web sites that have the quality and quantity of information they need, are appropriate to their topic, and are at an appropriate reading level. As was mentioned by some of the teachers interviewed, students often skip sites that do not have visual appeal, regardless of the readability or the validity of the sites to the topics at hand. It is difficult for students to find useful sites that are specifically designed for middle school students. Although students

rely heavily on search engines to find sites on topics. search engines are not the best tools for returning "student-friendly" Web sites.

- The majority of students I observed saw the large number of sites returned from search engines as a good sign, an indication that they were on the right track. I seldom saw students trying to limit the number of Web sites that were returned to those that were more relevant to their topic, unless I had specifically taught the student to use Boolean Logic.
- I have noted that the majority of students do not attempt to determine the validity of the information published on the Internet. They do not typically check for currency, sponsorship, or bias. Students will usually steer away from highly informative sites that are published by respectable organizations in favor of visually attractive sites that may not be published by authoritative or reliable sources. I have observed students taking notes from Webs site that turned out to be published by other students. Student produced or supported sites may be good places to find links to more information, but are not authoritative primary sources.

Summary of Findings

Student Research Projects

Student Comments and Generalizations

The students interviewed and surveyed in this study had generally positive outlooks toward school research projects. They not only enjoyed the increased choice, independence, and personal creativity that research projects allowed, they also felt that research projects were good ways to learn, with more opportunities to study areas of interest in some depth, and were good breaks from classroom routines. Students also felt that research projects increased their "buy-in" to learning.

The majority of students viewed research projects as entailing finding facts on a topic, rewriting the facts in their own words, and presenting the findings. Students desired structure and concrete measures of success in research assignments, but not at the expense of interest, choice, or space for creativity. They agreed that they had difficulty

engaging in and enjoying research projects that they felt to be boring, that didn't seem to be important, or that simply required them to find facts and re-write them. They also did not enjoy or appreciate projects in which they felt rushed.

Students talked about several aspects of research projects that they felt contributed to making the experience successful and enjoyable. They felt that student choice increased their interest in a topic, improved the calibre of the learning, and improved the products of the research projects. Students talked about projects that were interesting, that were seen as important, that provided opportunities to explore and express their individuality, and that somehow linked them to the world outside the classroom or to other students. They stated that they were more engaged and learned more in research projects that were presented to them in ways that grabbed their interest.

Teacher Comments and Generalizations

All four interviewed teachers expressed a philosophical affinity toward research projects as an effective tool for learning. All have had great success with research projects as learning tools, but all also identified areas of concern.

The teachers in this study felt that making decisions based on information available is a competency that students will need throughout their lives. They felt that student research projects provided students practice not only in meaning making, but in working independently, working collaboratively with others, and time management. The teachers also felt that research projects allowed more student "buy-in" to learning, and that research projects placed more responsibility for learning on the students.

Discussing successful research projects, the teachers felt that when students collaborated with others on projects they were more apt to become involved in ways that are not normally available during regular classroom routines. Teachers felt that practice in team dynamics represented very valuable opportunities for students and was a necessary competency for the students' future lives. The teachers interviewed all seemed to enjoy the peer teaching and support that they witnessed and encouraged during group research projects. The teachers felt that providing students with choices of topics or presentation modes increased "buy-in" and provided more students with opportunities for success.

Teachers mentioned that the engagement of the students increased when the enthusiasm of teachers and/or the students was high.

When discussing note-taking strategies that worked well for them, and that helped avoid student plagiarism, two of the teachers interviewed mentioned the teaching tactic of *Weaving a Thought Cloth*, and using keywords and phrases from sources as very effective techniques. Both methods require students to put sources away before they make notes. The teachers were unanimous about the types of scenarios that keep research projects from being successful, and about some of the problems that can occasionally occur in research projects. Areas of concern included the externally driven need to rush through units of study, reducing opportunities for reflection and depth of understanding. Also mentioned were the limits on the availability of library resources and computer labs, reducing time available for research projects.

Teachers expressed their greatest disappointment about projects where students did not feel intellectual engagement or excitement, in which students did not have the time or resources available for successful engagement, where students completed topical studies that did not engage their critical thinking skills, and where it seemed as if students were simply “putting in time”.

Teachers felt frustrated when research projects were not as time-effective as other classroom activities, and where student learning was questionable. Although all the teachers interviewed liked team research projects, they were occasionally disappointed with students who let their peers do the work and made few if any contributions to the team effort. I have also observed some of the problems that can occur with group research projects, such as unequal allocation or sharing of quantity and quality of work among team members, and the tendency of some groups to waste time in irrelevant socializing.

The teachers in this study all felt, with varying levels of intensity, that the processes of note taking, meaning-making, synthesizing, and using research information were areas of frustration for them. Teachers felt that the majority of students did not know how to take notes effectively, with many students choosing to copy material directly from their

information sources. I have also observed students engaged in topical research projects, taking notes from their sources and conversing with friends at the same time. There appears to be little engagement when students simply gather information without having to think about it.

Internet-Based Research

Student Comments and Generalizations

The student survey results and interviews showed that all students use the Internet for research and that most feel it is a good source of information. The majority of students feel they can find useful information on the Internet quickly and efficiently (although this does not correspond with teacher observations). The Internet is the first place most students will go to for research information.

The majority of students surveyed felt that the Internet was as reliable as a source for information as were books, and many students preferred to use the Internet for research. Students who preferred the Internet mentioned convenience, speed, and currency as reasons for their preference. Many students appear to have difficulty gauging the accuracy of Web sites, relying on their instincts and previous topic knowledge. A great majority of students were frustrated by the large numbers of Web sites that search engines bring up, and do not really know what to do about this. The interviews with students revealed that each interviewee had different approaches to searching for information on the Internet. They learned their Internet research approaches largely by trial and error and from their peers.

Teachers Comments and Generalizations

Although the teachers interviewed for this study were excited about the possible uses of the Internet for research and learning, they expressed some frustrations about how they and their students approached the Internet as a research tool. Teachers who were trying to integrate computer/Internet technology with other subject curricula were often frustrated by computer and network glitches, the large quantities of time needed to prepare projects that included working with the Internet, and the lack of ready technical support.

The teachers talked about the inability of a majority of students to find useful information on the Internet, and mentioned the tendency of students simply to *wander* through the Web. Some teachers felt that students learned Internet research techniques by trial and error, and hearsay. All the teachers interviewed expressed concerns about students' lack of critical thinking when finding Web resources, or using information found on the Internet to *make meaning*. Teachers noticed that the Internet has made it even easier for students to plagiarize, and that this is a very large problem in research projects.

Personal Observations Concerning Internet-Based Research

The complex and often technical nature of computers, school computer networks, and the Internet requires that an experienced person be on hand to assist teachers when problems occur. My observations of students engaged in Internet research have revealed that students often learn Internet research techniques by trial and error and hearsay.

Additionally, after being taught and trying the use of Boolean logic search terms and operators, the majority of students find that their Internet research skills improve and they add Boolean logic to their kits of Internet research tools. The majority of students observed do not plan their research. Students often have difficulty selecting Web sites that have the quality and quantity of information that they need, that are appropriate to their topic, and are at an appropriate reading level. Moreover, students seldom try to limit the number of Web sites that are returned to those that are most relevant to their research topics.

Conclusions

The literature in the field of digital information literacy reviewed is unanimous in the view that "literacy is no longer simply a matter of learning to read, write, and calculate. It is a matter of knowing how to critically examine and creatively use information."

(British Columbia Ministry of Education, 1995, p. 3) The increase in "...uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively."

(Association of College and Research Libraries, 2001, p. 16)

This study found that research projects are a valuable tool for learning and that they provide opportunities for student-directed learning, collaboration and peer teaching, critical thinking, and creativity, while fostering increased enthusiasm and information literacy skills.

Commentators and educators from this study have expressed concerns with research projects that do not engage the critical minds of students whether during inception of the research, or in the process of finding and gathering information. Concerns have also been expressed about the degree to which “meaning-making” occurs and about the abilities of students to critically evaluate Internet sources. Concerns are regularly raised about the growth of plagiarism and educational practitioners sometimes wonder if students are obtaining value from their research endeavors.

The findings of this study and from the literature identify areas of intervention that could enhance the educational effectiveness of research projects and improve students’ digital information literacy. The following points summarize these.

- There is a need to develop structured models of the research process that can be easily transferred to individual situations. These models might include:
 - Questioning techniques that engage student critical thinking;
 - Planning strategies;
 - Gathering strategies;
 - Sorting and sifting strategies;
 - Synthesis strategies;
 - Reporting strategies;
 - Metacognitive strategies.
- Research should be focused around critical challenges to inspire thinking and creative problem solving, in contrast with the traditional methods of research that have students simply gather information, organize findings, and present information.
- Note taking structures and methods that make it difficult for students to plagiarize the ideas and words of others should be devised and implemented. Students should be taught, and develop through practice, an understanding of the ethics of information use.

- Students should be taught processes for the critical evaluation of sources.
- Students should be taught methods and processes for synthesizing information and meaning-making.

The above areas of intervention that could enhance the educational effectiveness of research projects and improve students' digital information literacy were used to formulate the study recommendations found in Chapter Five.

Chapter Five – Research Implications

Study Recommendations

Recommendations from this study are intended for districts or schools seeking to develop or refine policies and practices concerning student digital information literacy; specifically, the use of research projects and the Internet for research by students and teachers, and the roles of teacher-librarians in the process of implementation.

Study Recommendation #1 – Critical Challenges in Research Projects

Schools can help students become more information literate by letting go of the topical research project and agreeing to embrace research projects that have a large critical challenge component. If teachers are to effectively utilize the time afforded them to educate students, they must release the notion that when students are “on-task”, they are automatically learning what is intended. Topical research projects, such as *country projects* and *ancient civilization projects* that have students gather as much information as possible about their topics, may appear to be beneficial, but precious time would be better utilized if students were “pushed” to develop critical thinking strategies that would help them to solve problems and answer questions through research processes applied in a range of scenarios and contexts. Whether teachers provide students with opportunities to develop McKenzie’s (2000) “essential questions”, or follow the scaffolded research processes and approaches profiled in *WebQuests* and the *Big6* model, students would attain greater benefits for time “on-task” if they were intensely challenged during the research process. Once an educator embraces the concept of critical challenges in research projects, it is hard to return to having students mindlessly gathering and rearranging information.

Study Recommendation #2 – Collaboration Between Teachers and Teacher-Librarians

The percentage of time available for collaboration between teacher-librarians and teachers differs widely from school district to district, but most agree that the majority of a teacher-librarian’s time should be spent in collaborative ventures.

Teacher-librarians are school experts in information literacy. They are also more than likely school specialists in digital information literacy. Commentators on information literacy all seem to agree about the importance of teachers collaborating with teacher-librarians in research endeavors. Teacher-librarians stay current regarding information literacy standards, information literacy structures and approaches, and resource availability on topics. It is teacher-librarians who can push for unified approaches in school student research endeavors and encourage the use of critical challenges. Teacher-librarians can provide structures for teaching the research process and strategies for note taking, source evaluation, and synthesis. Teacher-librarians are responsible for teaching students information literacy and sharing tools with teachers. Teachers have “enough on their plates” without having to be information literacy specialists.

School districts and administrators who strongly believe in the power of collaborative teaching should provide release time for teacher-librarians, to free them from the day-to-day functioning of the school library, so that they can meet and work with teachers in their roles as information literacy experts.

Study Recommendation #3 – Schools Should Adopt a Consistent Philosophy or Model for Student Research Projects.

Schools which select and agree on a model for “typical” research projects can increase consistency of expectations between different teachers, classes and grade levels, and enhance the transfer of information literacy skills and competencies to individual scenarios and situations. This consistency also entails providing clear expectations and structures for the avoidance of plagiarism, instructions in effective note taking, and methods of source evaluation.

It is immaterial whether a school selects the *Big6* (1985) research model, McKenzie’s *Research Cycle* (2000), other tried and proven research models, or creates one of its own in collaboration with teachers and teacher-librarians. Whichever research model is adopted or created, it should include the following:

- It should ensure research projects have a large critical challenge or problem-solving component:

- It should provide some structure with regard to research planning:
- It should provide structures for efficient gathering of relevant information, whether the material is provided or search strategies are taught and utilized:
- It should provide structures to support the thoughtful organization of material:
- It should provide strategies for the synthesis of research information:
- It should include a philosophy about the reporting of findings (with persuasive reporting a natural result of a critical challenge or problem-solving scenario):
- It should include an evaluative component that has students think about what has been learned and what is yet to be learned.

With the prevalence of research projects as learning tools, it would not be unreasonable to have schools take time to make some decisions regarding the model that is most appropriate for them. With the help of a teacher-librarian, conversations around information literacy can reveal the philosophies of individual school staff members, so that a model can be chosen that fits the teaching styles of the staff. Models can also be adjusted on an individual basis to reflect individual teaching styles during collaboration with teacher-librarians.

It is important to caution that research models, although adopted by schools, should not replace dynamic research ideas that already have a strong critical challenge component. John Ringstead (unpublished data, 1991) developed a unique and dynamic approach to research about Ancient Rome. His research project has been adopted and adapted by several teachers. His approach is to provide students with a list of items that they must prove the Ancient Romans did or did not have or use. Adaptations to the approach have students write down quotations from sources that appear to prove their points, organize their findings into categories, make the categories into general statements (such as: "The Ancient Romans were very hygienic."), combine general statements into one "over-riding" statement (such as "The Ancient Romans were an advanced civilization."), and create a persuasive essay to present their findings in an organized manner, weaving quotations into their writing to help prove the statements they make.

Ringstead's type of research project has a built-in critical dynamic that might be lost if it were forced to conform with a very different general research model adopted by a school. The chosen research model is primarily adopted to replace traditional (topical) research and to provide consistent expectations and structure, not to hamper the creativity of teachers.

Study Recommendation #4 – An Adopted Research Project Model Should be Easy to Access

Although the most powerful way for students to receive instruction in the competencies required for successful use of a research project model is through collaborative endeavors with teacher-librarians, a readily accessible structure must be in place to support students and teachers in every step of the process.

Teachers and students would benefit greatly by having a readily available tool that assists and supports them in every step of the research process. I have begun to create such a tool, based primarily on Jamie McKenzie's *Research Cycle* (2000), and have placed it on my school's Internet pages (see Appendix B), because it is here that students tend to go first when undertaking research projects. On this Web site the research process is described in detail, with examples provided for every step. The breakdown of the Web site is described below.

1. A section that describes research projects in general and compares the concepts of a critical challenge with topical research (see Appendix B):
2. Another section of the site is designed to take students through every step of a research process. Each step stands alone, and can be used by teachers and students at the appropriate phase of the research process (see Appendix B for the complete Web site).
 - a. **Step 1: Arriving at a Research Question.** Students use their personal interests to design an "essential question" for research. This step provides a link to examples of essential questions. Most teachers will not use this

step, as they will be providing the research challenges based on particular areas of curricular content.

- b. Step 2: Planning the Research. Students:
 - i. Brainstorm “leading questions” (questions that *lead* them toward answers to their essential questions – leading questions are my way of simplifying the myriad type of subsidiary questions presented by McKenzie). The Web site includes a link to a “leading questions chart”, which acts as an organizer for the gathering phase of the research. (See Appendix B)
 - ii. Brainstorm key words and phrases that might be used to find information that answers their leading questions. This section has a link to a thesaurus and an online encyclopedia for vocabulary and ideas to enrich the search.
 - iii. Brainstorm some possible general sources for information. This section asks “Is this the type of research question that can be answered with the help of the opinion others: experts in the field: or videos: or Web sources...?”
- c. Step 3: Finding the Sources. This section is broken down into two areas:
 - i. Step 3a teaches students to use Boolean Operators in their searches for sources:
 - ii. Step 3b contains links to and descriptions of several possible Internet sources of information, including: search engines, Web directories, educational Web portals, “Ask an Expert” sites, and the school’s subscription to magazine and journal articles. It is in this step that students begin to evaluate sources using the school’s Web site evaluation form (See Appendix D).

- d. **Step 4: Interviews and Surveys.** This section of the site has the students (who have research questions that might benefit from it) develop interview or survey questions, guides students through questioning strategies, discusses the ethics and methods of questioning others, and helps them to organize and synthesize information obtained.
- e. **Step 5: Note Taking.** This section of the site has students read about the nature of plagiarism and provides a note taking strategy that is meant to help them avoid plagiarism. This section provides a downloadable digital note taking form and a downloadable example note taking form, shows how to deal with quotations, and includes information on citing sources (APA format). (See Appendix B and D)
- f. **Step 6: Synthesis.** This section provides a simple guide to help students make sense of information gathered and asks them to address the question: "Have you answered your essential question, or do you need to find more information?"
- g. **Step 7: Reporting.** This phase of the site provides students with some ideas about different strategies to present findings.

Study Recommendation #5 – There Should be Regular In-Service Programs for the Staff Regarding the School’s Adopted Research Model.

If a school is to maintain momentum and perspective by adopting a commonly agreed upon research approach, fresh ideas must be in constant supply. Once a staff adopts a research model, continuous improvement should be encouraged. Although continuous improvement can be achieved by the sharing of experiences among teachers, and by the dynamic influence of the teacher-librarian, it is strongly recommended that staff members (or the teacher-librarian) provide regular in-service on various aspects of the research process that fit the adopted model. In-service can be provided very inexpensively by other teacher-librarians and Information Technology specialists in the school district.

Study Recommendation #6 -- Schools Should Adopt a Universal Note Taking Strategy.

Students would benefit greatly if they were well acquainted with one or two effective methods of note taking and had sufficient practice with these methods to have natural transfer among different subjects, classes and grade levels. The development of a consistent note taking strategy by a school provides consistency throughout students' careers in the school, provides support to teachers as they compare experiences and continue to work together to improve the strategies, and does not require every teacher to develop and/or teach their own strategies of note taking.

I am attempting to have two note taking strategies adopted by the teachers in the school where this study was conducted. They can be used in various situations. The models proposed are described below.

1. Sandra Kirby and Kate McKenna, in *Experience, Research, Social Change: Methods from the Margins* (1989), discuss the concepts of the library as a "playground for the mind" and the notion of research as creation of a "thought cloth". Blending their ideas with my own, I have developed a strategy, I call: *Weaving a Thought Cloth* (from Kirby and McKenna), where middle school students in the process of research do not take notes while reading material. The information gathering session begins with 20 minutes of silent reading of source material. Students must extract meaning from the material, but without writing any notes. Silent reading is followed by 10 to 15 minutes of silent writing, where the information sources are not present. The students write their understanding of the material in any form that works best for them. The silent writing session is then followed by small (like topic) group discussions, where students help each other fill in the holes in logic and understanding, and where students are allowed to take notes. These conversations are where the understanding of students is made transparent, and students work collaboratively to help each other make meaning. (See Appendix C)

Many students initially have some difficulty in not being allowed to take notes while reading, and have to adjust to the intense focus necessary when they are reading something and have to remember the important points. Practice in the process expands the students' ability to sift and sort information as it is being read, and to remember details with more lucidity.

Weaving a Thought Cloth works especially well in jigsaw style team research processes, where "like-topic" students meet to share information, but it can also work well in individual research projects, reducing student uncertainty and increasing topic understanding. Because the time on gathering is intensified (students cannot have unrelated conversations while note taking), the time required for research is reduced considerably (as long as pre-selection of material is effective).

2. The second note taking strategy can be downloaded from the school's Web site and requires less teacher control than *Weaving a Thought Cloth*. This strategy, which has been developed as an evolutionary process and cannot be ascribed to a single creator, was developed after numerous conversations with Lisa Chase (Humanities and Journalism teacher). I have designed a downloadable note taking form that allows students to write only keywords and phrases while reading source material. Students can then remove themselves from the source and use their keywords and phrases as reminders while they write paragraphs expressing their understanding of the material.

This note taking process can be taught to students in two sessions, where they learn how to use it and practice. Although it requires less direct teacher control than *Weaving a Thought Cloth*, therefore making it more transferable to individual situations, it requires some teacher intervention, because some students revert to old habits by copying directly from sources. One way to alleviate this problem is to separate the keyword and phrase sections of the note taking form from the student note section. This note taking form does not yet have a means of differentiating original thinking from the thinking of the source authors. McKenzie (2000)

recommends using a different colour of ink for original student thinking. Although this note taking system is incomplete, it is now being used by teachers in the school who are finding it very useful. (Appendix C)

The two note taking systems described above are imperfect, but they are a beginning. Both can help teachers eliminate plagiarism and increase topic understanding. A school may wish to look at other systems of note taking for other types of situations, such as Ringstead's approach discussed in Recommendation # 4 above. Regular conversations among staff are important in revealing individual values and experiences, and improving systems as needed. The adopted note taking processes should not be seen by teachers as limitations; rather, by agreeing on a few effective note taking systems, teachers can help to free themselves from instructing (or not instructing) students with their own system of note taking. Teachers can rely on the teacher-librarian or other information literacy specialists to research the best note taking systems and adjust them to the needs of the staff.

Study Recommendation #7 – Schools Should Adopt Universal Commonly Agreed Upon Formats for Web Site Evaluation.

Students would benefit by having schools adopt a common Web site evaluation strategy or format. If a staff can agree on a format for Web site evaluation that fits all of their needs, or can work together to create one that generally fits their notions about critical assessment of information sources, then they and their students would benefit from the consistency. A common Web site evaluation tool can result in teachers not teaching different systems and confusing students with myriad formats, while possibly adding to student resistance to the critical analysis of sources. A single format for Web site evaluation may increase transfer, as students hone critical evaluation skills through repetition.

After reviewing ten formats for use by students to evaluate Web sites, I have developed a Web site evaluation form that allows students to make quick evaluations using a brief questionnaire on which they grade the usefulness of a site. Students can evaluate five sites on one form, and can copy and paste the site URLs onto a downloadable document

for quick evaluation. The only thing students are required to write on the document is the overall grade that they give to a Web site. The overall grade is selected by adding the number of times the student answered: "yes" to the questions on the questionnaire. The form is simple to use and makes "grading" sites feel less arbitrary. (See Appendix D)

Study Recommendation #8 – Schools Should Adopt a Common Method for the Citation of Sources.

Students are often taught several citation methods during their school career. If districts are unable to select one method for use by everyone in the district, then schools should select a consistent method for their students.

It is frustrating for students to learn a different citation method from each of their teachers as they progress through school. Many students, as observed by the teachers interviewed in this study, will not automatically provide credit for the work of others. At the Grade Seven level, students should already understand that quoting or referencing the work of others requires a provision of credit; yet, few students cite their sources unless required to do so.

A unified citation method with clear expectations for citing the ideas of others would benefit the students and teachers in many ways. A consistent method would increase the probability of transfer from class to class, year to year. Referencing and citing sources will become a habit – just something that one does as an integral part of research. Teachers will not need to teach referencing and citing each year, while students will view referencing their sources as a natural part of any research project.

Adopting a standard citation method may also be a step toward increasing understanding among students about concepts of the ownership of information, or intellectual property, and what they can and cannot use in their work – an area currently of great concern for many commentators and educators.

Organization and Implementation

School District # 71 (Comox Valley) has continuously increased the number of computers in and associated with school libraries. Some libraries now incorporate class

sets of computers and attached computer labs. Access to the Internet in the school district is universal. The school district has also placed special value on the work that teacher-librarians are doing to integrate the use of computers into other curricular areas through collaborative ventures. Thus, the juxtaposition of computers and Internet access points with school libraries is a logical policy.

As more and more students and teachers use computers in their research endeavors, there is greater need for effective and efficient use of the technology. But in inquiring into the nature of effective research on the Internet, I must step back from the question: "Are computers being used effectively in student research projects?" and ask: "Are the research projects an effective way to learn?" In doing this it is my intention to focus not on technology and Internet access, Web sites, servers, and the other technical issues that often dominate discussions about school use of computers, but on more basic educational questions. Another way to consider this is to state that poorly conceived and badly executed student research projects will not be improved or made more educationally significant merely because the research is conducted with computers and the Internet as opposed to conventional print resources. If it wasn't worth doing, it wasn't worth doing with high technology either.

Many teachers are seeking effective constructivist teaching methods in order to foster greater student understanding. This has made research projects more and more popular among teachers. Middle school students may complete several research projects in a single year. If research projects are to be utilized so often in schools, then it is of grave importance to ask whether the students are learning from research projects what teachers hope they are learning from them. Student time at school is limited and precious...are we making the best use of it? A school or school district focusing on means of enhancing the digital information literacy of students as an integral element of the total educational program may benefit from the following advice concerning the roles of research projects, school libraries, and teacher-librarians in the overall process.

The Power of Conversation

In her review of the literature about barriers to the integration of technology with curricular areas, Patricia Hiebert (2000) discusses the lack of time available to talk to other teachers. Senge (2000) identifies five characteristics that move organizations to the sustainable enhancement of capacity. Three of these important elements of capacity enhancement in organizations involve the development of teams and the unearthing of personal views, and are described by Senge as: (1) "mental models" (p. 66), the ingrained assumptions that we have about the world and that effect our behaviour; (2) "shared vision" (p. 71), the organizational image of the future that each member of the team shares and to which he/she is committed; and (3) "team learning" (p. 73), teams design and implement the learning that members feel will bring them to their goals.

Williams (1996) discusses the ideas of Dr. David Cooperrider, of Case Western Reserve University, who developed a means of aligning the various aspects and directional pulls of an organization through an approach Cooperrider calls *Appreciative Inquiry*: "...an inquiry into the hopes, dreams and visions..." of the individuals in the organization (Williams, 1996, p. 43). By encouraging individuals in an organization to tell stories about "positive and significant events during their careers" (p. 45), or share observations of the positive effects of certain practices, the members of the organization are naturally creating a vision of what they would like to experience again...or a potential vision of the future. In telling their stories, individuals are also making their values and mental models apparent to the other members of the organization. Appreciative inquiry also has the fringe benefit of focusing the members of an organization on successful events and practices, and helping to provide a positive emotional base with which to build new directions for the organization. The premise of appreciative inquiry is that organizational changes based on the values and vision of the members of the organization, have a greater chance of being sustained. Appreciative inquiry is clearly linked conceptually with Senge's views of the importance of team learning and the significance of mental models in the overall process of organizational development and change.

Often, informal conversation between teaching staff is not viewed as professional or staff development. The potential power of conversation is ignored as a means of learning

when school staffs decide what to do during Professional Development days or when in-service training is provided to staff on various topics and concepts. It is common for teachers to become excited about educational strategies or methods that will benefit their students, but without follow-up and a sense of a community sharing the experience, even the best ideas and practices “fall by the wayside”. New methods and approaches that require teachers to give up or modify current practices sometimes inspire, but frequently demand additional work. It is difficult for teachers to sustain extra initiatives and effort in a culture of isolation and without team or community support. When teachers fail to implement new practices they are often afflicted with a sense of guilt or personal failure. In-service or professional development workshops would likely be more effective for a group or school staff that was already working toward common goals and invited or developed the in-service program to develop the skills and understanding necessary to attain its goals.

Successful implementation of the recommendations of this study could begin with formal and informal *Appreciative Inquiry* conversations regarding digital information literacy. The goals of these conversations are to reveal a staff’s collective vision, and to make the mental models of the individual members of a staff evident. Conversations and story telling can be easy ways to reveal personal preferences, concepts, definitions, and hopes. When teachers discuss ideas and practices that have worked for them they become animated and excited, inspiring others with personal stories of their experiences. The stories offer different perspectives that can open minds. Teachers feel valued for their experiences. When teachers discuss successful student research projects, they are naturally reflecting on and creating understanding of why the projects worked. In the process, they solidify their own understandings of the elements that made the research projects effective.

Conversations among educators about what works in their practice combined with the natural desire to improve, work to develop and improve teachers’ practices from the inside out. Initiating changes by beginning with what teachers are currently doing, or with what they are observing and hearing from colleagues, creates a continuous cycle of

improvement in practice. This is much like the cycle of *action research*. Professional development becomes teacher driven.

For successful implementation of the recommendations of this project, there must be staff members in a school who wish to improve the digital information literacy competencies of students, and who wish to improve student critical thinking by designing research projects around critical challenges. By creating time and opportunities for conversations, teachers can show each other examples of research projects that use critical challenges. Discussion can then ensue regarding the power of critical thinking inherent in some projects, and the preconditions, including teacher skill development, organizational structures, and resources needed to successfully conduct such projects with students. When teachers are allowed time to look collaboratively at what has worked in the past they are creating or inventing their future.

Dialogue about digital information literacy will quickly gain momentum if championed by a staff member. Teacher-librarians are the natural instigators of these conversations in schools. Teacher-librarians can look into the various ideas and philosophies and present their findings to the group as a means of initiating further conversations. These conversations are not meant to teach or instruct, but rather to make the values and views of various staff members about information literacy more apparent. As a consequence of this improved collective understanding of concepts such as information literacy or critical challenges in research projects, there is a greater chance of success in making sustainable changes in teacher practice.

In short, my view is that the changes needed to make technical innovations, such as networked school computer labs, school Internet gateways, and high-speed connections to the Internet, educationally powerful and effective are not technological but organizational. It is necessary for those who are expected to implement and sustain the educational changes required by these technical innovations to develop their own understandings of the possibilities and implications. It is also necessary for schools to engage in acts of learning at an organizational level. Making time for focused conversations and dialogue is an essential element of the process of organizational

learning. Teacher-librarians can play important roles as facilitators of these staff conversations and collaborative knowledge construction processes.

Collaborative Endeavors

Teachers should not be expected to be specialists in information literacy. An excellent way to teach students powerful digital information literacy strategies is through partnerships between teachers and teacher-librarians. The organization of a teacher-librarian's time, if freed from the day-to-day functioning of the library, usually allows for much of the day to be spent in collaborative ventures with teachers. This creates a unique opportunity for teacher-librarians to work with teachers in integrated units of study. If teacher-librarians are allowed to work in this manner with all students and teachers in the school, then consistency is ensured in digital information strategies and approaches. While teaching students information literacy competencies, teacher-librarians also teach teachers, creating an information literacy momentum as teachers weave their new learning into current practices. However, this can only happen if teacher-librarians are not expected to be library clerks doing filing and cataloging tasks and checking out books to students, or maintaining school computer networks and servers and acting as in-house computer technicians.

A School Library Web Resource as a Powerful Support for Effective Research Projects

A well-designed School Web site resource can help support consistency of research practices throughout a school and improve the chances of transfer of digital information literacy competencies from class to class, year to year. By providing on-line consistent and effective research tools, tutorials, strategies for planning, note taking, writing, citing and synthesis, a Web-based school resource places the digital information literacy tools taught in classrooms at the fingertips of the students and teachers. Students, working at home or at school, can access the Web site resource for assistance in planning research projects, to access links to databases and on-line experts, to download templates for effective note taking or Web site evaluation forms, to view examples of other students' leading questions or keywords used in searches, to find out how to limit Internet searches

with Boolean logic, to link to educational Web portals, to find out how to cite sources, or even to view exemplary work of other students in the school.

These ideas only scratch the surface of the potential for use of the school Web site as a support for the consistent development of school-wide information literacy. A problem faced by most schools is the time it takes to produce and maintain an effective school Web portal. Information Technology teachers produce the majority of school Web sites, with Library pages often produced by teacher-librarians (or by Information Technology specialists for teacher-librarians). To be effective and useful, the library Web sites must be continuously developed and maintained. The development and maintenance of school Web resources is a fairly new and often voluntary addition to responsibilities of the majority of teacher/Web authors. Almost all of the work on school Web sites occurs on teachers' personal time and is performed in addition to their existing responsibilities of preparing and evaluating lessons and activities. Hence, while the potential of school Web sites as supports for information literacy is great, there should be more attention paid to developing staffing and assignment policies that permit teachers to devote more time to the development and maintenance of school Web sites as a regular teaching responsibility.

Directions for Future Research

Although the data collected from teachers for this study reflects work with middle school students in Grades Seven, Eight, and Nine, the data collected from students, in the form of interviews and surveys was limited to Grade Seven students. Typical middle schools include students from Grades Six, Seven, and Eight, or students in grades Seven, Eight, and Nine. The developmental differences between Grade Six students and Grade Nine students are quite large. Research into the different needs of the various age groups of middle school students might lead to a better understanding of students' capabilities and potential for handling critical challenges at different age levels and developmental stages.

This study, and the results of my continued action research, initiated the further development of the use of critical challenges in student research projects at our school, as well as development of an Information Technology program that includes a major focus

on digital information literacy, and a Web-based resource designed to assist students and teachers in the research process. All of these developments are in their infancy. There is still much need for continued action research to further develop the school's approach to developing digital information literacy as an overarching school goal.

McClaren (2001) defines...

...cognitive process instruction [as] teaching people about their own learning and helping them become effective, self-regulated learners. It entails learning a set of skills: how to chunk information, how to use frames or tables to organize information and make relationships evident, how to use mnemonics, how to use metaphors to bridge from the familiar to the less familiar, how to make concept maps, how to use imagery, etc. (McClaren, personal correspondence, August 2, 2001)

Although some cognitive processing strategies are demonstrated in the school's Web site, they are simply offered as a "follow the dotted line" sequence of activities. Further work in this area might include the teaching of cognitive processing strategies to students, who learn to decide where best to use the strategies in their research endeavors (rather than following teacher-created, lock-step structures).

Chapter Six – Lessons Learned from the Research Project

The conduct of this inquiry reflects the cycle of *action research*, being that of plan, act, reflect, plan, act,.... The study taught me to not worry about “finishing”: not to rush to solutions or conclusions that are more than likely “fluid” anyway.

In its original inception, this inquiry was to be about the integration of the Internet into various middle school subject curricula. In that form, it would have investigated numerous aspects of the potential of Internet use in schools, from discussion groups to fully interactive Internet activities. This approach was abandoned as too broad. Each of the various possibilities could benefit from an inquiry having that particular focus. As a teacher-librarian observing student and teacher uses of the school library and computer labs, I noted that almost all teachers had students working on research projects. I also noted that a growing number of students used the Internet for their research and that teachers expected they would do so. On the basis of these observations, I decided to focus the project on the use of the Internet in student research endeavors.

In correspondences with my project supervisor, Dr. Milton McClaren, I began to formulate a deeper question for my inquiry. In helping me to further define my inquiry, Dr. McClaren wrote:

Since student behaviour, as researchers, is the focus of your work, it is always important to first see the problem from the subjects' eyes out. In other words, why do STUDENTS (author's emphasis) think they are asked to do 'research' in school in the first place—is it just an exercise, a way of filling time, or does it have other purposes and values for them?
(McClaren, personal correspondence, August 8, 2001)

As I inquired further into Dr. McClaren's thoughts on the use of the Internet in research projects, he responded:

I suspect the problem with teachers' use of the Internet, and with students' use of it as well, is that the current system is moving more and more toward

covering stuff without really paying attention to the creation of meaning and understanding. As long as we subscribe to the coverage metaphor, this won't change. (McClaren, personal correspondence, August 21, 2001)

Further conversations with Dr. McClaren about the purpose of research projects, made me take a step back from my inquiry and ask about the general effectiveness of research projects as learning tools, as well as the positive and negative experiences of students and teachers in their research endeavors. Although the question of how to improve student and teacher use of the Internet in research projects was of significant interest to me, I found I could no longer look at just the *gathering* phase of research, but needed to look at the whole process in order to understand sustainable improvement.

As I sought and reviewed additional literature on the topic of information literacy, it became apparent that I needed to look at the reasons for asking students to do research projects in school: what do students learn from research projects? I included questions in my student survey, as well as my interviews with students and teachers, in order to attempt to make their thoughts and values about the research process, its benefits, and its drawbacks apparent. Although I feel that my understanding of the need for research projects in schools was significantly increased, and I was delighted at the positive correlations between the literature reviewed and my study findings, I believe that I have only scratched the surface. Our understanding of student and teacher views and attitudes about research projects and information literacy would benefit from further research. What is also becoming apparent is that this action research project is continuous and does not stop with the completion of this report.

MALT Program Lessons Learned

Self-Evaluation of MALT Program Competencies Attained Through Completion of this Project

1c. Provide leadership

During this project, I have sparked the interest of several teachers on the staff of the school where I teach. I have tried to demonstrate the potential for dynamic research

projects that fully engage students in critical challenges and teach various digital information literacy competencies. During the five months in which this inquiry was conducted, I have worked collaboratively with six teachers to develop and implement highly successful student research projects.

2b. Apply systems thinking to the solution of leadership and learning problems

I used systems thinking and systems diagrams in the pattern defined by Peter Senge (1990) to help deepen my understanding of relationships and dynamics that limit development of the use of the Internet in learning, as well as the aspects that must be in place to create sustainable improvement in teacher practice. (See *Potential Causes of the Problem* on page 7 of this report, and *Organizational Implementation* on page 115)

5a. Identify, locate and evaluate research findings.

Although I conducted an extensive review of literature both in conventional print form and on the Internet, I felt that my review of the literature was far from complete. The quantitative vastness of the literature available in the field of digital information literacy made it difficult to select the most prominent commentators.

My inquiry approach included a survey of 100 grade seven students, interviews of four students and four teachers, as well as personal observations. These sources provided a rich depth of information. The various approaches to the inquiry permitted a triangulation among different sources of data. The positive correlation between the findings of this study and those of sources in the literature was reassuring. All data gathering approaches involved data categorization into themes and comparison between approaches. Synthesis of data was followed by an evaluation of the relevance and importance of the data to the research question, summaries of the synthesized data, and recommendations made based on the findings.

5b. Use research methods to solve problems

Qualitative and quantitative methods were used to determine student attitudes, experiences and competencies with digital information literacy, as well as teacher

experiences with the use and development of research projects as tools for learning. The number of methods used in the inquiry increased the probability that information gathered was valid. Information gathered from the inquiry was used to develop recommendations that are applicable at both the school and school district levels. They should be useful to districts or schools seeking to develop or refine policies and practices concerning the use of the Internet by students and teachers and the roles of teacher-librarians.

7b. Communicate with others through writing

This project report is comprehensive and provides for some variety of audience through the use of visual objects, such as diagrams and graphs, which help make the information more accessible to a larger readership. Completion of the project required that I use several forms of communication, including e-mail, file transfer protocol, an on-line survey instrument, and develop a written proposal for district officials. It was also necessary for me to explain the purposes of the project to my professional colleagues, and to students and parents. This was done both in written and verbal communications.

I experienced some difficulty in creating the school Web site resource as a guide for student research. The language I use tends to be more advanced than that of the average Grade Seven student. Also, presentation formats for the Information Technology Web resource, which guide the research process, are not attractive to Grade Seven students because they are purely functional rather than visual.

4a. Assess the implications of the learning environment and best practices from other organizations for application during the project.

The focus of this inquiry was an assessment of the needs of students and teachers so that recommendations might be made to improve teacher practice and student learning. The literature review focused on obtaining information about best practices for the development of digital information literacy. An *action research* cycle led to the implementation of practices obtained from the review, as well as reflection, evaluation, and modification of practices. An example of implementation is evident in the adoption

and adaptation of aspects of Jamie McKenzie's *Research Cycle* (2000) into collaborative projects and Information Technology course work.

4b. Evaluate the influence of technology on learning.

A major focus of the inquiry was to assess the competency of middle school students with regard to digital information literacy. This assessment also formed a needs assessment or analysis. Data gathered from interviews with students and teachers, survey of students, and personal observation of technology use in research projects, was related to the review of literature on the topic of digital information literacy to arrive at recommendations for the improvement of the use of technology in middle school student research endeavors. Problems with the use of computers and the Internet in student research are also discussed and recommendations made to improve teacher and student practices.

4c. Create learning opportunities for others.

Findings from this inquiry were used in collaborative research endeavors, where I worked with teachers to develop projects that focused on critical challenges and digital information literacy competencies. As a result of these collaborations, some teachers are changing their practices to incorporate more critical challenge and digital information literacy competencies in their research projects. By the end of the year, almost every student in the school will experience an individual research project that reflects the values and principles gleaned from the literature review and the first hand inquiry.

4e. During project completion: help others learn.

The project's focus was to improve teacher and student practice in student research endeavors. The goal of improving teaching practice is to improve student learning. Collaborative ventures with teachers allowed them to experience, observe, and experiment with the practical results of this inquiry.

7e. Use computers to facilitate learning.

A major focus of the inquiry was to determine the competency of middle school students in using the Internet for research. The recommendations of this study are designed to

improve learning by improving digital information literacy. During the course of this study, I used computers to design an on-line survey, process the results, store and synthesize findings of the study, design a school Web resource to assist students and teachers in their research endeavors, and to create multi-media presentations.

References

- Alexander, J., & Tate, M.A. (1996). Evaluating Web resources: Checklist for an informational Web site. Wolfram Memorial Library: Chester, PA. Retrieved June 5, 2001, from <http://www2.widner.edu/Wolfram-Memorial-Library/Webevaluation/inform.html>
- ALSC Children and Technology Committee. (1997). Selection Criteria. American Library Association. Retrieved June 5, 2001, from <http://www.ala.org/parentspage/greatsites/criteria.html>
- American Library Association. (1989). Presidential Committee on Information Literacy Final Report. Chicago: American Library Association. Retrieved January 13, from <http://www.ala.org/acrl/nili/ilit1st.html>
- Asselin, Marlene. (2000, June). Research instruction. teacher-librarian, 27, (5), 64-65. Retrieved December 15, 2001, from EBSCO database.
- Association of College and Research Libraries. (2001, February). Information literacy: Competency standards for higher education. teacher-librarian, 28, (3), 16-23. Retrieved December 15, 2001, from EBSCO database.
- Austrom, L. et. al. (1997, November). Students' information literacy needs in the 21st century: Competencies for teacher-librarians. Association for teacher-librarianship in Canada and the Canadian School Library Association. Retrieved January 8, 2000, from http://www.geocities.com/Athens/Olympus/..._Competencies_for_Teacher_Librarians.html
- B.C. Ministry of Education. (1995). Developing independent learners: The role of the school library resource centre. Victoria, British Columbia: Province of British Columbia Ministry of Education. (Original work published 1991)
- B.C. Ministry of Education. (1996). Integrated resource package: Information technology 8 to 10. Victoria. Retrieved March 10, 2002, from <http://www.B.C.ed.gov.B.C..ca/irp/it810/ittoc.htm>
- B.C. Ministry of Education. (1998). Cross curricular information: Information technology. Victoria: Curriculum Branch. Retrieved March 24, 2001, from <http://www.B.C.ed.gov.B.C..ca/irp/curric/apcinf.html>
- B.C. Ministry of Education. (1999a). Computer & Internet Use in B.C. Schools: The B.C. Results from the Second International Technology in Education Study Retrieved April 1, 2001, from <http://www.B.C.ed.gov.B.C..ca/statistics/sites.pdf>
- B.C. Ministry of Education. (1999b). Conditions for success: Report of the teaching learning and education technology advisory committee. Victoria: Education Technology Branch. Retrieved March 24, 2001, from http://www.B.C.ed.gov.B.C..ca/technology/advisory_report/
- B.C. Ministry of Education. (1999c, November). Information technology in education: Plan for 2000 and beyond. Retrieved April 1, 2001, from <http://www.B.C.ed.gov.B.C..ca/technology/plan2000/infoitech1.htm>

- B.C. Ministry of Education. (2000, September). The 1994 Kindergarten to grade 12 education plan. Retrieved April 1, 2001, from <http://www.B.C.ed.gov.B.C..ca/resourcedoes/k12educationplan/welcome.htm>
- B.C. Ministry of Education. (2001). Grades 6 to 9 - Integrating information and communication technology (ICT) into the curriculum. Victoria: Education Technology Branch. Retrieved March 24, 2001, from <http://www.B.C.ed.gov.B.C..ca/technology/6-9.htm>
- Barron, E., & Ivers, K. (1998). *The Internet and instruction: Activities and ideas*. Englewood, CO: Libraries Unlimited.
- Beck, S. (1997). Evaluation criteria: The good, the bad & the ugly: or, Why it's a good idea to evaluate Web sources. Retrieved June 5, 2001, from <http://lib.nmsu.edu/instruction/evalcrit.html>
- Bouie, E. (1998). Spotlight on technology integration. [5 pages]. T.H.E. Journal. [Online serial article 2059] Retrieved March 25, 2001, from <http://www.thejournal.com/magazine/vault/A2059.cfm>
- Branch, R.M., Dohun, K., Koenecke, L. (1999, June). Evaluating online educational Materials for use in instruction. Eric Clearinghouse on Information and Technology, Syracuse. Retrieved March 27, 2001, from http://www.ed.gov/databases/ERIC_Digests/ed430564.html
- Braun, L. (2000, Fall). In Virtual Pursuit. Library Journal, 126, (17), 32-35. Retrieved December 15, 2001, from EBSCO database.
- British Columbia Teacher-Librarians' Association. (2001). The ethics of information use: A teacher's guide. School Libraries in Canada, 20 (4).
- Broadhead, R., & Carroll, J. (2001). *Canadian Internet directory and research guide: 2001*. Toronto: Stoddart.
- Carper, L. J. (1996). Effectively using technology to develop independent research topics by middle school language arts students. Doctoral thesis, Nova Southeastern University. Eric Document ED 401 888.
- Center for Curriculum, Transfer, and Technology. (1999, October). Report on the online educational resources project. Victoria. Retrieved March 26, 2001, from <http://www.ctt.B.C..ca/edtech/oer/oer-report.pdf>
- Community Learning Network (no date). Educational WWW Resources for K-12 Students and Teachers (by Subject). Retrieved March 26, 2001, from <http://www.cln.org/subjects.html>
- Community Learning Network (no date). Information Technology Professional Development. Retrieved March 26, 2001, from <http://www.cln.org/in-service/itpd/project.html>
- Community Learning Network (no date). Integrate the Internet into the Classroom. Retrieved March 26, 2001, from <http://www.cln.org/integrating.html>

- Community Learning Network (no date). Learn More about the Internet. Retrieved March 26, 2001, from <http://www.cln.org/internet.html>
- Conference Board of Canada. (2000). Employability skills 2000+. Ottawa. Retrieved January 14, 2002, from <http://www.conferenceboard.ca/education.learning-tools/esp2000.pdf>
- Dupuis, E. A. (1999). The creative evolution of library instruction. Reference Services Review, 27,(3), 287±290.
- Eisenberg, M. (1997, Sept/Oct). Big 6 tips: Teaching information problem solving. Emergency Librarian, 25, (1), 25-26. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1997, Nov/Dec). Big 6 tips: Teaching information problem solving. Emergency Librarian, 25, (2), 22-23. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1998, Jan/Feb). Big 6 tips: Teaching information problem solving. Emergency Librarian, 25, (3), 28-29. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1998, March/April). Big 6 tips: Teaching information problem solving. Emergency Librarian, 25, (4), 43-44. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1998, May/June). Big 6 tips: Teaching information problem solving. Emergency Librarian, 25, (5), 37-38. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1998, Sept/Oct). Putting it all together. Emergency Librarian, 26, (1), 38-39. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M. (1998, Nov/Dec). Tip #6 -- Evaluation. Emergency Librarian, 26, (2), 35-36. Retrieved December 15, 2001, from EBSCO database.
- Eisenberg, M., Johnson, D. (1996, May/June). Computer literacy and information literacy: A natural combination. Emergency Librarian, 23, (5), 12-17. Retrieved December 15, 2001, from EBSCO database.
- Gilster, P. (1997). Digital Literacy. New York: Jown Wiley & Sons. In The Jossey-Bass reader on technology and learning. (2000). San Francisco, CA: Jossey-Bass.
- Glen, T., Sullivan, N. (1998, Feb/Mar) Integrating technology into the curriculum. Thrust for Educational Leadership, 27(5), 10 – 11.
- Goett, J. A., Foote, K. E. (2000, March). Cultivating student research and study skills in Web-based learning environments. Journal of Geography in Higher Education, 24, (1), 92-100.
- Haycock, K. (2000, February). Applying research in information literacy. teacher-librarian 27, (3), 34-35. Retrieved December 15, 2001, from EBSCO database.
- Haycock, K. (2000, December). Effective search strategies. teacher-librarian 28, (2), 37-38. Retrieved December 15, 2001, from EBSCO database.

- Hiebert, P. (2000). Supporting technology integration: A case study. Masters thesis. Royal Roads University, Victoria, British Columbia, Canada. Retrieved March 10, 2002, from <http://library.royalroads.ca/cgi-bin/Pwebrecon.cgi?PAGE=dbPage&SEQ=20020310083224&PID=614>
- Joseph, L. (1999). WWW cyberguide ratings for Web site design. Retrieved June 5, 2001, from <http://www.cyberbee.com/guide2.html>
- Kirby, S., McKenna, K. (1989). *Experience research social change*. Garamond: Toronto.
- Kouzes, J., Posner, B. (1995). *The leadership challenge: How to keep getting extraordinary things done in organizations*. Jossey-Bass: San Francisco.
- Kubly, K. (1997, April). Guiding students in using the World Wide Web for research. Mid-South Instructional Technology Conference Proceedings, Murfreesboro, TN.
- Lance, K. (2001, October). Proof of the power: Recent research on the impact of school library media programs on the academic achievement of U.S. public school students. Library Research Service of the Colorado State Library and the University of Denver. Eric Document EDO-IR-2001-05.
- Media Awareness Network. (1996). How to search the Internet effectively. Retrieved June 5, 2001, from <http://www.meida-awareness.ca/eng/Webaware/tipsheets/search.html>
- Media Awareness Network. (1996). Knowing what's what and what's not: The 5 w's (and 1 H) of cyberspace. Retrieved June 5, 2001, from <http://www.meida-awareness.ca/eng/Webaware/tipsheets/w5.html>
- Meyer, Randy. (2000, Fall). It takes a cybervillage. School Library Journal, Fall 2000 (Library Journal Net Connect. Supplement to School Library Journal. Fall 2000).
- McClaren, M., McIntosh, Dale. (2000). LT531: Leadership and learning in an information technology-rich environment. (Course binder, available from Royal Roads University, Organizational Leadership and Learning Division, 2001 Sooke Rd., Victoria, B.C. postal code: V9B 5Y2.)
- McKenzie, J. (2000). *Beyond technology: Questioning, Research and the information literate school*. FNO Press: Bellingham, Washington.
- Ontario Ministry of Education. (2000). *The Ontario Curriculum Grades 9 through 12 – Program planning and assessment*. Retrieved March 10, 2002, from <http://www.edu.gov.on.ca/eng/document/curricul/secondary/progplan/progplan.html>
- Oshry, B. (1996). *Seeing systems: Unlocking the mysteries of organizational life*. Barrett-Koehler: San Francisco.
- O'Sullivan, M., & Scott, T. (2000, Mar/Apr). *Teaching Internet information literacy: A critical evaluation*. Multimedia Schools, 7, (2), 40-44.
- Palys, T. S. (1997). *Research decisions: Quantitative and qualitative perspectives*. Harcourt Canada: Toronto.

- Richmond, Betsy. (2000). Ten C's for evaluating Internet sources. McIntyre Library. Retrieved June 5, 2001, from <http://www.uwec.edu/library/Guides/tenes.html>
- Roth, Lorie. (1999, November). Educating the cut-and-paste generation. Library Journal, 124, (18), 42-45. Retrieved December 15, 2001, from EBSCO database.
- Royal Roads University. (2000, July). Royal Roads University Research Ethics Policy. Retrieved March 10, 2002, from <http://www.royalroads.ca/or/integritypercent20andpercent20misconductpercent2Cpercent20julypercent2014percent2Cpercent202000.doc>
- Ryan, Sara. (2001). Evaluating Web sites: What makes a Web site good? Multnomah County Library. Retrieved June 5, 2001, from <http://www.multnomah.lib.or.us/lib/homework/Webeval.html>
- School District No. 71 (Comox Valley). (1999, January). Technology plan update 1997-1998. Retrieved March 26, 2001, from http://www.k12techplan.educ.gov.B.C..ca/techplans/71_Comox_Valley/1997/index.asp
- School District # 71 (Comox Valley). (2001). ICT 6 – 9 Initiative. Retrieved April 2, 2001, from http://sd71.B.C..ca/Sd71/Edulinks/ICT6_9/index.htm
- Schrock, K. (1996). Critical evaluation of a Web site: Middle school level. Retrieved, June 5, 2001, from <http://discoveryschool.com/schrockguide>
- Scott, T. J., & O'Sullivan, M. (2000, May/June). The Internet and information literacy: Taking the first step toward technology education in the social studies. Social Studies, 91, (3), 121-126.
- Senge, P. (1990). The fifth discipline. Doubleday: New York.
- Senge, P. (2000). Schools that learn: A fifth discipline fieldbook for educators, parents, and everyone who cares about education. Doubleday: New York.
- Shiroma, D. (2000, July). Using primary sources on the Internet to teach and learn. Eric Clearinghouse for Social Studies/Social Science Education, Bloomington. Retrieved March 27, 2001, from http://www.ed.gov/databases/ERIC_Digests/ed433218.html
- Showme Multimedia Ltd. (No date). Quality information checklist. Retrieved June 5, 2001, from <http://www.quick.org.uk/summaryprint.html>
- Sunal, C.S., Smith, C. et al. (1998 Jan/Feb). Using the Internet to create meaningful instruction. Social Studies, 89, (1) 13 – 17.
- Snyder, I. (1999, October 1). Literacy and technology studies: Past, present, future. Australian Educational Researcher, 27, (2).
- Statistics Canada. Retrieved March 25, 2001, from <http://www.statcan.ca/english/edu/students.htm>
- Tri-Council Working Group. (2000, November). Code of conduct for research involving humans. Retrieved March 27, 2001, from <http://www.nserc.ca/programs/ethics/english/policy.htm>

- US Department of Education. (1995). Technology and teacher professional development. Retrieved March 27, 2001, from <http://www.ed.gov/Technology/Plan/RAND/Teacher.html>
- University of Southern Maine Library. (2000). Checklist for evaluating Web resources. University of Southern Maine. Retrieved June 5, 2001, from <http://library.usm.maine.edu/guides/Webeval.html>
- Watson, J. S. (1999, November). Students and the World Wide Web: Issues of confidence and competence. In *Unleash the Power! Knowledge – Technology – Diversity: Papers Presented at the Third International Forum on Research in School Librarianship*. Birmingham, AL.
- Wiggins, R.W. (2000, Fall). Coping with the trillion-page Web. *School Library Journal*, Fall 2000 (Library Journal Net Connect. Supplement to School Library Journal, Fall 2000).
- Williams, R. (1996). Survey guided appreciative inquiry: A case study. OD Practitioner, (28), 43-51.
- YTV Kid & "Tween" Report. (1999). Computer Ownership and Internet Use On the Rise in 'Tween' Households. NewsWire. Retrieved February 24, 2001, from <http://www.newswire.ca/releases/November1999/29/e8506.html>

Appendices

- Appendix A Survey Questions, Interview Questions, and Consent Forms
- Appendix B Courtenay Middle School Web site Research Process for Information Technology Seven
- Appendix C Two Note Taking Strategies
- Appendix D Courtenay Middle School Web Evaluation Form

Appendix A

Interview Questions – Teachers	A-2
Interview Questions – Students	A-3
On-line Survey – Students	A-5
Consent Forms – Students	A-9
Consent Forms – Teachers	A-11

Interview Questions for Teachers

1. What do you think of research projects?
2. Do you remember a research project that you loved doing with the students?
What did you like about it? What do you feel made it work so well for you?
3. Do you recall a research project that you did not enjoy doing with the students?
What do you think kept it from working well for you?
4. Do you recall a research project that you felt was of most benefit to your students?
5. Why do you think it is important for students to undertake research projects in general, not just those they do on the Internet or in the library? What do you hope they learn from the experiences?
6. What do you think the highest benefit is to students in doing research projects?
7. Do you feel students enjoy research projects? What do you think they like best?
8. What do you see as the biggest problem with research projects?
9. Where do students tend to go for research information? Do you guide them as to where to go?
10. How have you had students use the Internet for their researching?
11. What observations have you made with regard to students doing research on the Internet?
12. Are there *skills* you feel students excel at?
13. What *skills* are they lacking? What kind of guidance can we give them?
14. What do you like about having students use the Internet for researching?
15. Do you dislike any aspect of using the Internet in your research projects?
16. How do you feel things can be improved with regard to student researching on the Internet?
17. Where do you think we should go from here? What would you like to see?
18. What kinds of support do you feel you need to help students become better on-line researchers?

Interview Questions for Students

1. When was the last time you did a research project for school?
2. What do you think of research projects?
3. Do you remember a research project that you loved to do? What did you like about it? Do you feel you did a particularly good job? Did you get a lot of guidance? Was it the topic that thrilled you, or did the teacher inspire you?
4. Do you recall a research project in which you felt that you learned quite a bit? What made the project so successful?
5. Do you recall a research project that you did not enjoy doing? What was it about this project that did not work for you?
6. If you had to define research for a young person, how would you explain it?
7. Where do you go for research information?
8. How have you used the Internet for your researching?
9. Do you feel the Internet is a good place to find research information?
10. Do you ever use e-mail when you are doing research on topics?
11. Do you feel you can find the information you want quickly and efficiently on the Internet?
12. How would you know which Web pages you can trust for accurate information?
13. How would you compare the Internet for research with books and other print material? Do you feel that the Internet provides information that is as good as or better than what you find in books?
14. When you use the Internet for researching, how do you deal with the huge number of web pages that can come up in a search.
15. How do you deal with large numbers of Web pages in a search?
16. Do you use search engines? Which ones? How?
17. When using a search engine for your research, do you use advanced search techniques (AND, OR, "phrase", NEAR...) to limit the number of Web pages that show up to the ones that fit your topic better?
18. Is there a topic for which you think the Internet would NOT be a good place to look for information? Please describe that topic.
19. What kinds of help do you feel students need to become better users of the Internet for researching?
20. Your friend, Betty, is a grade eight student at Sandal City Middle School in the British Columbia interior. Betty has never felt confident with research projects and has just started to use the Internet for research. She wants to get better at researching, and especially at researching on the Internet. Betty's grade eight teacher has assigned a research project and Betty, being new to her school, feels shy about asking for help. Even though you no longer live in the same community, she trusts you and has asked you for some help with her research question: "Why did the Roman Empire, after being so powerful and rich for so long, eventually decline and collapse?" Imagine that you are helping Betty with her project.
 - a. Betty doesn't understand why research projects are always used in school? How would you respond to her question?
 - b. How would you have her begin thinking about how to do the research project? (What should she do first, second...)

- c. What would you recommend to her about starting her research on the Internet?
- d. What kinds of things should Betty be careful about while doing research on the Internet? (Betty can handle three to five things to be careful about before she gets too frustrated with the whole thing.)

On-Line Survey

How Do Middle School Students Research On-line?

This is not a test. This is an anonymous survey (your name does not appear on the survey)...so you are free to be completely honest with your answers. With this survey, I am trying to understand how middle school students use the Internet as a research tool. I will be using the information to help make internet researching by students easier and more effective. I need to know as much as possible about how you think about and use the Internet for researching before I try to improve things. The information on the survey will be used in a project for a Masters degree at Royal Roads University. By completing and submitting this survey you are giving consent for the information to be used in this research project.

- 1) What grade are you in?
- 2) Are you one of the students who took Info Tech 7 with Mr. L. in the first term?
 Yes No
- 3) Do you enjoy doing research projects for school?
 Always
 Most of the time
 About half of the time
 Sometimes
 Never
- 4) Do you use the Internet to find information for school research projects?
 Always
 Most of the time
 About half of the time
 Sometimes
 Never
- 5) Do you enjoy using the Internet for school research?
 Always
 Most of the time
 About half of the time
 Sometimes
 Never
- 6) Do you feel the Internet is a good place to find useful information for research projects?
 Always
 Most of the time
 About half of the time
 Sometimes
 Never
- 7) Do you feel you can find the information you want quickly and efficiently on the Internet?
 Always
 Most of the time
 About half of the time
 Sometimes
 Never
- 8) Do you ever use e-mail when you are doing research on topics (by e-mailing experts on the topic you are researching)?
 Always

Most of the time

About half of the time

Sometimes

Never

9) Do you feel that you know which Web pages you can trust for accurate information?

Always

Most of the time

About half of the time

Sometimes

Never

10) Do you prefer the Internet for your researching rather than books and other print material?

Always

Most of the time

About half of the time

Sometimes

Never

11) Do you feel that information on the Internet is as good or better than information in books and other sources?

Always

Most of the time

About half of the time

Sometimes

Never

12) What do you think is better about the Internet than books (or other sources) for research? (250 characters, or about 50 - 60 words):

13) What do you think is better about books than the Internet for research? (250 characters, or about 50 - 60 words):

14) Do you think you can find all of the information you would need for any topic on the Internet?

Yes No

15) When you use the Internet for researching, are you ever frustrated by the huge number of Web pages that come up in a topic search?

Always

Most of the time

About half of the time

Sometimes

Never

16) When you use search engines for researching on the Internet, are you ever frustrated at the number of Web pages that are not really what you want?

Always

Most of the time

About half of the time

Sometimes

Never

17) When using the Internet for your research, do you first go to a search engine (Altavista, Yahoo, Google...) to find Web pages on your topic?

Always

Most of the time

About half of the time

Sometimes

___ Never

18) Which search engine do you prefer using? _____

19) When using a search engine for your research, do you ever limit the number of Web pages that are found by using AND to link two words? (example egypt AND mummies)

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ Never

___ I don't understand

20) When using a search engine for your research, do you ever limit the number of Web pages that are found by using "quotation marks" to keep words in a phrase together? (example "Ancient Egypt")

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ Never

___ I don't understand

21) When viewing a Web page on a topic, how often do you check who wrote or sponsored the page?

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ never

22) Do you check the reputation of the Web page author? (How much of an expert is the author?)

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ never

23) Do you check when the Web page was last updated?

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ never

24) Do you think that research projects are a good way to learn? Why do you think so (or not think so)? (250 characters, or about 50 - 60 words)

___ Always

___ Most of the time

___ About half of the time

___ Sometimes

___ never

25) Your teacher gives you a research question: "Why did the Ancient Egyptians mummify people?" How would you handle this question? What would you do first, second, third, and fourth?

First, I would..

26) Second, I would..

27) Third. I would..

28) Fourth. I would..

29) How do you think teachers can make research projects better?

Thank you for taking the time to complete this survey. Your help is greatly appreciated.
If you have any questions, simply e-mail me at luxenburg@courtmid.sd71.bc.ca

Royal Roads University -- Masters in Leadership and Training
Digital Information Literacy in Middle Schools
RESEARCH INFORMATION & CONSENT FORM – Student & Parent

STUDENT'S NAME: _____

Dear (Parent/Guardian's Name):

_____, who is a student at Courtenay Middle School, is invited to participate in a research project. The project is described below. Because the student is a Minor, your consent as Parent/Guardian is required before he/she can participate in the project. The students' role as a participant is outlined below and the overall project is described. Please read the information. If you are willing to permit the above named student to participate, would you please sign below indicating your agreement. If you have any questions or require further information, please contact me at 334-4089. The best time to reach me is in the mornings, but you may also leave messages and I will call you as soon as possible. You may also contact me by e-mailing Luxenburg@courtmid.sd71.bc.ca. Thank you for considering this request.

I am currently Teacher-librarian at Courtenay Middle School. I am also a graduate student at Royal Roads University in the Masters of Arts in Leadership and Training program. My research for the degree focuses on helping middle school students improve their understanding of and skill in using the Internet for on-line research. To help students become better researchers, I must first try to determine how they currently use the Internet for school research projects. Once I get a sense of the needs of middle school students, I will use the information gained, as well as information from literature written on the topic, to create workshops for students. I will also work collaboratively with teachers to improve the on-line research competencies of their students. Another phase of the project will involve the design of a school web page that can be used as a tool by students and teachers in research projects.

This research project is part of the requirements for a Master of Arts in Leadership and Training. My credentials as a graduate student in the MALT program at Royal Roads University can be established by telephoning either Dr. Gerry Nixon, Dean, Royal Roads University at (250) 391-2569 or Ms. Angela Wilson, Program Associate, MALT, at (250) 391-2589.

This document constitutes an agreement to permit your son/daughter to participate in the research.

The research will consist of the following one or more of the following:

- ❑ A short interview (approximately 60 minutes) in which I will ask open-ended questions regarding the participant's attitudes, observations, and experiences around research and using the Internet for research. The interview will be recorded on audiotape, and transcribed onto paper. Where appropriate, portions of the interviews may be summarized in anonymous format in the body of the final report. (Confidentiality measures are described below)
- ❑ Informal observations made by myself in the course of teaching and observing students' use of the Internet for researching. Observations will be recorded in

research notes with codes used to identify participants. (Confidentiality measures are described below)

You and your son/daughter will have an opportunity to view and discuss the interview transcripts or notes prior to their use in the report. You may, if you wish, also receive an abstract of the final report. The complete final report will be housed at Royal Roads University where it can be accessed.

Students are not compelled to take part in this research project. Given your permission, if a student does elect to take part, she or he is free to withdraw at any time with no prejudice. Participation in the research project is completely voluntary.

All data retrieved as part of this research will remain strictly confidential: the report will not indicate student identities and the name of the school will be changed in the report. Material obtained will be stored in a secure location. Audiotapes will be erased or destroyed after publication of the report, transcripts of tapes and any research notes will be coded so that a student's identity is never revealed and the key to the identity codes will be destroyed one year after publication of the report.

(Signing this Letter of Consent indicates acceptance of the above means of handling of data).

The purpose of the research is to gain information about the needs of middle school students. The information gained is intended to benefit the students. The results of the project should empower students to use the Internet and information technologies for research. It is not the intention of the project to assess individual student competence or skill in using digital information literacy or to generate any negative feelings. I am confident that my research methods will minimize or eliminate any negative consequences.

By signing this letter, you give free and informed consent for _____ to participate in this project. The participant may withdraw from the research at any time prior to publication of the report. Questions are welcome at any time prior to, during, or after participation.

Student Consent

Parental/Guardian Consent

Name (Please Print): _____

Name: _____

Signed: _____

Signed: _____

Date: _____

Date: _____

Royal Roads University -- Masters in Leadership and Training
Digital Information Literacy in Middle Schools
RESEARCH CONSENT FORM -- Teacher

_____ (first and last name) is being invited to participate in a research project.

Statement of Intent and Description of Research: Avi Luxenburg:

As part of my program of studies in the Masters of Arts in Leadership and Training Program at Royal Roads University I am conducting an action research project.

My research is designed to discover ways of helping middle school students improve their understanding of and ability to conduct on-line research. To help students become better researchers, I must first try to determine how they currently use the Internet for research. Once I have a sense of the current approach and needs of middle school students, I will use the information gained, as well as information from relevant literature to design and develop workshops for students. I will also work collaboratively with teachers to help them improve the on-line research competencies of their students. Finally, I will design a school web page that can be used as a tool to assist students and teachers in their research endeavors.

This research project is part of the requirement for a Master of Arts in Leadership and Training. My credentials as a graduate student with Royal Roads University can be established by telephoning either Dr. Gerry Nixon, Dean, Royal Roads University at (250) 391-2569 or Ms. Angela Wilson, Program Associate, MALT, at (250) 391-2589.

This document constitutes an agreement to take part in my research, the objective of which is to develop a strategic plan to improve middle school student competencies in on-line research.

The research will consist of a short interview (approximately 60 minutes) in which I will ask open-ended questions regarding your attitudes, observations, and experiences around students' research in general and in particular their use of the Internet for research.

The interview will be recorded on audiotape, following which the interview will be transcribed onto paper. The interview information will be anonymous and your identity will be fully protected. Where appropriate, some elements of the conversation may be summarized in the body of the final report. In such cases your identity (including such information as the school where you teach) will be protected. A follow-up session will allow you to read transcripts of your interview and make any changes, corrections, or further observations.

A copy of the final report will be housed at Royal Roads University.

You are not required to take part in this research project. If you elect to take part, you are free to withdraw at any time with no prejudice. Participation in the research project is completely voluntary.

All data retrieved as part of this research will remain strictly confidential; the report will not indicate individual identities and material obtained will be stored in a secure location. Audiotapes will be erased or destroyed after publication of the report, transcripts of tapes

and any research notes will be coded so that an individual's identity is never revealed and the key to the identity codes will be destroyed one year after publication of the report. (Signing this Letter of Consent indicates acceptance of the above means of handling of data)

The purpose of the research is to gain information about the needs of middle school students, and is intended for their benefit. The results of the project are intended to empower students to use a new medium for research and communication. It is not the intention of the project to make students or teachers feel negatively about their level of competence around digital information literacy. I am confident that my research methods are designed to minimize or eliminate any potential harm.

By signing this letter, you give free and informed consent to participate in this project. However, you may withdraw from the research at any time prior to publication of the report. Questions are welcome at any time prior to, during, or after participation.

Participant Consent

Name (Please Print): _____

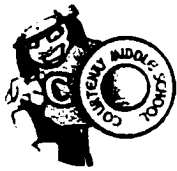
Signed: _____

Date: _____

Appendix B

Information Technology Research Steps

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Research Steps - Use your *Research Word Document* for Every Step

Step 1 - The Proposal

Arriving at a Research Question

Your Interests

- A** What are some of your general interests?
- B** What would you like to know more about?
- C** What are some world issues that you are curious about? (hunger, the environment, economic issues... what would you like to know more about in the world)
- D** What are some community issues that you've thought about? (Community issues are things like crime, bullying, vandalism, zoning bylaws, skateboard parks and policies...)
- E** Which careers have you thought about?
- F** What are the skills or abilities you would love to have?
- G** What focuses your attention like nothing else? What puts you into FLOW?

This is an important question that requires some deeper thinking. When an activity puts you into flow, you lose track of time. When you stop the activity, it

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Questioning

for some good examples

return to the activity.

H A through G are meant to get you thinking about areas that will more than likely be of interest to you. Take a moment to look at what you wrote and see if you can see any patterns. What appears to be repeated, or, what direction do your thoughts appear to be taking you.

Write approximately five possible research questions based on your reflections in A - G. The research questions you come up with should be challenging, but be very careful of taking on too much - I don't think "What is the cure for Cancer?" is appropriate for a thirteen week course...you will only have a few weeks to actually do your research. (Save the cancer research for high school.)

Begin your questions with "How" or "What" or "Why" or "Which".

What does it take to...

"Why do things happen the way they do?" (McKenzie, 2000, p. 8)

"How could things be made better?" (p. 9)

(p. 9)

McKenzie, Jamie. (2000). Beyond technology: [Click here](#)

What does it take to become a professional dancer?

What does it take to be a successful chemist?

Why do people bully?

Why are people so helpful during a disaster?

Why do we continue to pollute the world when we all know it is so bad for us?

How can bullies be made to stop?

How do dancers see the world?

How can I take beautiful photographs?

For many more examples of questions that have been approved in previous classes and just some darn good questions, [click here](#).

The Question you are Proposing to Research

information literate school. FNO Press: Bellingham, Washington.

I Select the one research question from your above choices that you feel you are most interested in working on.

Choose a question that will provide a challenge to you, but that will be "researchable" by looking in books, finding web resources, interviewing people, asking experts, or searching for in magazine databases.

Submit your proposal to Mr. L.

Step 2

Planning the Research

Guide

Example

Leading Questions

A **Using your Word document, brainstorm several "leading questions"**. Use the graphic ability of Word by creating a web. [Click here for an example](#) (which you can save to your "L" drive and use if you do not want to take the time to create your own).

Often, the research question is a large question that can leave you fumbling and wondering: "Where do I start?".

Leading questions break up the large question into "doable" parts: they "lead" you to begin your search with a clear purpose.

In your Word document, **create a table for your best leading questions** that provides space for information you might find. [Click here for an example chart](#) (which you can save to your "L"

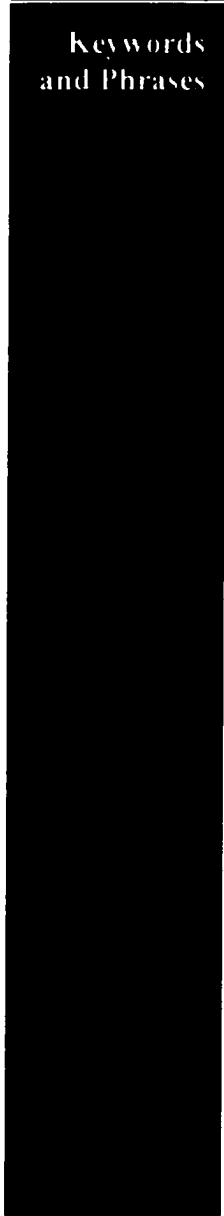
Research Question: "Why do people rush to the cause when others need help in a disaster?"

Leading Questions: Which disasters can I find out about? Are there organizations I can talk to? Doesn't the Red Cross deal with disasters? Who can I talk to about people helping others? Would a psychologist be able to guide me? I heard about people going off to help during the Manitoba floods, who where they? Who organized it? Who can I call to find out? What is courage?



to take the time to create your own).

Always leave room for more leading questions, for as you find out more, you will have more questions.



Keywords and Phrases

B In your Word document, brainstorm several keywords and phrases from your leading questions to help you with your research.

It is often difficult to know which are the important and useful keywords and phrases when you do not know about the topic.

Do a bit of preliminary browsing in the reference section of the library to help you with your brainstorm.

Visit Encarta or Worldbook Online (both have links on the desktop) and browse for "a feel" for your topic and for keywords and phrases.

Use a thesaurus with some of the words you have found to come up with different words and phrases. Here is a link to [Roget's Thesaurus Online](#).

Be prepared to add more keywords and phrases to your list as they come up.

disasters organizations

courage "Red Cross"

calamity (from thesaurus) catastrophe (from thesaurus)

tragedy (thesaurus) cause

"people helping people" "September 11"

"Manitoba floods" terrorism

earthquake bravery (thesaurus)

volunteering "helping others"

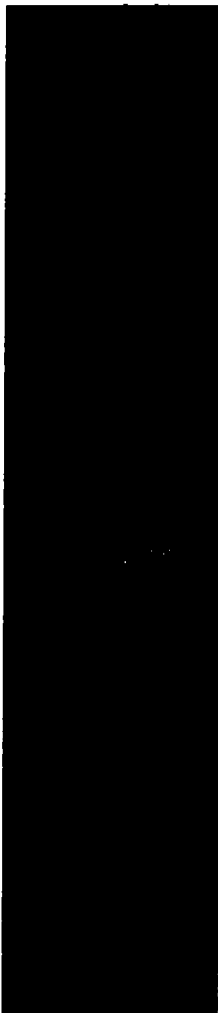
Note the phrases above (two or more words) are held together by "quotation marks".



Sources

C In your Word document, brainstorm your possible

Ask some adults if they know of anybody who has volunteered to help in a disaster.



sources for information?

Will your leading questions be answerable in Web resources, by looking in magazine articles, by interviewing others for their opinions, by finding experts to ask, by finding information in books?

Be specific with your sources... brainstorm by using your leading questions.

Call the Red Cross to see if they are the right people to talk to, and if they are, arrange to speak to an individual person.

Use the magazine database to find articles on recent disasters that are about people helping others.

Find web pages on the topic.

See if there are any experts I can find on the topic. They might be psychologists. Use Mr. I.'s links to "ask an expert" sites.

Step 3a	Learning to Search
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Searching using Boolean Logic

Introduction

Often, when you are using a search engine, or are searching some sort of database for information, you will have more sources come back to you than you know what do with. Many people become completely frustrated when the number of Web pages that a search engine finds is huge, with very few pages of relevant to your topic.

Always begin your search with a broad focus, and then zero in to

On November 19, 2001, I used the term "disasters" with Altavista.

529,554 Web pages were returned to me. I know there were some fabulous Web pages there, but I didn't have three weeks, four days, and 19 hours to sift through them all to find the gems.

The term "volunteering" returned 375,662 sites.

with the Boolean tools below.

Keep track of the combinations of words and phrases that you have used, and whether they were successful or not. Do this in your Word Document.

Using AND

reduces # of pages

Using the term AND in between two words or phrases tells the search engine that you want sites that have both words or phrases in them. So...sites that only have "disasters" will not return, and sites that only have "volunteer" will not return; only sites that have both.

disasters AND volunteering

3,536 sites were returned, with 7 of the first 10 being of direct relevance to my topic or providing contacts for me to e-mail.

Using OR

increases # of sites found

If my topic was very specialized, and my search was not returning enough sites. I would place OR between words or phrases to tell the search engine that I want all sites that mention either word or phrase.

disasters OR volunteering

901,680

using "a phrase"

reduces # of pages

Placing "phrase marks" around a set of words tells the search engine that you wish to find this exact phrase, and only this exact phrase. The phrase marks bind the words together, in the order in which you place them.

"September 11"

360,967

This is a default with Altavista, in that you do not need to place phrase marks around your words to have the search engine treat them as a phrase -- altavista does this automatically.

Not all search engines default to

Altavista's default.

phrase. With Google, I typed: *helping people* and received almost 3,000,000 sites. When I put quotations marks around the phrase, it became "helping people", and returned just over 400,000 sites (still a lot, but much, much better).

Combine Terms

reduces # of pages

Advanced searchers use the various Boolean tools in combination with each other. Combining tools is a great way to limit the number of sites you receive to very relevant ones.

"helping others" AND disasters

1,239 with several sites being of direct relevance.

"Red Cross" AND disasters

37,440 with several of the first few of significant relevance.

"September 11" AND disaster AND helping

1,220 hits, with several being of relevance.

AND NOT

reduces # of pages

Sometimes combining search terms is not enough to limit your search. If a specific type of site keeps appearing, and you do not want this site, get rid of it by adding AND NOT _____ to your search terms.

"Red Cross" AND disasters AND NOT terror*

33,923 hits that have taken out any pages that refer to terror or terrorist or terrorism (* is the wild card symbol that tells the search engine to use all possibilities)

Often, sites that are trying to sell you something can be eliminated by saying: AND NOT products.

Since so many of the sites were news stories (which I really didn't want), I tried:

"Red Cross" AND disasters AND NOT news*

If you do not want news stories, just say so by stating: AND NOT news*. See the examples for more details.

Which took out news and newspaper, leaving me with a more manageable 13,883 hits.

Finding Sources of Information

Search Engines

- A** Find ten exceptional Web resources for your topic using Boolean logic with two different search engines.

Search Engines ▾

Copy the best Web URLs (Addresses) to your Word Document. Create a table to keep track of all of your findings and make brief notes to yourself to remind you of what was on the page.

Right now you are simply browsing and sifting the best information to answer your leading questions.

Web Portals

- B** A Web portal is like a window to the Internet. An organization will attempt to organize part of the Web for you. You can use Web portals much like a search engine, but the organization who made the portal has already checked-out the sites for quality.

Web Portals ▾

Use two Web portals to help you find 5 excellent sites that help you to answer your leading questions. Keep track of the sites you find in the same way you did for "A" above.

Web Directories

- C** Web Directories, like portals, are an organization's way of organizing part of the Internet for you. Several search engines (such as Yahoo) offer categories of Web sites. Rather than submitting search terms, you would find the broad category for your topic, then follow it down to more specific


Web Directories ▾

listing of sites.

Use two Web Directories to help you find five excellent sites. Keep track of your findings as you did for "A" above.

Ask an Expert

D Often, the best way to find out about something is to ask an expert. The links to the right offer about a hundred different "ask an expert sites". Through these sites, you can find an expert in your topic, and e-mail her or him a series of questions.

Ask an Expert Links 

Before you e-mail questions to an expert, you must have your questions approved by Mr. L. Use the instructions for writing questions below.

Magazine Articles

E Some of your leading questions might be handled by finding magazine articles on the topic

Magazines

User ID: comoxvalley

Use our link to the Ebsco Publishing database of hundreds of magazine articles on various subjects. A great resource for almost any research topic.

Password: schools

Once you are in, click on the EBSCOhost Web link, then make sure that the top two boxes are checked before you hit "enter".

While searching this database, makes sure that the "full text" box is checked so that you only receive articles that do not require sending away for.

Select the Sources you will use

[Top of Page](#)

Once you have found an article that you feel helps you answer a leading question, you can e-mail this article to yourself or print it.

- F** Of the sources you have found from the above search, select the best sources (5 to 10 sources) for use in your research. When selecting the sources, you should consider the degree to which each answers your leading questions and helps you to understand the issues you are looking into well enough to make some judgements.

Consider the readability of the sources you are selecting. A web page or article may have almost all of the information you are looking for, but do you understand it...many articles and web pages are not written with middle school students in mind, and use language that is at more of a university level.

If you are using Web pages as sources, be sure to read the information on the right about Web page reliability and evaluation.

You will find a link to a Web evaluation Word document that synthesizes Web evaluation criteria from more than 10 reputable organizations.

Copy and paste the Web evaluation form into your **Research Word Document.**

If you are using Web pages, consider that almost anyone can create and publish a web page. Many students feel that if it is on the Internet, it is fact; but, unlike books, which require you to be somewhat of an expert in your field to write about a subject, Web pages are open to anybody to write.

There are many things to consider when deciding if a Web page is a reliable source of accurate information. Consider who wrote the page, who is sponsoring the page (does the sponsor want to sway your opinion about something?) and consider several other factors that determine the validity of a web page.

Click here to download a Web page evaluation form (a Word document). The form quickly has you look at some important factors in a Web resource and evaluate it according to a 5-point scale. A web page that scores 4-points or more would be considered a reliable source of information.

Step 4	Interviews, Surveys, & Questioning Others	
<p>Use Interviews or Surveys?</p>	<p>Sometimes, a good way to gather information is to ask others for their views and opinions. Interviewing and surveying is especially good for essential questions such as "What is a good friend?", and "Why do bullies bully?"; but, it can also be used for other, "less essential" questions, such as "What does it take to become a chemist?"</p> <p>When deciding whether your research lends itself to questioning others, simply ask yourself whether the opinions and experiences of others would help you shed light on your big question or any of your leading questions. Also, are there experts in the topic available to you through personal contact and/or the Internet.</p> <p>One student researching the origin of our understanding of dog behaviour contacted a local veterinarian for information. She found out the Veterinarian's e-mail address, received permission from the vet to ask her questions on the topic, and then sent an e-mail with her questions to the vet.</p> <p>The same student was also lent an exceptional book on the topic from a person she had never met (and still hasn't met). How did this occur? She talked about her topic to others. When you talk</p>	<p>Questioning is an important part of researching the question: "Why do people rush to the cause when others need help in a disaster?"</p> <p>This question lends itself to interviewing representatives of relief organizations, such as the Red Cross, about their experiences and observations with disasters; as well, experts such as psychologists might also provide the authoritative information that you need.</p> <p>The opinions of students and adults might also be valuable, since what we are dealing with here is a human dynamic, humans might provide some interesting insights.</p>

have ideas and sources for you. In this particular case, one person arranged for the researcher to receive the book.

Talk about your question. Ask others for help.

Interviewing

[Top of Page](#)

What is an Interview

An interview may take anywhere from one minute to over an hour. The interviewer (you) asks the interviewee open-ended questions so that the interviewee is drawn into the topic and is encouraged to talk about his or her views and experiences.

Interview Questions

A Designing Questions

When designing interview questions, your job is to draw the interviewee out: make him or her want to talk about the topic. The best way to draw out the thoughts and opinions of the interviewee is to use *open-ended questions*.

Open-ended questions are very difficult to answer with a one-word or very short answer. If you want short answers (as with most surveys), it is best to use closed-ended questions; such as, *"Do you feel that snowboarding is better than skiing?"* The interviewee has the choice of answering "Yes", or "No". S/he may wish to go on to back up this short answer, but most young interviewees would not.

If you want a window into people's thoughts around snowboarding and skiing, then an open-ended question would be a superior vehicle. The following examples of open-ended questions would be more likely to draw a person's thoughts out:

"How would you compare snowboarding and skiing?"

"Why do you prefer snowboarding to skiing?" or "Why do you prefer skiing to snowboarding?"

"Why do you think many young people prefer snowboarding to skiing?"

Open-ended questions often begin with "How..." or "What..." or "Why..."

First,

In your ongoing

Why do you think people help other



Questions

Document. brainstorm a few open-ended questions for each of your "leading questions". You should end up with ten to fifteen open-ended questions.

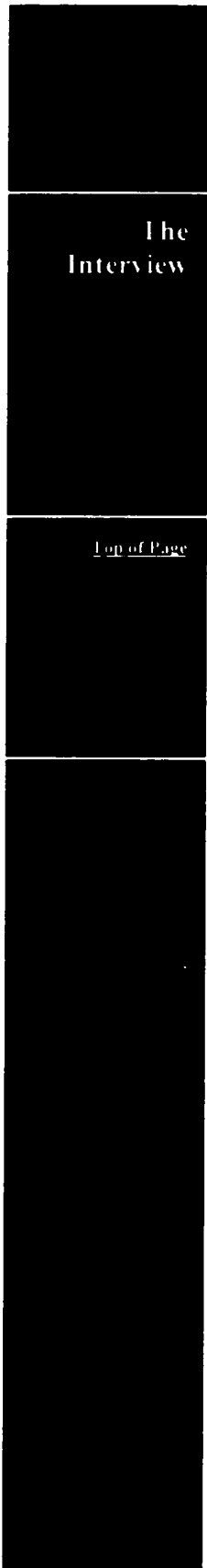
- people?
- Why do you think so many people jump to help when there is an accident or disaster?
- What do you think makes a person courageous?
- Why did volunteers in the Manitoba Floods (or another disaster) volunteer?
- Who else do you think I can talk to about this topic?
- How have you been involved in a relief effort (big or small)? (for a disaster volunteer or organizer)
- What do you think are the most important characteristics of a disaster volunteer?
- How does a person become a volunteer in a disaster?
- Why are you a disaster volunteer or organizer?
- Where can a person go for information about being a disaster relief volunteer?

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Second, Select the best.

Select the five best questions. Make your choices by determining which questions will really draw your interviewee out, and on whether the question truly addresses your research (will the

- people?
- Why do you think so many people jump to help when there is an accident or disaster?
- What do you think are the most important characteristics of a disaster volunteer?
- What do you think makes a person courageous?
- Who else do you think I can talk to about this topic?



The Interview

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questions you choose answer your leading questions?).

B Location

The interviewer (you) arranges a location that fits the desired feel of the interview. Arrange a quiet location if you want thoughtful responses (students are more likely to not provide you thoughtful responses in the hall at lunch - you will more than likely be surrounded by several other students and a lot of noise. The interviewee will likely be answering questions to impress those around rather than providing you truthful and honest replies)

Preparation

Although you will have your questions with you, you should be so familiar with them, that you hardly need look at them.

Understand where you want the interview to go, so that you can "go with the flow" if your interviewee is taking you in a direction you did not expect (but is valid for your research).

Recording

How will you record the information?

There are several ways of doing this, from a *tape recorder* to a *video camera* to *writing notes* to *having somebody take notes*.

A *tape recorder* would be best, so that you can focus completely on the interview while it is happening and have a completely accurate account of the interview. However, once you have recorded the interview, you will have to go back to it for note-taking and quotations.

A *video recording* will more than likely make the interviewee uncomfortable...remember, you want the interviewee to be "drawn out", and a video camera would make this difficult.

Writing notes while you interview is difficult to do well, for your focus is split between your notes and the interviewee. The natural flow of conversation is interrupted and you will miss important information.

Having a partner write notes and quotable sentences is preferable to making your own notes, for it frees you up to concentrate on the interviewee.

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e-mailing

You might choose to e-mail questions to an expert you found on the Internet, or have found an expert locally, or wish to e-mail your questions to interviewees rather than interview personally.

This approach has advantages and disadvantages. The wonderful thing about e-mailing questions is that you will receive an already recorded document. Another possible benefit to this method is that it allows those who are not as comfortable being put "on the spot" while speaking to others to think about their answers at their own leisure.

E-mailing questions means that you will not interact with each answer, looking for more details, following the natural flow of conversation that might lead to the unexpected (the most exciting thing to a researcher is the unexpected), or change directions when needed. The interviewee might also need some clarification on a question, and if you are not there to help, he or she may not understand the question.

Politeness and Ethics

Remember, the interviewee is doing you a favour by becoming involved in your research. Always thank the interviewee for being involved before the interview, and again after. If the interview did not go well, then this is your own fault for either not choosing the right questions or the right interviewee. Please do not take a "less than satisfactory" interview out on the person who was trying to help you. Always be polite: before, during, and after the interview.

When a person takes part in an interview or survey, they must now be protected by you. The interviewee's identity must be kept out of your final product: any papers or material with the interviewee's identity on it must be kept secure; do not talk about what the interviewee says in the interview to anyone.

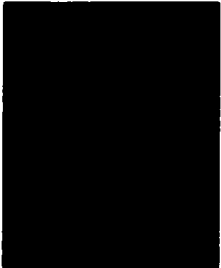
Always remember to let the interviewee know that although they will never be mentioned anywhere, the results of the interview will be used for the final product - which will be published.

Synthesis of Interviews

C Chart Your Findings

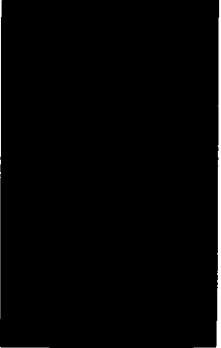
In your ongoing Word document, chart the results. Use a table:

Interviewee	1	2	3	4
Question 1	Quote	Answer	Answer	Answer



reasonable.

- Most of the time
- About half of the time
- Less than half of the time
- Never



To what degree do you agree with the following statement: All people who like sweet pickles have bad taste.

- Completely agree
- Mostly agree
- I half agree
- I sort of disagree
- Totally disagree



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When designing surveys, you will need some lead in questions to warm the volunteer up to the topic. After you have brainstormed several questions, choose the ones that you feel would address your research leading questions.

Have you ever witnessed somebody going out of their way to help somebody else?

- Yes
- No

Also, you will want to trial your survey on a few people to determine which questions are working the way you want

the survey.

which need
changing.

B Surveying

How will you survey your target population?

Will you *photocopy several surveys and hand them out*? This approach is effective, in that it takes less of your time, but it requires you to organize the handing out and the collection of the surveys.

Will you go around and *survey people personally*? This is an effective way to survey, in that you have more control of the survey (you can make sure that people understand your questions and take the time to think about it). This process is more fun than other methods, but takes more of your personal time and energy.

Will you *e-mail your questions* to your target audience? This is an effective method, but you have little control as to who opens their e-mail and whether volunteers understand your questions.

C Synthesis

As in the interview synthesis above, you will want to chart the results of your survey. The wonderful thing about surveys is that they lend themselves especially well to bar graphs, pie charts, line graphs and other visual organizers.

Use a spreadsheet program (such as Excel) to chart, then graph the results of your survey.

What are the emerging patterns?

What is different about how people answered the same question?

What is the same about how people answered questions?

What conclusions can you make from the patterns you see emerge.

Write all of these thoughts in your Word Document. Place your thoughts and observations in *Leading Questions* that you designed earlier.

Step 5	Note-Taking
Plagiarism	<p>One of the most common mistakes made by students when researching is a serious one: Plagiarism.</p> <p>When you use the words and ideas of others, in a work that you publish or hand in, without giving credit to your sources, you are committing "plagiarism". When a person publishes material (books, magazine articles, Web pages...), the published material is automatically "copyright" (which means that it belongs to the person who created it). You must have permission to use another person's published material.</p> <p>It is not always easy to determine whether a something that you find on the Internet is copyright. Some works clearly state (usually on the material or at the bottom of the Web page) that it is copyright. Most works provide an e-mail link to contact the author for permission to use the material.</p> <p>Some material on the Internet is available for use with some conditions. Many web page creation resources will allow you to use an image, or a background, or an animation if you give credit and provide a link to the site you are using for the material.</p> <p>Personal information is always off limits. If a page is about a sports star or movie star, this is considered personal information.</p> <p>The following sites have some great information on Plagiarism:</p> <p>http://www.googletown.com/home/plagiarism.htm</p> <p>http://www.cyberbee.com/eb/copyright.htm - an interactive site that gives you some basics on copyright.</p> <p>http://www.templetons.com/brad/copymyths.html - some detail on ten myths about copyright.</p>
Avoiding Plagiarism	<p>Right now, let's focus on information from sources: any sources (books, magazine articles, Web pages, e-mail)</p> <p>There have been quite a few students who have simply copied and pasted information into something that they hand in.</p>

Note-taking
Keywords
Notes and Paragraphs
Quotations

happening, it is illegal, and is not going to happen here.

- A** Once you have selected sources that you feel will answer your leading questions, begin to read the information. The key here is that you are not mindlessly reading the material and jotting down notes. Pause regularly to ask yourself: Is this leading me to a better understanding of my topic? What is this telling about my topic? Is this important?

Use the note-taking form to write keywords and phrases. These are simply to remind you of the important things which you have read. Use a new note-taking form for each source of information.

(click here to download the note-taking Word document)

(click here to download an example source article and a filled-out note-taking document)

Important: When we read material thoughtfully, we are interacting with it. If you have thought about your topic...stop reading! Take a moment to write your thoughts, add to your leading questions, ask a question....

- B** Once you feel that you will lose memory of what you just read (for some this can be a few paragraphs, for other, pages of text - use the keywords and phrases to help you remember), stop reading, put away the source, and start writing notes from your keywords.

Some people write notes from their keywords in point form, while others begin to weave the information into full paragraphs. With a bit of practice, it becomes far more efficient to write full paragraphs, for they force you to create meaning from the text you have read.

- C** At times you will find a phrase or sentence in your source that really "says it all". Go ahead and copy this sentence into your note-taking form, but be sure to put it in the quotations part of the form. Also, it is important that you take down the page number of the quotation if you are using a book or magazine article.

www.

Book with one Author

Credit

of others, you must give them credit. Your work will have a bibliography section (or a links and sources page in your Web project), where you will give credit to the sources you used for information.

When you take a direct quotation from a source, you must do to provide credit than place the source information in the bibliography; you must place the quotation in "quotation marks", and place the following after the quote: (Author last name, date, p.__)

Example from Charles Darling's site on citing:

Emily Bronte "expressed increasing hostility for the world of human relationships, whether sexual or social" (Taylor, 1988, p. 11).

see below of source citation.

Alvarez, A. (1970). *The savage god: A study of suicide*. New York: Random House.

Book with two or more Authors

Natarajan, R., & Chaturvedi, R. (1983). *Geology of the Indian Ocean*. Hartford, CT: University of Hartford Press.

Magazine Article	E-mail, Interview, & Conversation	Internet
------------------	-----------------------------------	----------

Heyman, K. (1997). Talk radio, talk net. *Yahoo!*, 3, 62-83.

Maddux, K. (1997, March). True stories

Personal communications are cited only within the text and not the reference page.

R.W. Runyon (personal communication, April 18, 1993)

Actual example:

The information and examples used for citations were taken from:

Darling, Charles. (2000, January 10). A guide for writing research papers based on styles recommended by the American Psychological Association. *Capital Community College: Connecticut*. (Online)

internet
patrol.
NetGuide
Magazine.
88-92.

http://www.patrol.com/...
(November 24, 2001)

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Step 6

Synthesizing - Have all of the "leading questions" been fully answered?

Organizing
what you
have

A Once you have used the note-taking form, and have all of the results of your interviews or surveys, it is time to take a look at what you have.

Open your "leading question chart" and start to plug information into it from your notes. If a paragraph you have written answers more than one leading question, consider combining the leading questions or pasting the paragraph into both locations.

Synthesis

B Look at the chart of leading questions and information. Begin to ask yourself:

Do I have enough to answer each leading question?

Did the answers lead me to other questions?

Do I have enough information to make my point/to back up what I am saying?

What patterns do I see in the information I found?

Have I answered my big (essential) question?

What conclusions can I make from the patterns that emerge?

Write all of these thoughts in your Word Document. Place your thoughts and observations in Leading Questions Chart you designed earlier.

More
Information
Needed?

C If your answers to the above questions lead you to the conclusion that you do not yet know enough, then you will need to find more sources, use your creativity to seek out different information, obtain help, do more reading and talking, and take more notes.

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All done?

to move to the next step - The Web Page

Proposal Question Examples

A few Pre-Approved Questions for Teams

Why...	<p>What is a hero?</p> <p>Why do bullies bully?</p> <p>Why is friendship important?</p> <p>Why is it that when people think of terrorists, most think of muslims?</p> <p>Why is art important to people?</p> <p>Why is architecture so important to humans?</p>	<p>Why do people enjoy being scared?</p> <p>Why should we (or shouldn't we) use animals for research?</p> <p>Why are Greek and Roman mythology and gods always getting mixed up by people?</p> <p>Why are horses considered a "noble" creature?</p> <p>Why is music important to people?</p> <p>Why are people interested in animals?</p>
Which...	<p>Which is the worse type of pollution?</p> <p>Which is the greatest hockey goalie that ever existed?</p> <p>Which is worse, a hurricane or a tornado?</p> <p>Which is a worse disaster, the Titanic, or September 11th?</p> <p>Which is the better form of exercise, yoga or hockey?</p> <p>Which animal makes the best pet?</p>	<p>Which city would be a better place for my family to live: Courtenay or Nanaimo (Courtenay or Victoria, Nanaimo or Victoria, Victoria or Vancouver...)?</p> <p>Which is the worse disease?</p> <p>Which is the worse kind of racism? Which is scarier, a vampire or a werewolf?</p> <p>Which is better, travelling across the ocean by boat or by plane?</p> <p>Which is the best province for my family to live in?</p>
How...	<p>How are ancient heros more heroic than today's heros.</p> <p>How can we stop bullying?</p> <p>How can I improve my spelling without memorizing a bunch of words?</p> <p>How would we have to adapt to be able to</p>	<p>How does Islam compare with Christainity (or Judaism, or Hinduism...)?</p> <p>How have computers ruined our lives?</p> <p>How has technology ruined our lives?</p>

	live on Mars?	How has Mr. L ruined our lives? How does a person become a clown?
<p>What (and other ponderables)</p>	<p>Did the end of the world begin with the agricultural revolution? Are there real monsters? What makes a song good or bad? What makes a book good or bad?</p>	<p>Was Robin Hood more of a hero than King Arthur? (or the other way around) What can we do about endangered species? What makes a poem good or bad? What makes a movie good or bad?</p>
<p>A Few Questions that have been previously approved for other students</p>	<p>Why do teenagers find smoking a cool thing? What makes a popular kid popular? What does it take to become an Olympic swimmer? What kind of shoes do sk8boarders prefer? With what kind sk8boadring? and why? What does it take to be a marine biologist? Why do the Palestinians and Israelis fight? What makes a good parent? What is good photography? What is a good friend? What is the of music on the brain?</p>	<p>Why do scientists use rats for lab experiments? How to find a specific hockey card when collecting? How do you get in to the Olympics with Taekwondo? How I can become a career ballet dancer? How can I help the environment at home? What can I do with Helicopter pilot training? What does it take to be a Chemist? What does it take to win medals and competitions when you are a synchronized swimmer? Why do people take drugs and smoke when they know it is very bad for them?</p>

Appendix C

CMS Note Taking Form C-2

Weaving a Thought Cloth C-3

The idea of research as "weaving a thought cloth" comes from Sandra Kirby and Kate McKenna's 1989 book: "Experience, Research, Social Change: Methods from the Margins". Published by Garamond Press, Toronto.

How often do we see students who appear to be engaged in researching a topic, but when we look further into their activities, they are "mindlessly" taking notes while engaged in other conversation, or simply copying material directly out of a resource, or are not thoughtfully engaged in the topic (visualizing, questioning, following tangents...)? Weaving a Thought Cloth is one way to ensure complete engagement and to avoid "cut and paste" researching. Weaving a thought cloth is an effective way to begin a unit of study, or can be added to the beginning of any research project.

Deepening Initial Understanding of a Research Topic by...

Weaving a Thought-Cloth

What is a thought-cloth?

A fabric is made up of threads that are woven together. Some fabrics are loosely woven and are fragile to stress, while other fabrics are woven tightly, and are resilient to strain and challenge. When you weave a cloth made of thoughts, you need an initial structure (or plan) for the fabric. Once you have your initial structure, the more threads (or information) you weave into the cloth, the more resilient your ideas about a topic to challenge and the more uses you will have for your understanding.

Some students begin researching a topic by taking notes on details. Some students are not even engaged in their topic while they are taking notes, and if you asked them to share their understanding, they often cannot do so. When students begin to take detailed notes on a topic before developing some understanding (structure) of the topic, the results may at first appear pleasing, but very soon, it is evident that there is little depth to the understanding of the topic: the integrity of the fabric quickly breaks down to challenge or stress.

How do we weave a thought cloth?

1. Begin by writing down what you know about the topic (accuracy is not important)
2. Survey numerous resources on the topic (books, Internet, reference books...),
 - a. and without writing things down, try to get a picture of the topic. If you are working on Ancient Egypt, you might follow your interests and scan numerous sources. For example, if you are interested in war, or art, or how people live, then you would seek out information on the topic and follow your mind where it wants to go. If you are scanning information and pictures on how people live, and find yourself gazing with interest at the architectural wonders of Ancient Egypt, then you would follow your nose. This is an active type of scanning, where you are trying to find general threads of understanding about the civilization.

- b. At the end of 30 minutes of browsing, close out all resources and quickly write (in point form if you wish) about the areas you looked into and the basics of what you learned. The first couple of times you do this, you might find it difficult to remember details, but you will soon become quite good at remembering quite a bit at the end of your session. It is not uncommon for students to be able to write 500 to 1000 words after a “weaving session”.
 - c. Meet with a small group (or the whole class) and begin conversations about what you have learned. This is not a presentation...this is a conversation, in which you support and challenge each other’s findings.
 - d. After three to four sessions, you should begin to have a general picture of your topic: a basic structure to the *thought-cloth* that is now ready for more detailed work.
3. Now that you have the major threads of a *thought-cloth* in place, it is time to choose what you will work on.
- a. What aspects of the main topic will you focus on (if not all aspects)?
 - b. What will you do with the information you find (Web page, PowerPoint Project, Hyperstudio Project, Newsletter, Essay, Television Broadcast, historical fiction story...)?
 - c. What information do you need to weave a strong *thought-cloth*?
 - d. Write down some big idea questions that you will focus on in your research. Here is an example based on the following project:
 - i. A short story about a young boy who enlists in the Egyptian Army because it is the only way he can get close enough to an evil general to kill him for revenge. For this project, you might have the following “big idea” questions:
 1. How were young men treated in Ancient Egypt?
 2. What was life like for soldiers in Ancient Egypt?
 3. When and where would this story take place? What would life be like in that time and place?
 4. What would a young soldier see, feel, hear, taste touch in his everyday life? Who would he talk to and how?
4. Use a variety of resources to find out information that answers your big idea questions. As more questions come out of deeper research, change and add to the questions above. Here are the rules about note-taking:
- a. **You may not look at any resources while you are writing.** How do you do this? Well, you read and view resources for a while, the way you did when first starting your thought cloth; then, you put the resources aside and write down notes about what you read.
 - b. Notes must be very brief and be in your own words and in your own voice.

5. Regularly check the information you are gathering with other students. Talking with others about what you have found is a good way to help you weave your understanding effectively. Also, comparing notes with others allows you to:
 - a. Ensure your understanding is based on accurate data. If you and another student disagree about an event or a detail in the research, it is a good opportunity to find out which is the accurate data.
 - b. Obtain other ideas regarding areas to research and resources to find information.

Appendix D

Courtenay Middle School Web Evaluation Form

Name: (replace this with your name)

Division:

Date

Page __ of __

Research Question/Topic:

Evaluating Web Resources

Copy and Paste the URL of the Web resource you are evaluating in this section.



Accuracy

Are sources listed for the facts?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Can information be verified through another source?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is the site clean of errors (grammar, spelling...)?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Authority

Is the publisher reputable?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is the author qualified to write on the subject?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is there a means of contacting the author or sponsor?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Objectivity

Is the sponsorship of the resource clear?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is the Web Resource free from commercial interest?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is the Web resource free of any obvious biases?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Currency

Is there a publication date listed?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Is there a date listed for the last update?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Coverage

Are the topics covered in depth?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Does the content appear to be complete?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

Evaluation

The Web resource receives an evaluation out of 5

5 - If you answered "yes" 11 or more times

4 - 9 to 10 times

3 - 8 times

2 - 7 times

1 - 6 times

0 - fewer than 6 times



/5	/5	/5	/5	/5
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This resource has been designed by A. Luxenburg for use with Courtenay Middle School students. The questions are adapted from several sources, chief of which is Barron, E., Ivers, K. (1998). The Internet and instruction: Activities and ideas. Englewood, CO: Libraries Unlimited.