

Action Research Project: Searching – From the Inside Out

Cathie Conforti, Gail Desler, Alix Peshette

Statement of Problem

Instead of drowning in the abundance of information that floods their lives, information literate people know how to find, evaluate, and use information effectively to solve a particular problem or make a decision.

Dr. Francis Keppel

Being able to find answers to problems or questions is a skill all people find useful. Whether the need arises to find which schools have the highest API scores or simply to find the closest theater where the latest movie is playing, everyone needs to find answers. Indeed, in the age of information, those who are able to retrieve information quickly and efficiently are considered information literate.

Today students face a new challenge in achieving information literacy. Being literate requires more than just being able to open a textbook, scan the index, and locate the answer. Given the vast amount of information now available to students (regardless of grade-level), textbooks are simply one type of source students can turn to in their quest for information. Savvy textbook publishers now include Internet sites in their chapters, knowing that the Internet offerings are not limited to state and district adoption cycles. Many districts have budgeted more for Internet wiring than for textbooks. Students are often logging on to the Internet before checking out anything from the library (McKenzie, 2000).

However, not all students are actually finding useful information as they venture out into cyberspace. In fact, many students are overwhelmed by the amount of

information available, the juxtaposition of contradictory information, and a format that does not instantly provide the right answer, something they could always count on from their textbook. “Information helps us reach conclusions, make our choices, and communicate more effectively. But the good stuff is often buried in heaps of junk (Valenza, 2000).” Without the tools for wading through the Internet’s information glut, students are not truly information literate.

To address the problem of information literacy, we see a need to provide our students with an information toolkit (McKenzie, 2000). This kit will include strategies not only for conducting Internet searches, but also for evaluating the usefulness of the information. Information literate students who can find and evaluate information will welcome the challenge to go beyond the distilled information of the textbook – and beyond state and district mandated standards.

Area of Focus

The purpose of this project is to investigate digital literacy. Our goal is to develop a set of classroom lessons based on our findings. The lessons are designed for direct instruction and can be taught in less than two weeks of class time. Our “toolkit” will include a pre- and post-survey for assessing student ability to retrieve information; a website evaluation template to help students question the reliability of information; a note-taking template to train students to document their own progress in locating useful information; and a reflection piece to encourage students to think about the steps they have taken into the world of research.

Rationale Statement

We recognize the need in our classrooms to equip our students with tools for locating and evaluating information. As a result of observing our own 5th, 6th, and 7th grade students in the process of doing Internet research, we are concerned with their often hit-and-miss approach. It is not uncommon for our students to complete a research session, for instance, with printouts of questionable value on the status of women during the Han Dynasty or claims of “I couldn’t find anything.” Yet we have no intention of limiting our students to textbook-driven research topics. We recognize that “successful searching and efficient electronic investigations must rest upon a carefully developed, structured foundation of information-literacy skills that would include solid questioning, prospecting, translating and inventive abilities (McKenzie, 1999).”

If we can provide our students with the tools for locating and evaluating information, they will have the information-literacy skills necessary to succeed in an increasingly standards-driven curriculum and technology driven-work force.

Review of Relevant Literature

Increasingly, ‘becoming literate’ will become a more precise term than ‘being literate,’ reflecting the continual need to update our abilities to communicate within new technologies that regularly appear. (Donald Leu, 2000, p.24)

Across the nation educators are scrambling to find funding for wiring to the Internet (McKenzie, 1998). As more and more classrooms go online, teachers are recognizing that the definition of literacy is changing. From the 1800’s when people were often considered literate if they could sign their signature with their name rather

than an X, to the 1900's when typically the primary dictionary definition of literate was "able to read and write (Heritage, 1981)," educators now must examine literacy from a 2000's perspective. Today the word *literacy* is frequently combined with the word *information*. Many educational associations are attempting to define literacy in the information age. The Association of Supervision and Curriculum Development (ASCD), for instance, states that "information literacy ...equips individuals to take advantage of the opportunities inherent in the global information society. Information literacy should be a part of every student's educational experience (Montgomery, 1999, p.1)." Michael Lorenzen (Lorenzen, 2001) points out that there is some urgency in the need for schools to promote information literacy. If we are simply to turn students loose on the web without providing structure and strategies to their search for and evaluation of information, the end product could be a generation of information illiterate students.

An Escalating Need for Literacy

According to Naisbitt (Association, 1994), the Information Age will impact our future job market. The demand for white-collar jobs over blue-collar jobs will increase. Information gathering and information sharing will become a basic job skill requirement. Yet our schools still maintain the Industrial Age format of direct, assembly-line instruction by the teacher to rows of students (Thornburg, 1995). New models need to be observed and evaluated in order to prepare our students for the real world of work they will encounter as adults. "In this rapidly changing environment, the role of educators has changed from disseminators of a finite knowledge base of information to facilitators of the process of accessing and interpreting new information. There is no way to predict

what core of facts our students will need to know in the twenty-first century. Therefore, educators must consider what strategies enable students to be well-informed, creative thinkers and active participants in our society. The number of available facts will change exponentially in their lifetimes, but the basic skills of information processing will remain constant (Librarians, 1998).”

Defining Literacy

The concept of literacy in the information age is a complex one. In order to understand current definitions of literacy, it is helpful to understand the evolution of the definition. Although civilizations are often judged by their literacy rates, literacy needs (and definitions) have changed over the centuries. To the citizens of ancient Mesopotamia, basic literacy was the ability to keep simple accounting records of merchandise traded. Scribes purposefully chose not to simplify the rules for decoding cuneiform writing. Why should the masses have access to literacy? Only the wealthy were likely to send their children to scribe school. The ability to correspond through writing was hardly a basic job requirement. Their societies could function quite well with high “illiteracy” rates (Leu, 2000).

In medieval Europe, the Catholic Church served as the bastion of literacy, information and research. Lesser sons of the nobility and clever sons of the peasantry could enter the priesthood and establish a career based on literacy. Besides the obvious religious implications of joining the Church, men of the cloth were also prepared to become the custodians of the written word and advisors to the often-illiterate rulers. A large part of the duties of some monastic orders was the hand copying of manuscripts.

This tedious process resulted in small numbers of manuscripts that were jealously guarded by the monasteries and revered by the commonality as sacred text. Thus, if a thought or opinion was written, it was considered the 'truth.' Clerics who rose to positions of trust and became advisors to monarchs often wielded considerable power behind the throne. The remaining 90% of the population, the peasants, by lack of literacy, were destined for a life that was brutish, exhausting and short. Without literacy, the peasants had no power to change their circumstances by rising above their station in life. Thus, literacy represented real power (Rowling, 1968).

In 1455, Johannes Gutenberg's invention of movable type rapidly made the printed word more accessible. "Gutenberg's invention brought about changes, and it is interesting to speculate on the major possible parallels between the changes that flowed from Gutenberg's invention and those that can come from fast computing and the Internet (King, 1997, p.4, ¶4)." The context of literacy changed from being a religious vehicle to being a secular vehicle of mass communication. The impact of mass-produced secular information created a tremendous rise in the literacy rates of Western Europe. "The effect on communication and the spread of ideas was huge. Barriers between scholar and citizen, between the learned elite and those who needed to learn, were broken down (p.4, ¶4)."

Following the American Revolution, leaders such as Jefferson viewed literacy as "central to the survival of government as informed citizens made reasoned decisions at the ballot box (Leu, p.4)." By 1959 the United Nation's published its "Declaration on the Rights of the Child: Principle 7," declaring "the child is entitled to receive free and compulsory education, at least in the elementary stages (Langford, 1998, p.5)."

Today literacy is considered a universal right. Its definition has changed greatly from the ancient river civilizations to modern-day travelers on the information highway. Today literacy involves more than the ability to read and write. Linda Langford, in her article "Information Literacy: A Clarification," cites studies done by Kuhlthau that tie the definition of literacy to the current information needs of a society. Kuhlthau found that "to be literate was not only to recognize when information was required, but involved the ability to construct one's own knowledge through a process that gave meaning and self-interest to the notion of learning throughout a lifetime (Langford, 1998, p.5)." Part of today's literacy challenge is being able to deal with vast and rapidly escalating amounts of information. According to Langford, the "mere ability to read and write is being translated into the ability to read, write, and to develop the capacities to understand, absorb, assimilate, and digest the images being transmitted electronically with the added capacity to communicate these images electrographically (p.5)."

Donald Leu (2000) has also studied the ever-changing definition of literacy. He applies the term "deictic" to literacy definitions (p.3, ¶ 6). He explains that "deictic" refers to words whose meanings change quickly. Words such as "today," for instance, change meaning literally overnight. Leu explains that it is not so much the passing of time that affects the meaning of literacy, but rather rapidly emerging new technologies and the envisionment of how these improved technologies might be used. Leu explains the difficulty of conducting long-term studies on the impact of technology integration into the curriculum on improved student learning. In classrooms, for instance, educators would no longer consider students to be high-end consumers of technology for simply being able to use a word processing program (p.22).

In this age of rapidly changing and wider access to technology, the Internet, and an enormous variety of sources of information, new skills are needed in order to be literate. It is no longer sufficient for students to assume that an author is an expert and that the information is valid. Books have traditionally been edited and published using established standards for authenticity of information. There is no master editor or publisher for the World Wide Web. It is up to the recipients to make meaning of the information. With so many types of informational sources available – text, video, animation, primary source documents, records of data – it is critical that our students learn to process through these sources and make analytical choices concerning the information (Pickering-Thomas, 1999). Accepting information at face value is no longer an option. According to Jeooek, the true meaning and underlying bias is not always apparent, especially to researchers with emerging information literacy skills. “Instead of drowning in the abundance of information that floods their lives, information literate people know how to find, evaluate, and use information effectively to solve a particular problem or make a decision (Association, 1994).”

With the reality of rapidly changing technologies comes the problem of assessing the implications and outcomes for acquiring literacy. In this information age, few would disagree with Donald Leu’s belief that “accessing information, evaluating information, solving problems, and communicating solutions are essential to success in this new era (Leu, 2000, p.5, ¶2).” As more states and districts weave technology strands into their standards, educators might have some concern about the literacy level of a student who could answer the questions at the end of the chapter, for instance, but who could not use word processing, email, electronic databases and spreadsheets, hypermedia, and Internet

technologies. Each of these technologies “has helped to redefine the nature of literacy and each has seen new envisionments for its use redefine the technology itself (p.5,¶2).”

Technology is changing literacy and literacy is changing technology.

Leu raises a concern that in the rush to be wired, many districts have concentrated more on technology itself rather than its use in the classroom. Obviously there is a need for increased and continued staff development in order for today’s teacher to be prepared to teach today’s student. Unfortunately, even in the best of situations where wiring and hardware are matched by effective staff development, districts may not be able to furnish the public with evidence of improved student learning. Often by the time a comprehensive study is completed, whatever tools and technologies were involved have become outdated and are no longer used in the classroom. Leu predicts that it will be awhile before assessments can keep pace with the technologies used in classroom studies (p.25). In the meantime, technology – and the definition for literacy – will continue to change.

Literacy in the Curriculum

Information literacy should be as basic to today’s curriculum as the 3R’s have been in years past. Jeremy J. Shapiro and Shelley K. Hughes question “what does a person need to know today to be a full-fledged, competent and literate member of the information society (Shapiro & Hughes, 1996, p.1)?” They point to the irony that over 200 years ago Condorcet, a philosopher, educational reformer and journalist who was in hiding from the Jacobin reign of terror during the French Revolution, published a piece that could be relevant to us today. Condorcet’s belief that there was a “link between

knowledge, liberty and happiness – a conception that is reflected in the Declaration of Independence and the U.S. Constitution – raises profound questions for those of us involved and concerned with not only the implementation and uses of information technology but with providing for knowledge and literacy about this technology (p.1, ¶3).”

Shapiro and Hughes recommend that an effective information literacy curriculum will have seven dimensions:

1. Tool literacy – the ability to understand and use the current tools of technology: software, hardware, multimedia.
2. Resource literacy – the ability to understand how information is formatted, stored, and retrieved electronically.
3. Social-structure literacy – the ability to understand something about the individuals and groups that generate electronic information.
4. Research literacy – the ability to understand the tools relevant to the work of today’s scholars and researchers such as analytical software.
5. Publishing literacy – the ability to publish using both textual and multimedia tools.
6. Emerging technology literacy – the ability to “ongoingly adapt to, understand, evaluate and make use of the continually emerging innovations in information technology so as not to be a prisoner of prior tools and resources (p.4).”
7. Critical literacy – the ability to evaluate the advantages and disadvantages of information technologies.

Shapiro and Hughes were designing a curriculum with the college student in mind. The American Association of School Librarians (AASL) and technology leader Jamie McKenzie suggested guidelines for an information literacy curriculum more in line with grades K-12. According to the AASL, to become effective information users, students must have frequent opportunities to locate, interpret, analyze, synthesize, evaluate, and communicate information (Montgomery, 1999). Jamie McKenzie contends that asking students to merely gather information is using yesterday's curriculum with today's technology (McKenzie, 2000). McKenzie explains that information literacy has three major components:

1. Prospecting: digging for pertinent and reliable information, sifting through and discarding information that is not useful
2. Interpreting: understanding the usefulness of information
3. Creating new and fresh ideas: developing original insights rather than merely rehashing the thoughts and words of others

McKenzie envisions a generation of "free range students," students who have learned to "feed on the wild grains and fragments available on the Internet or on the shelves of the local library (McKenzie, 1998, p.16)." He sees availability of vast amounts of information as an opportunity for students to become "infotectives," no longer limited to the distilled, second-hand information of the textbook. He defines an "infotective" as a "student thinker capable of asking important questions about data in order to convert the data into information...and eventually into insight (p.2)." It is the responsibility of the schools to provide the structures and tools to enable students to make meaning of

information. McKenzie warns, “ ‘info heaven’ can become ‘info hell’ if we do not equip students with the reasoning and exploration skills required to cope with ‘info glut’ (p. 3).”

The need for information literacy certainly extends across the curriculum. On a daily basis, educators see students struggling through what is increasingly an overwhelming amount of information. The process of taking students from research to writing is no longer a two-step process of taking information from the text and/or encyclopedia and copying it into the traditional written report format. Researchers Jacqueline Mancall, Shirley Aaron, and Sue Walker (Mancall, 1986) in their article “Educating Students to Think: The Role of the School Library Media Program,” advise educators to revisit John Dewey’s words “All which the school can or need do for pupils, so far as their minds are concerned is to develop the ability to think (p.20).” Their article examines the critical role the librarian/media specialist should play in designing a thinking curriculum for students, one that will prepare them to survive in an increasingly complex society. They stress the importance of teaching students to be “better observers, appliers, and evaluators of ideas and information, all areas fundamental to the process of thinking in a critical fashion (p. 20).” They question the value of a curriculum that places more value on the product rather than the process. Research should no longer be an exercise in finding “correct answers.” Students need strategies that will help them “develop insight and facility in structuring successful approaches to solving their information needs (p.21).”

Mancall’s team has developed a list of ten skills essential to learning how to do research:

1. Distinguishing between verifiable facts and value claims

2. Determining the reliability of a source
3. Determining the factual accuracy of a statement
4. Distinguishing relevant from irrelevant information, claims or reasons
5. Detecting bias
6. Identifying unstated assumptions
7. Identifying ambiguous or equivocal claims or arguments
8. Recognizing logical inconsistencies or fallacies in a line of reasoning
9. Distinguishing between warranted or unwarranted claims
10. Determining the strength of an argument

In developing the above list, these three researchers are confirming Jamie McKenzie's concern for the need to provide students with the means for finding, evaluating and using information.

Literacy in the Social Studies Classroom

Today's student is no longer limited to a history text as a main source of information. The Internet offers an increasing library of online primary sources. As students go online seeking information on an assigned topic, they are likely to find sources that contradict, corroborate, or question theories presented in the textbook. At a time when state standards mandate that students be able to differentiate between primary and secondary sources, the need to go beyond the text has become a genuine one. By mandating that students work with primary sources, the state is encouraging students "not to just study history, but to investigate it (Podany, 1997, p.147)." While it has always made sense to allow students to construct meaning in history the same way historians do

– by going to the sources, it has not been until the arrival of the Internet that teachers and students could easily access the primary sources that make personal interpretations of historical events possible.

Many national and international museums and archives are digitalizing their collections of documents, letters, diaries, artifacts, and photographs at an escalating rate. The Library of Congress, for example, offers an extensive online assortment of primary documents. Students can log on to the Smithsonian website and read first-hand accounts of the Woolworth's sit-in, or from the National Archives and Records Administration site, read the telegrams and letters Jackie Robinson sent to Presidents Eisenhower and Kennedy, or from the PBS site, read diary accounts from Lewis and Clark's Corps of Discovery. From an incredible assortment of sites and sources, students can reconstruct history through the eyes and accounts of ordinary people, as opposed to what historian/film producer Ken Burns refers to as the "top down" accounts found in textbooks (Monk, 1994).

This year, a handful of high school districts in California and Illinois will have a unique opportunity to put a face and voice to the study of the Holocaust. Film producer Steven Spielberg will be making available to educators via the Internet thousands of Holocaust survivor and rescuer interviews conducted by his Shoah Foundation (Foundation, 2001). Several schools have received grants to allow for video conferencing with Holocaust survivors through the Simon Wiesenthal Museum of Tolerance. These two organizations are dedicated to providing students with information and helping them gain an understanding of why it is important to study the past. They

offer extensive training sessions to educators on the appropriate use of their resources (Tolerance, 2001).

Not all campuses have the hardware, software, or staff development in place to allow their students the type of structured and safe access to information described in the above paragraph. There will be students this year who begin their research project on the Holocaust by going online and searching for sites. Some of these students will find sites claiming that the Holocaust was a hoax. Unfortunately there is no quality control in cyberspace. Will these students have the tools to do the research, to evaluate the information, and to act on that information? Will they begin their research with the competencies Irving describes as essential: critical thinkers, competent readers, perceptive questioners, resourceful information searchers, skilled information handlers, and accomplished presenters (Pickering-Thomas, 1999).

In his article “The Web – Teaching Zack to Think,” Alan November discusses the need for schools to teach strategies for online searching, for deconstructing URLs, and for validating information. He too is concerned that a student researching the Holocaust might come across articles such as the one written by Holocaust denier Professor Arthur Butz from Northwestern University. Unless students are taught to analyze a URL, they might not realize that part of the address for Butz’s website contains a tilde (~), indicating his is a personal web page, not a university sponsored page. If students know how to research the author’s background, they might begin to question if a professor of electrical and computer engineering would necessarily be qualified to write on a historical event. November argues, “To survive in the future economy, kids must learn how to research, publish, and communicate working with the Internet and other information tools

(November, 1998).” As students increasingly rely on the Internet for information, schools must teach students how to search for and evaluate information.

The Need for Internet Search Strategies

Knowledge is of two kinds: we know a subject ourselves,
or we know where we can find information upon it.

Samuel Johnson, 1775

Faced with the sea of information available on the Internet, the student who is given a research assignment, but no research strategies is bound to flounder in that sea. Recently sites have sprung up from highly respected sources which make searching easier by the click of a button or the fill-in-the-blank approach. While these sites may help students cobble together some available data, they do not help students develop concrete, transferable research and search strategies. Left to their own devices, students will often go to a popular search engine or directory, type in a keyword and then wade, overwhelmed, through the deluge of information. It is small wonder that the retrieved information is often superficial, inaccurate or only peripherally related to the topic.

The American Association of School Librarians (Librarians, 1998) has set forth The Nine Information Literacy Standards. The first standard reinforces the need for effective Internet search strategies.

Standard 1: The student who is information literate accesses information efficiently and effectively.

1.1 recognizes the need for information

1.3 formulates a question based on information needs

Invitations to Inquiry

From a review of current literature on search strategies, it is evident that formulating the question is the critical first step. Technologist Jamie McKenzie states, "Questions and questioning may be the most powerful technologies of all...If we hope to see inventive thought infused with critical judgment, questions and questioning must become a priority of schooling and must gain recognition as a supremely important technology (McKenzie, 2000, p.1, p.6)."

Certainly, the step of questioning is not new, but rather a reiteration of the scientific method of inquiry. Springing from the Academic Reform Movement of the 1950's and 1960's as described by Joyce and Weil in *Models of Teaching* (Joyce & Weil, 2000), the use of the scientific method of inquiry has been infused into public schools as the model for research in academic disciplines.

Before one can even put fingers to keyboard, a clear statement of the question must be developed. Called "task definition" by Michael B. Eisenberg, Doug Johnson, and Robert E. Berkowitz (1988), this first step in the information problem-solving process is to recognize that an information need exists, to define the problem, and to identify the types and amount of information needed (p.28).

One strategy used with success in K-12 classrooms has been to literally have the students write out their research question. With a little prompting, students can be motivated to be as specific as possible. An example of such a research question, one with great appeal to junior high school students might be "Where can I learn skateboard tips and tricks?"

The next step involves circling all the relevant parts of the question. This reduces the sentence to a series of keywords, such as skateboard, tips, and tricks. This parsed research statement may now be succinct enough to raise the accuracy and relevancy of an Internet search (Eisenberg, 1988). However, where to apply this set of keywords is now the most relevant question.

Information Sources

In the rush to apply high tech solutions to research and problem solving, some of the more mundane but highly effective sources of information may be overlooked. Print sources still offer accurate information on topics that are not affected by time, trends, or new discoveries. The online biographies of inventors may have new interpretations of their lives and accomplishments, but print sources can still provide valuable information for the research quest.

Students can collaboratively brainstorm and assess the value of various types of electronic resources for data gathering, including databases, CD-ROMs, commercial and Internet online sites, electronic reference works, community and government information electronic resources.

Location and Access

The American Association of School Librarians states in Standard 6 of *The Information Literacy Standards* that a student who is an independent learner is information literate and strives for excellence in information seeking and knowledge

generation (Association, 1994, p. 42). One might note wryly that this is the standard, but hardly the reality in public schools.

All too often students gravitate towards a favorite search engine or directory, regardless of its suitability for the research task at hand. Indeed, due to the commercialization and proliferation of search engines and directories which now offer ancillary services such as e-mail and chat opportunities, student choices are now more than ever driven by forces other than a search for excellence in information seeking.

Subject Directories and Search Engines

At the core of good decision-making for research locations and access is the understanding of the differences between subject directories and search engines. Each type of informational source has strengths and weaknesses, which can be utilized for effective researching or unparalleled frustration on the part of the student (Eisenberg, 1988).

The chief strength of a layered subject directory is that it is composed of evaluated resources that organize information hierarchically. It is a suitable vehicle for narrowing down a search while one looks for general information on a topic, such as nuclear power. Subject directories are probably the most accessible search vehicles for students. Through a process of decision-making, a student can sort down through the layers of categories to an appropriate layer in which to delve more deeply into the specific topic. While keywords can be helpful in the use of a subject directory, one does not need to be proficient in selecting the keywords to obtain satisfactory results. The

chief weakness in subject directories is that they usually search only the index page of a web site, thus mention of a subject, in a deeper layer of a site, can be overlooked.

Search Engines and Multithreaded Search Engines

Search engines allow the user to give search instructions through the use of keywords and Boolean logic. The search engine then applies the keywords against a database of words. Multithreaded search engines search many other search engines simultaneously. The obvious strength of a search engine is that every page of a web site is searched for the keywords or combinations of keywords. The chief weakness is that one could use a non-specific keyword, devoid of Boolean logic, such as the word *dolphins* and receive hits on everything from sports teams named Dolphins to varieties of *dolphins* found in the Pacific Ocean (McKenzie, 2000,p.127).

Boolean Logic

If the conscious and appropriate use of subject directories and search engines has been taught to students, then successful search strategy skills must continue with instruction in the use of rudimentary Boolean logic principles. The principles of Boolean logic seek to construct logical relationships among search terms using three logical operators: OR, AND, NOT. Proper understanding of the underlying principles of these operators solve the afore mentioned problem regarding the search string: dolphins. If only the word *dolphin* is keyed into Google.com, one receives 766,000 hits, starting with information on the Miami Dolphins. If searching for information on the reproduction system of dolphins, a search string composed of *dolphins* AND

reproduction results in only 15,800 hits, starting with information on Bottlenose dolphin reproduction at Seaworld. Obviously, the goal is for fewer and more relevant hits to aid in the research quest (McKenzie, 2000, p.127).

Evaluating for Authority, Relevance, Accuracy and Comprehensiveness

Unlike print sources of the past that passed through a series of editing and clarifying stages by established and respected sources, information found on the Internet can be generated and published by anyone with Internet access. This situation is analogous to the information glut that followed the invention of the printing press. The mass dissemination of information hardly qualifies it as veritable, unbiased or comprehensive.

Indeed, the ability to evaluate information for relevance, accuracy, bias and comprehensiveness is among the most important skills needed by students if they are to become life-long learners and sophisticated consumers of the information age.

Janet E. Alexander and Marsha Ann Tate (*Web Wisdom: How to Evaluate and Create Information Quality on the Web*) suggest five criteria for information evaluation: authority, accuracy, objectivity, currency and coverage. This criterion is designed to foster the questioning of information (Alexander, 1999, p.23).

Authority

Is it clear who is responsible for the contents of the page? Is there a link to a page describing the purpose of the sponsoring organization? Is there a way of verifying the legitimacy of the page's sponsor? That is, is there a phone number or postal address to contact for more information? (Simply an email address is not enough.) Is it clear who wrote the material and are the author's qualifications for writing on

this topic clearly stated? If the material is protected by copyright, is the name of the copyright holder given?

Janet E. Alexander and Marsha Ann Tate (Alexander & Tate, 1999, p3)

The evaluation of authority can start with the dissection of the URL. Students can be directed to evaluate whether the web URL ends in a .com, .edu, .org, .gov or .mil. Even so, the scrutiny of URL endings can be misleading. The use of .org can signify an organization promulgating hate or gross historical inaccuracies. A URL that ends in .edu, but contains a tilde (~) followed by a personal name can indicate a personal web page written by an employee of the educational institution, but not in any way condoned or supported by that institution. Clearly, the student researcher must be willing to ask and answer all of the evaluative questions listed above to fully ascertain the authority of published work on the Internet (Alexander & Tate, 1999).

Accuracy

From the grammatical accuracy of the written words to the citing of sources of factual information, much can be gleaned about the accuracy of the proffered web information. Crosschecking facts and assertions with other reliable sources of information verifies the initial source of information (Eisenberg, 1988).

Objectivity

On the surface, asking if the information is provided as a public service, is free of advertising, is it clearly differentiated from the informational content, might seem to answer the question of objectivity. It can be posited that discerning objectivity requires understanding bias (Eisenberg, 1988).

Use organizational systems and tools specific to electronic information sources that assist in finding specific and general information ...boldface and italics, graphic clues and icons, cross-references, Boolean logic strategies, time lines, hypertext links, knowledge trees, URLs, etc., including the use of search tools and commands for searching the Internet (e.g., Yahoo, Lycos, WebCrawler, Veronica, Archie) (p. 13).

Students will need guidance and tools to truly become “infotectives” in the Information Age. Following the recommendations by the U.S. Department of Education’s National Technology Educational Plan (U.S. Department of Education, 2000), it is strongly recommended that educators take an in-depth look at how they are currently enhancing students’ technology and information literacy skills.

Education and Training are central to how nations will fare in the future. Strong nations and strong communities will distinguish themselves from the rest by how well their people learn and adapt to change. The task of education must therefore be to provide the young with the core knowledge and core skills, and the habits of learning, that enable them to learn continuously throughout their lives. We have to equip them for a future that we cannot really predict.

Prime Minister Goh Chock Tong, Singapore (*U.S. Department of Education, 2000*)

Summary

The literature substantiates the need to teach concrete, discrete research skills to students. Between academic requirements and demands of the work world, students are at a life-long disadvantage without these skills. Within the authors’ three classrooms, there is a continuing struggle as to how to take students through the research process to some type of final product resulting from their research. In the discipline of history, for instance, the authors question the value of static resources, such as a textbook, as the only source of information. Digital literacy skills allow students to break out of the confines of distilled and often

voiceless accounts of historical events provided by textbooks. In addition to textbooks, they now have dynamic online sources at their fingertips that may contradict, corroborate, or question current textbook theories.

Across the curriculum and throughout life, students will need to locate, evaluate, and synthesize information. Students who possess these skills will be empowered life-long learners. Educators who integrate information literacy skills into the curriculum indeed lay a foundation for an informed citizenry.

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