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Information Search Strategies on the Internet: A Critical Component of New Literacies

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Abstract

The ability to effectively search and locate information on the Internet is an important skill for education and essential for success in the 21st century. The results from a single search task can produce an overwhelming amount of information. Without the new literacy skills and strategies that the process of searching and locating information on the Internet requires, this can quickly become a daunting task. The purpose of this exploratory study was twofold. First, it set out to identify the specific new literacy skills and strategies that are required to successfully access information on the Internet. The second focus was to determine how the participants learned to search for information on the Internet.

This qualitative study was conducted in a rural school setting in the northeast with seven middle school level teachers. Collected data consisted of observational field notes and interviews with the participants. Five main themes emerged from the data analysis: literacy skills, other skills and strategies, learning technology, emotional reactions to technology and issues of digital divide. These findings will be useful in aiding researchers and classroom teachers who seek to more accurately define the new literacies required for success in online environments.

Keywords

Search strategies, Internet, New literacies, Information and Communication Technologies, Digital divide, Literacy skills, Learning technology

Introduction

Computers have become an integral part of our culture. As technologies continue to move ahead, so too must the educational system that has the job of ensuring our children are ready to become effective members of our society when they leave school. [Berkowitz](#) (2002) reports that information and technology skills are the 'new basics' and being able to find and use information more effectively is essential to the success of students of all ages. Information Communication Technologies (ICTs) have infiltrated our daily lives. In order to provide our students with an adequate education, it is necessary to address these changes in our society through the education process. The National Council of Teachers of English (NCTE) and the International Reading Association (IRA) Standards for the English Language Arts state that middle school students should be able to conduct research using "a variety of technological and information resources" ([NCTE/IRA Standards](#), 2000). It is

clear that technology will remain a fundamental part of our education system and teachers are expected to incorporate the use of technology in classroom instruction.

As schools move to integrate technology into classroom curricula, students need to develop the new literacies required to prepare for a future in an increasingly digital society. "To become fully literate in today's world, students must become proficient in the new literacies of ICT" (IRA, 2002). [Leu, Kinzer, Coiro and Cammack](#) (2004) identify these new literacies in terms of five functions:

1. Identifying important question;
2. Locating information;
3. Critically evaluating the usefulness of information;
4. Synthesizing information to answer questions;
5. Communicating answers to others.

Of these five functions, the ability to locate information is perhaps the most critical as much of what we do on the Internet stems from our ability to adequately search for specific information. Furthermore, as the size of the Internet increases, efficient access to information becomes increasingly more difficult ([Nachmias & Gilad](#), 2002). The results from a single search task on the Internet can produce an overwhelming amount of information, often causing frustration and a sense of information overload ([Brandt](#), 1997; [Nachmias & Gilad](#), 2002). It takes having the ability to search in a strategic and concise manner to curtail the numerous possibilities that can inundate a searcher and prevent a virtual bottleneck that prohibits access to information. Obviously, information is worthless unless it can be efficiently located and retrieved.

Navigating the Internet has become an essential literacy skill for today's middle school students ([Eagleton, Guinee, & Langlais](#), 2003). Many middle school students may be fluent in using the computer for word processing, emailing, and instant messaging, however we cannot infer that they have the necessary skills to navigate the Internet or search for information efficiently ([Leu](#), 2000). Teachers need to provide students with strategies for successful online research by boosting their understanding of the inquiry process as it applies to the Internet ([Eagleton & Guinee](#), 2002). An important question then becomes whether or not teachers possess the required skills, strategies and dispositions necessary to efficiently search the Internet while overcoming the challenges inherent within a complex, multidimensional and unbounded online environment. It has been reported that adult Web users search the Internet more than they engage in any other computer activity (about 70% of their time online) except using email ([Nachmias & Gilad](#), 2002). Therefore, searching on the Internet isn't just a popular activity but an important skill needed to obtain information, thus understanding information searching processes is a relevant research issue ([Nachmias & Gilad](#), 2002).

Many researchers that have conducted studies in the area of searching on the Internet recommend that further research should be completed ([Eagleton & Guinee](#), 2002; [Nachmias & Gilad](#), 2002; [Sutherland-Smith](#), 2002). One way to enhance our understanding of the search process is to examine the user's behavior by analyzing the abilities and literacy skills required for accomplishing a successful search. This pilot study set out to add to the understanding of the processes employed when conducting a search on the Internet by identifying specific literacy skills and other strategies used when conducting searches and exploring the manner in which those skills were acquired.

Research Questions

1. How do teachers learn to access information on the Internet?
2. How do teachers conduct what they consider to be successful searches?

3. What literacy skills do teachers believe are necessary to the process of conducting searches on the Internet?

Setting

This study was conducted in a rural Pre-K through 8th grade school in northeastern Connecticut. Total enrollment is approximately 540 students. Graduating students attend a regional high school located in a neighboring community. There are 40 full-time classroom teachers on staff and 17 members of the support staff. A recent grant award designed to integrate technology within the social studies curriculum made it an optimal location to begin exploring the Internet searching skills the teachers possessed and how they acquired these skills.

Participants

Six middle school teachers participated in this study as identified with the following pseudonyms and teaching assignments at the seventh and/or eighth grade level:

1. Mark—Social Studies (3 sections), Mathematics (1 section) and Literature (1 section)
2. Molly—Science (3 sections), Pre-Algebra (1 section) and Literature (1 section)
3. Jess—English (3 sections), Mathematics (1 section) and Literature (1 section)
4. Marie—French (6 sections)
5. Shawn—Special Education (full-inclusion support)
6. Lisa—Technology Education

Purposeful selection ([Yin, 1989](#)) provided the researcher with the opportunity to take several factors into consideration when selecting participants. First of all, teachers with varying levels of technology and Internet experience were selected. Participants were self-identified as having minimal, adequate, or extensive experience. Selection procedures reviewed number of years of teaching experience and included teachers with less than five years, five to ten years, and more than ten years of teaching experience. Finally, both male and female participants were included.

Data Collection Procedures

Two data collection sessions were scheduled with each participant to coincide with planning periods or other times during the school day that did not conflict with teaching or other responsibilities. Both sessions were conducted within each participant's own classroom to ensure that the participant was comfortable with the surroundings and the computer to be used so unfamiliarity would not have an impact on the data. Each classroom had two computers connected to the Internet and participants selected which computer was to be used.

Initial Interview

An initial interview was conducted with each participant following a semi-structured protocol with further probing of participant responses ([Gall, Gall & Borg, 2003](#)). The questions focused on asking the participants about the processes of conducting a search on the Internet, what skills are required to accomplish a search task and how he or she learned these particular skills. Figure 1 outlines the initial interview protocol that was followed. The researcher added additional questions if participant responses prompted further exploration.

Figure 1. Initial Interview Protocol

Part I. Teaching background

Could you tell me a little bit about your background as a teacher?

Prompt participants to include the following as needed: job title, sketch of teaching job (responsibilities, etc.), years teaching experience, and years in this school.

Part II. Technology in the school

I'm interested in the school environment in regard to technology.

- How do you think this school fares compared to other schools?
- What do you see as the biggest problem with technology?
- How would you define technology integration?
- Do you have any concerns in regard to the integration of technology?
- How do you integrate technology into the classroom?
- Do you incorporate the Internet into the classroom in any way?

Part III. Personal experiences with technology

I want to ask you some questions about the Internet and your personal experience.

- Do you recall the first time you ever used the Internet?
- What were your initial impressions?
- How did you learn to navigate the Internet?
- How often do you use the Internet?
- What types of activities do you engage in most frequently on the Internet?

Part IV. Present scenario**Part V. Searching skills and strategies**

Questions to follow the scenario prompt.

- What type of literacy skills do you think are used when navigating the Internet?
- What additional skills, if any, are needed to navigate the Internet?
- Do you see the Internet as an important educational tool?
- Is there anything else you would like to add?

Following the interview questions, participants were asked to verbally respond to a scenario that prompted them to identify procedures for locating information on the Internet. The following text was read to the participants by the researcher:

I'm going to give you a kind of scenario. I want you to explain how you would approach this particular situation. You have friends visiting from out of town. You're planning a day trip to Boston and you want to locate an Italian restaurant. How would you use the Internet to obtain this information? Explain this as a step-by-step process.

After participants responded to the scenario, the researcher posed additional questions. The purpose of providing the scenario first was to prompt participants to think about search processes before asking them to identify the specific skills and strategies that are required. The interview sessions were audio taped and transcribed for analysis.

Observation of Search Task

An observation and follow-up interview was scheduled with each of the participants at a second session. Each participant completed a predetermined search task on the Internet that was observed by the researcher. Participants were asked to utilize a think aloud strategy ([Pressley & Afflerbach, 1995](#)) during the search process to indicate what was being done at each stage of the search task on the computer and why. The researcher

prompted the participants throughout the search task in order to assist in documenting the activity. The following text was given to each participant on a slip of paper at the start of the search task: *Locate a stuffing recipe that includes sausage in the ingredients*. Five of the six participants participated in the search task. Due to scheduling conflicts, one participant was not available to complete the search task. These sessions were audio taped and transcribed to capture the data from the think aloud. Additionally, the researcher observed each of these sessions and took field notes to prompt questions for the final interview session.

Final Interview

A follow-up interview was conducted with each participant after completing the search task. This interview was unstructured and focused on asking questions about the processes and procedures that were used to complete the search task. Additionally, questions about the participant's perceptions of his or her own searching ability and success with the search task on the Internet were posed. These interview sessions were also audio taped and transcribed for analysis.

Data Analysis

The research design for this study allowed for methodological triangulation of the data by using multiple methods of data collection ([Janesick, 1994](#)). This technique provided depth to the data and allowed for the confirmation of patterns and themes that were documented during analysis. Additionally, the inclusion of several participants in the study provided for data triangulation by offering alternative sources for the data through the inclusion of multiple participants ([Janesick, 1994](#)). Member checking, which allowed each participant the opportunity to clarify some of the data that was collected throughout this study was also utilized ([Gall, Gall & Borg, 2003](#)). This technique was utilized by presenting each participant with a copy of the transcript from the initial interview and the analysis of the transcript. This enabled the participants to clarify any misinterpretations that were made during the analysis process. Due to time constraints, member checking was not utilized following the search task and follow up interview segment of data collection.

Transcriptions and field notes were analyzed using a constant comparative method ([Gay & Airasian, 2000](#)) to determine emerging patterns and themes. Initially, commonalities in the processes observed most frequently when searching on the Internet were identified. Further analysis of the transcriptions identified literacy skills and strategies that were documented. Five main themes evolved from the analysis that included (a) literacy skills, (b) other skills and strategies, (c) learning technology, (d) emotional reaction to technology, and (e) issues of digital divide.

Results

Literacy Skills

Various literacy skills were reported by the participants as important to conducting a search on the Internet. Reading was the most fundamental literacy skill identified by the participants. However, several different types of reading were identified to include:

1. The ability to scan, skim and sift through material quickly;
2. In-depth reading of information and texts;
3. Critical reading ability.

Table 1 highlights examples from the participant responses that were documented. The most prevalent of the three types of reading identified was critical reading and the ability

to evaluate and/or interpret the information that was presented in both search results and within web pages. Additional literacy skills presented by the participants included the ability to use language well and the importance of developing written expression.

Table 1. Literacy Skills Identified as Important to Searching on the Internet

Skill	Description
Reading	Scanning, quick reading . . . I would think probably quick, quick reading, looking for highlighted words, words they're searching for and they would probably read more in-depth on certain page if they found it, pertaining to what they were looking for (Jess, T2, L72-78).
	You need to be able to read and interpret what you're reading (Shawn, T1, L120-121).
	You need to be able to sift through a lot of material and find what's important and what's relevant (Lisa, T6, L169-171).
Writing	In a written way, express what you're looking for (Shawn, T1, L121-122)

Other Skills and Strategies

Higher order thinking skills was another essential skill reported as being necessary for successful searching and navigation of the Internet. More specifically, a sense of good judgment and common sense were reported to be key to searching for information. Logic was also indicated as an important element for using the Internet. Examples of these skills are shown in Table 2. One can clearly see from the examples provided that not only are these seen as important higher-order thinking skills but they overlap with the critical reading skills that were also identified and are important to reading comprehension ability. [Cummins](#) (2001) expresses that the most crucial aspects of searching the Web are developing a good search strategy by asking specific questions and following up by thinking critically and evaluating the results you receive.

Table 2. Other Skills and Strategies Identified as Important to Searching on the Internet

Skill	Description
Critical Thinking	You need to be a critical thinker and really look at what you're viewing (Mark, T5, L132-133).
Judgment and Common sense	I think some common sense, good judgment that the site you're at is an accurate and reliable one. I guess some good judgment on how to pick a good site would help you out the most (Jess, T2, L83-85).
Logic and	I think problem-solving skills. If you're not finding what you want, you

Problem Solving	can always step backwards and try other avenues (Lisa, T6, L181-183).
	Logic, otherwise I can spend all day with a million hits on one thing. The flexibility to try different approaches to problem solving. (Marie, T4, L115-118)

Learning Technology

All of the participants indicated that they learned how to search the Internet in one of two ways, either through direct instruction or hands-on experience. Hands-on experiences included (a) using a trial and error approach, (b) being self-taught, or (c) a combination of attending workshops followed by self-exploration. Table 3 provides examples of the trial and error approach that is indicative of how middle school students commonly learn to use technology.

The participants that learned through a direct instruction method reported that information about searching and using computers was most often obtained during a one-hour staff meeting or a professional development session. One of the participants relied on handouts presented during the lecture-style sessions when conducting the search task for this study. The documents were stored in a folder located on the computer cart in this teacher's classroom. When given the search task by the researcher, the participant pulled out the documents and read through the procedures before beginning to search.

Table 3. Learning How to Search on the Internet

Method	Description
Trial and Error	Partially trial and error. I try to find websites on how to do searching and researching and read up on different articles.
	You use trial and error because you learn as you go along. You know pretty quickly that the more information you give the search engine the easier it's going to be to find what you're looking for (Shawn, T8, L66-70).
	Basically I was self-taught. Just playing around with it and looking at it and tried to discover new things. I think part of it was you had discussions with people who at the time were more kind of technology savvy than I was (Mark, T5, L80-84).

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Emotional Reaction to Technology

All of the participants reported an emotional reaction or connection to using technology, many of which were negative in nature. Even though all the participants showed success in completing the search task, only one participant reported a positive emotional connection with technology and was happy to describe herself as a "computer geek". Some of the negative emotions reported included (a) fear, (b) stupidity, and (c) panic. Some examples of these responses are included in Table 4.

Additionally, several participants reported a sense of frustration when technology did not work properly, which was most often attributed to problems with current technology issues the school was experiencing at the time of this study. These issues included problems with email working properly and the inability to access the Internet on a regular basis due to problems with the school's server equipment.

Table 4. Emotional Reactions Associated with Technology Use

Emotion	Description
Fear	I'm still afraid to press buttons I don't know about. I would rather have someone show me first and then I'll go ahead and do it (Marie, T4, L31-32).
	I think it's always the fear of someone stealing your information or whatever (Molly, T3, L53-54).
Stupidity	It [the Internet] made me feel terribly stupid because I couldn't even get into it (Molly, T3, L35).
Panic	Before if I had to use the computer to look up something I'd panic (Molly, T11, L76).

Two of the participants shared personal reflections in relation to their use of technology. These self-reflections conveyed that the participants identified their own technology skills as improving and that they felt they were getting more comfortable with using computers in general. One of these participants indicated that she used to get upset when she was unsuccessful on the Internet, but now she looks at it and attempts to figure it out on her own.

Issues of Digital Divide

Digital divide is most often thought of as an issue linked directly to the lack of equal access to technology as a result of socioeconomic status. Although unequal access was an issue raised by several of the participants, the notion of digital divide was also reported in relation to levels of technology experience. Table 5 provides examples of these two overarching themes of digital divide. Participants identified technology experience in several different ways:

1. Students know more [about technology] than their teachers.
2. Some students have no clue about how to use the Internet.
3. Some teachers are resistant to use technology in the classroom.

The third point indicated some important implications for students. Several participants spoke to the fact that some teachers are resistant to use the technology whereas other teachers utilize it in their classrooms on a daily basis. Concern was reported that some students within the school would have access if the teachers found technology to be an important component of the classroom, whereas other students might miss out on this opportunity. This was especially significant for one participant who argued that school might be the only opportunity for some students who do not have access to computers at home, which causes a discrepancy in the amount of experience students have in using technology. The result of this notion of digital divide is that students end up being at different skill levels, which makes it difficult to incorporate technology into the classroom.

Table 5. Issues of Digital Divide

Type	Description
Technology Knowledge	When the students seem to know more than much of the staff as far as technology, that's a concern (Mark, T5, L19).
	A lot of kids do know how to use it, but some of them don't; they don't have a clue even where to start (Jess, T2, L89-90).
	Kids are at all different levels. Just getting all the kids up to the same speed, it's kind of a challenge (Mark, T5, L 34-35).
Equal Access	When you have some students who are, you know, at the forefront and others might not have a computer at home (Mark, T5, 29-31).
	It is available to most people now at least through a public library or something...if everybody has access at home it would make a big difference (Lisa, T6, L190-192).

Technology in the Classroom

The participants in this study view technology as an important educational resource. It is seen as a tool that is used in the classroom to provide different types of support. Technology was described as a tool that provides support for students and improves their quality of work. It was also viewed as an important resource for the classroom and as a tool to enhance classroom lessons.

The participants in this study also mentioned problems with technology in the school. The biggest constraint identified was the lack of funding for updated equipment and adequate access to equipment. Additionally, several of the participants alluded to staff issues in that everyone in the building is not "on board" with technology and some staff members need to be "forced" into using it.

Discussion

Searching on the Internet entails a myriad of cognitive processes that are difficult to identify through observations alone. At the outset of this research, it was apparent that the

participants had difficulty in identifying the necessary skills needed to conduct a search or to navigate the Internet. However, by requesting that each participant complete a search task as part of the research process, he or she was able to identify skills that were used more concisely. Not only are fundamental literacy skills such as reading and writing necessary but higher order thinking skills have been identified as essential to using the Internet in a successful manner.

One of the most important skills that students can develop is the ability to navigate and locate information on the Internet. Without this skill, many hours can be spent trying to obtain specific information on the Internet but resulting in never accessing what one set out to locate. Critical evaluation of search results and information found on the Internet should be central to teaching search skills and strategies to students.

Online texts are essentially different from their print counterparts. Printed books are typically read in a linear manner within a bounded volume, whereas online texts are nonlinear and unbounded. Readers accustomed to viewing familiar printed text formats can be taken off-guard with websites that offer distracting animations, links to unrelated topics and downloads that call attention away from the reading process (Coiro, 2003). It is apparent that the act of reading on the Internet is fundamentally different from reading a traditional printed text. Therefore, different literacy skills and higher-order thinking skills are utilized when manipulating the Internet.

As new technologies become increasingly integrated into classroom lessons, teachers are discovering that many students do not possess the new literacy skills required to effectively read and write with the many new technologies that regularly appear in today's world (IRA, 2002). Improving reading comprehension is a critical national issue (RAND, 2002), especially because academic achievement and learning are dependent on the ability to read and comprehend at high levels (Alexander & Jetton, 2002; Bransford, Brown, & Cocking, 2000). This point was clearly shown in the results of this study. Searching and locating information on the Internet is a clear example of the necessity of high level reading skills. It seems evident that teaching students how to locate, read, and interpret search results and information from websites on the Internet should be an important focus of reading comprehension instruction today as students are faced with a future infused with technology.

To date there have been no large-scale quantitative or qualitative studies of Web searching (Jansen, Spink, & Saracevic, 2000). Considering the manner in which computers and the Internet have become a part of the daily routines in our society, this is somewhat discouraging. Jansen, Spink and Saracevic (2000) agree that given the recent yearly exponential increase in the estimated number of Web users, this lack of scholarly research is surprising and disappointing. Nachmias and Gilad (2002) indicate that finding information on the Internet requires the ability to use search engines, a knowledge of search techniques, browsing through information, a cognitive capacity to organize searches, the ability to execute a search, an understanding of how information is organized, critical-thinking skills, and a working knowledge of Internet notations. It is evident that educators need to assist students in the development of these essential skills for manipulating the Internet.

Conclusion

The results from this study show that searching and locating information on the Internet requires not only literacy skills but problem solving skills as well. Additionally, there are other issues to be considered such as levels of technology attainment, teachers' comfort with using technology, and equal access for students. More research is needed in this area to better understand the complexities of reading in online environments. Just as past

pedagogy has focused on teaching reading in the content areas, teaching reading on the Internet needs to be a new focus of pedagogy in the future. Clearly we must improve our understanding of the skills required for information searching on the Web and of the processes involved to help adequately prepare our students for life in the 21st century.

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