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Lost in Cyberspace: Where to Go? What to Believe?

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Abstract

Electronic search engines like Yahoo! and Ask.com dominate high school students' information seeking, with Google being the number one information searching option. This paper examines the literature that focuses on students' searching skills and ways that they are responding to an overload of information. The literature shows that students prefer using the Web over printed text because of the speed of accessing information and the likelihood of locating up-to-date information. Paradoxically, regardless of the level of Internet expertise, students are often not satisfied with search results. This paper therefore explores the techniques that students could be using to retrieve trustworthy and relevant information.

Keywords

Introduction

Storage and retrieval of written items started in the third millennium B.C. with Sumerians classifying information into library collections and indexing them based on the first few words of text (Cover, 2000). Today, there is no limit to including every single term of a document into an index and then retrieving the information at lightening speed. As a result electronic search engines like Yahoo! and Ask.com dominate high school students' information seeking, with Google being the number one information searching option (Griffiths & Brophy, 2005). Students have hundreds of other search options including university catalogues, databases and indexes, CD-ROMS, microfiche, videos, and of course print media. In fact the Web of information has grown so much that it may be an equal challenge choosing the right search option as finding the sought after information. How are students responding to this overload of information and ways of retrieving it? Are they coming up with personalized searching techniques? Are they being taught Internet strategies at school? Do their teachers possess the knowledge to teach them these skills? In what other ways is the Internet assisting them in accessing the information they need for schoolwork?

Perspectives

Today the Internet is imbedded in students' lives (Media Awareness Network, 2005). They use it daily for communication, entertainment, socializing, shopping, and learning (Lenhart, Madden & Hitlin, 2005; Lewis & Fabos, 2005). While on the Internet, students can play video games, download music, watch video clips, buy gadgets, use instant message, blog, email, talk, display their art, join online communities and search for needed information. Students rely on the Internet as their main information source (Gunn, 2005). This is the case even when completing research assignments for school. Over 40% of users turn to Google for their searches (Mills, 2006) and rely heavily on keyword searching (Gunn & Hepburn, 2003). They are confident of their skills and consider themselves stronger searchers than they actually are (Cmor & Lippold, 2001; Fidel et al., 1999; Vansickle, 2002), with over 90% rating themselves as competent in accessing information from the Internet (Osika & Sharp, 2002). Unfortunately, these young users, like most adults, have limited knowledge of search engines (Lorenzen, 2002; Scott & O'Sullivan, 2005). They lack the understanding of the systematic informational retrieval process and as a result base their searches on trial and error (Fidel et al., 1999). Therefore, students often find themselves so frustrated with unsatisfactory results (Levin and Arafeh, 2002) that they even adjust their research thesis to match the information they have already found (Fidel et al. , 1999).

Students get further frustrated with their ability to find the relevant information within a tolerable timeframe (Fidel et al., 1999). As Gunn (2005) points out youth are "Internet savvy but not necessarily searching savvy" (p. 1). Despite their frustrations, students continue to choose the Internet as their main searching choice. Scott and O'Sullivan (2005) found that "if given a choice, many high school students will choose to browse or surf the Internet for the information they need for a particular assignment" (p. 1). This may be due to a principal Marchioni (1992) describes where "humans will seek the path of least cognitive resistance" (p. 156). It is quite simply easier to sit at home and flip through page after page of irrelevant Web information than to learn how to access library databases and roam the library shelves.

Mayer (1992) termed computer language rules as *Syntactic Knowledge*. This *Syntactic Knowledge* is essential to understanding search engine terminology and therefore being capable of effectively conducting a query. Even before the Internet, in 1968, Lancaster showed that poor query construction was the number one reason for search failures (Lancaster, 1968). Students could produce much stronger searches if they learnt even a few basic features of search engines including how queries are interpreted by search engines and whether the chosen system uses AND or OR as its default operator. Web experts are much more likely to use advanced search options and therefore produce more relevant results (Holscher & Strube, 2000).

It has been suggested that Internet search engines may evolve in a manner to fit how average users search rather than users having to adjust to the dimensions of the search engine (Griffiths & Brophy, 2005). Although this is a wise path for companies to take in the efforts of conforming to user-friendly environments, with time people will be more willing to learn skills necessary to conduct more efficient searches. For example, the use of Boolean operators is almost completely ignored by average users (Hirsch, 1999; Jansen, Spink & Saracevic, 2000) although they may be quite easy to learn.

Many studies (Colaric, 2003; Tabatabai & Shore, 2005; Gunn, 2005) investigate students' searching practices by conducting surveys, questionnaires and interviews. They ask about students' experiences and expertise with Internet use. Further research observing students' searching behaviour could be conducted using newer technological instruments like tracking software and monitoring the history and bookmark options on their browsers. Some software options available include *Cyberpatrol*, which captures the links students

browse, *Camtasia* which records students' computer screen, face, and voice and *Morae* that functions like *Camtasia* but with the enhanced feature of analysis software built in. Its primary function is for usability testing. In addition to using the traditional instruments, these newer techniques could aid researchers in trailing the exact path that students follow. This could be linked with a think aloud thought process to gain insight into students' searching logic.

Despite the lack of searching expertise and Boolean knowledge, students in secondary schools choose to use the Internet for their school work (Eagleton, Guinee & Langlais, 2003) and this use increases as they enter higher grades. They prefer the Web over printed text because of the speed of accessing information and the likelihood of locating up-to-date information (Vansickle, 2002). Paradoxically, regardless of the level of Internet expertise, students are not satisfied with search response times (Liaw & Huang, 2006). This may be a result of many US households not yet being connected by broadband. This is a phenomenon that is rapidly changing and that many Canadian households do not face. However, soon speed of access will no longer be a burden since more and more North American homes are connecting to either DSL or cable.

As more families have access to rapid connections and as the Internet and search engines quickly become an everyday common technology, users will be more willing to take risks interacting with new technologies and more ready to incorporate new information into their prior knowledge. The concern then will be whether there is anyone teaching searching strategies such as narrowing or broadening searches or if students are left to fend for themselves. Students are ready for this knowledge now, but may have to wait for their lagging teachers to gain the needed comfort and for their skeptical librarians to trust that search engines will be able to provide quality searches and lead students to trustworthy sources.

Studies have shown that young Internet users show little concern for the authenticity of the information they access on the Web (Braun, 1997; Hirsch, 1999) and that student use of Web resources differs significantly from teacher's expectations (Grimes & Boening, 2001). The students in Scott & O'Sullivan (2005) research found that "any information is attributed to be good information, and the more of it, the better" (p. 1). It is no surprise then that Braun (1997) encourages teachers to assist students to develop the searching skills necessary "to discover authentic and relevant knowledge, to distinguish fact from fiction" (p. 157). Scott and O'Sullivan (2005) warn that "unless teachers and teacher-librarians show students there are other, more effective ways of finding information, they will continue to pursue this method of information retrieval" (p. 5). Bell (2005) shares the fear of some librarians that commercial search engines cannot offer students the trustworthy sites of high quality information like library databases could offer. This, however, does not have to be the case if search engines like Google are used in their full capacity. *Google Directory* has human editors that sift through the billions of web sites and evaluate for quality sites to include in their directory. *Google Book Search* locates full text books or their abstracts online. *Google Scholar* directs students to academic sites. These information banks are growing and offer trustworthy and educational pages. The *Google Directory* offers only 1/10 of 1% of what the entire Google web site offers (Miller, 2007), but is the better choice for users seeking high quality, informative sites for academic work. It eliminates irrelevant results and many commercial pages. Further research needs to be done assessing these options.

Many scholars such as Sutton (1999) have claimed that retrieving relevant information from the Web is difficult (Weideman & Strümpfer, 2004; Sutton, 1999; Braun, 1997) and that "as the World Wide Web grows exponentially, discovery and retrieval of useful educational material grows more problematic" (Sutton, 1999, p. 1191). This however may

not be the case as new algorithms, ranking systems, and organizational schemes arrange information in accessible ways. Also, when users become more competent with conducting searches and learn the necessary skills, they will be capable of navigating expertly through the information traffic.

Weideman and Strümpfer (2004) has shown that even an easily changeable concept like the number of keywords in a query will significantly improve the results of a search. Students often use no more than two or three words to conduct their searches (Spink et al., 2002) while Google recognizes the first 32 words entered in a query (Miller, 2007). Using only one or two keywords could produce disastrous search results. For example, if a student doing a project on the planet Mercury plugged in only the keyword "mercury" into the Google search box, s/he would be faced with 75,200,000 hits, with the third result being the first to produce information about the planet.

The main strategy that students use in adjusting their searches to produce more relevant results is to make minor changes to their keywords (Scott & O'Sullivan, 2005). It is doubtful that such a small modification will assist in achieving a better search. Once students have navigated to a particular web site, they look for the site's own internal search engine to conduct another search (Scott & O'Sullivan, 2005). However, many search engines do not work like Google and as a result will produce unsatisfactory results if approached as if they did. Other obstacles that stand in the way of adequate searches are that students have an inability to narrow their searches, to discern relevant sites from useless ones, and to construct successful and efficient keyword searches (Scott & O'Sullivan, 2005). Furthermore, students use only one search engine per information searching session (Vansickle, 2002) and as a result may not access the most relevant information.

Occasionally, students employ other strategies than using search engines to locate desired information. For instance, they may visit sites they have used in the past even if the site is not pertinent (Fidel et al., 1999), or they may plug their chosen topic in the Uniform Resource Locator (URL) (Guinee, Eagleton & Hall, 2003). Let's take the example of the project on the planet Mercury again. The student would type *www.mercury.com* in the address box. This site may have pertained to the chemical element mercury, the brand of car, the Roman God, the singer or other irrelevant topics. Rather, this URL leads to the web site of a software company. Even if it happened to be a site on the planet, it may not have provided trustworthy information. Therefore, such strategies lack the efficiency and effectiveness necessary for quality results. One helpful strategy that students could use is going to sites recommended by others such as their teachers or peers. If teachers provided students with even one relevant site, students could have a positive start to their assignment and likely find several other trustworthy links from that site.

Tabatabai and Shore (2005) conducted research on pre-service teachers and found the following associations with successful Internet searching "a) using clear criteria to evaluate sites, b) not excessively navigating, c) reflecting on strategies and monitoring progress, d) having background knowledge about information seeking, and e) approaching the search with a good attitude and enjoying the process" (p239). High school students could conduct quicker and higher quality searches if they employed similar strategies.

Scott and O'Sullivan (2005) agree with other scholars (Bell, 2005; Minkel, 2004) that students should not rely solely on the Internet for their source of information. They assert the "need to emphasize and require students to use a variety of sources for their research, and . . . to make them aware that the Internet is just another tool they can add to their arsenal of information retrieval sources" (p. 6). The Internet, however, is rapidly becoming the *only* research tool of the present. It is the starting and ending point for many users. Databases and indexes can be accessed through it. Commercial search engines are

competing to create more efficient searching software. Information is being disseminated through it at unmatched speeds. It provides a wide variety of resources necessary for research. It provides options for scholars seeking high quality sources. It is open at even the most unseemly hours and it allows thousands of people to use the same resources at once. Instead of trying to convince our students of the variety of offline resources available to them, it may be a better strategy to expend our energy on putting the same resources online. Future research could focus on which items students choose to access offline and assess whether these would be viable options to make available online. If they are available online, the question is why users choose to access it offline. I anticipate a research shift will happen soon where researchers will investigate why students use offline materials as oppose to the current trend of exploring the motivation of accessing online resources.

Applying Ideas

As illustrated above, search engines are just one option of accessing educational materials. Levin and Arafeh (2002) present a potpourri of other Internet uses to assist with school work. Internet-savvy students use the Internet for the following activities:

> *To correspond with other online classmates about school projects and upcoming tests and quizzes . . . to share tips about favorite Web sites and pass along information about homework shortcuts and sites that are especially rich in content that fit their assignments. [To] frequent Web sites pointed out to them by teachers - some of which had even been set up specifically for a particular school or class. [To] communicate with online teachers or tutors. [To] participate in online study groups . . . [and to] take online classes and develop Web sites or online educational experiences for use by others. (p. ii)*

Consequently, teachers can optimize on these possibility by teaching Internet skills and strategies to their students and by implementing assignments and projects that are conducive to Internet use. For example, a class forum or group could be set up where students could communicate with their classmates and teacher, where they could vote on specific classroom issues, where they could post their work or photos, where they could ask questions about lectures, readings, and assignments, where they could solicit the aid of their peers, where they could rely on a community to support their learning. Similar scenarios could work with blogs, wikis, and social network sites as well.

Blogs could be particularly handy for posting responses on current class readings or commenting on a set posting written by the teacher or peers. Wikis could be used for collaborating on a fictional piece, organizing a class field trip, or having a classroom web site that could easily be edited by any member of the class. A social network site set up for the sole use of a classroom could be one way to keep all the different technology uses of the class on one space. Through the site, students would be capable of emailing one another or sending a message to the entire class, they could post pictures, videos, or documents, and they could each start their own blog and leave comments on their peers' blogs. Again, it would create a community that students could access beyond the classroom walls.

One of the most important Internet skills teachers could pass on to their students is effective searching skills. Students would become quicker and more reliable searchers if they knew even a few simple strategies. An introduction to the exclusion operator (-), inclusion operator (+) and domain and title field limiters could be a simple start to a complex search. Even simple options like using quotation marks around phrases and clicking on "search within results" or doing advanced searches could minimize time spent surfing and produce substantially more relevant results. Using the find command once on a page, bookmarking relevant pages, opening new windows and saving searches could be

other strategies to assist in quicker searches. Walter Minkel (2004) affirms that students "rarely take advantage of any of the search engine's advanced features, such as phrase searching or limiting their search by date, multimedia format, or domain, such as .edu and .gov" (p.29). Such steps would considerably enhance a search and produce much more relevant information. Guinee (2004) found that another difficulty that students face is forming effective search strings; students' "background knowledge, language skills, and computer expertise" were all factors in determining the effectiveness of their searches (p. 208). One component that could assist students with weaker language skill is the use of the thesaurus operator (~). If students lack the vocabulary to try several searches with similar words, they could type ~ as part of their search to find more results on a given topic. For example, if an English as a Second Language student were to type in ~fat into the Google search box, the search engine would not only look for the term fat, but it would also look for related terms such as obese, large, weight and even diabetes. The problem that searchers often face, however, is that they are faced with far too many results and most of them are irrelevant hits. In this case, the thesaurus operator may seem to be more of a hindrance. To solve this problem, searchers could combine the thesaurus operator with a domain limiter (e.g. ~fat site:gov.bc.ca). This would substantially decrease the number of results and offer a much more reliable search list.

Furthermore, recommendations from teachers to use search directories that have been edited by human editors may be a reliable start to a search. Perhaps even offering a few recommendations of reliable web sites to frequent would give students the needed confidence to continue searching for relevant information. Many web sites offer links to other similar web sites and could be a path students would follow. It could also be an effective tactic for teachers to recommend queries or keywords to insert in search boxes. This is an especially important strategy for teachers to use with students who have less experience with the Internet and search engines. Liaw and Huang (2006) found that "experience with search engines is a key factor to affect users' attitudes toward search engines for discovering information" (p. 512). Knowing which words to insert in the search box could substantially lessen frustration levels. These suggestions would also act as good models for future independent searches.

Conclusion

The Internet has several functions for students. It is their textbooks, their library, their tutor, their homework guide, their study group, their guidance councilor, their notebook, their backpack, and their locker (Levin & Arafeh, 2002). They use it as a retrieval, storage, and transportation tool. Educators have not yet adequately recognized or responded to the manner in which students access information through the Internet.

We have only begun to tap into the power of the Internet. The authors of *Learning to Change: ICT in Schools* use a beautiful metaphor to show that we will not begin to understand how computers and the Internet can influence education until we stop holding back and let new technologies play the large roll they can. They depict a scene where the pencil and paper are the new technologies and educators are excited about its potential. They're not sure of its full impact, however, so are not willing to give one to each student. Rather, they decide to place one pencil and one piece of paper in each classroom and see what will happen. Do we look at computers and the Internet in this same absurd manner? It is not adequate to position one per classroom or situate several in a lab (Centre for Educational Research and Innovation & Organisation for Economic Co-operation and Development, 2001). We will not feel the full impact of the Internet until we submit to its potential and allow our students full access. This path requires educators to teach students the necessary Internet and searching skills needed to tap into this power.

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