Searching the Online Catalog and the World Wide Web

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Abstract

The article discusses the searching behaviors of school children using the online catalog and the World Wide Web. The amount of information and search capability for the online catalog and the World Wide Web, though, differ to a great extent, students share several common problems in using them. They have problems in spelling and typing, phrasing of search terms, extracting key concept, formulating search strategy, and evaluating search results. Their specific problems of searching the World Wide Web include rapid navigation of the Internet, overuse of "Back" button and browsing strategy, and evaluating only the first screen. Teachers and media specialists need to address these problems in the instruction of information literacy skills so that students can fully utilize the power of online searching and become efficient information searchers.

Keywords : Search behaviors; Information seeking; Online catalog; World Wide Web; Internet; Information literacy; Search errors; Information access

Introduction

To many children, searching information on the card catalog for schoolwork or recreation has not been an easy and enjoyable task.[1] Based on research[2] and the author's previous experience as a media specialist, middle and high school students would rather try other avenues, such as browsing on shelves, asking peers, teachers, or media specialists, to obtain information, if they could avoid using the card catalog at all. The introduction of the online catalog in the mid 1980s was welcomed wholeheartedly by many library users. The unique characteristics of the online catalog — interactive nature, immediate feedback, increased access points, and elimination of the need for alphabetizing — seem to make information searching easier and faster. The first major online catalog studies conducted in 29 academic, special, and public libraries indicated that people, including children and youth, preferred the online catalog to the card catalog.[3]

From the mid-1980s to the present time, the online catalog, with its

implementations initially began at universities and research institutions, has also been gradually replacing the card catalog in numerous schools across the nation. Despite the general acceptance and satisfaction with the online catalog, library users did experience some difficulties while searching information.[4] A study by Edmonds, Moore, and Balcom on the search effectiveness of the card catalog and online catalog found elementary and middle school students could use the card catalog more effectively.[5] Thus, it seemed that children have problems with either card catalog or online catalog, as also found by McDonald and Searing.[6]

While the online catalog has become more or less a standard search tool in schools, CD-ROM products such as Grolier Encyclopedia, ProQuest, SIRS, and many others have been continuously appearing on the educational market. Thus, in addition to learning search of traditional print resources, children are faced with a new group of electronic resources, each featured with different search mode and protocol. As technological development continues, educational resources stored in varied new electronic formats will increase. The Internet connectivity at schools in recent years has opened up an interesting multimedia cyberspace for children and youth. Along with other online resources and tools, the World Wide Web has become part of a school life for students and teachers. Information seeking via online catalogs, CD-ROMs, online databases, and the World Wide Web, therefore, has become an essential skill for students learning, and at the same time it brings a new challenge for students.

The challenge requires that students possess literacy skills to access information efficiently and effectively, to evaluate information critically and competently, and to use information accurately and creatively.[7] Indeed, the Internet is a fun place for many to browse around and enjoy rich sensory experiences provided there. However, can children and youth search the World Wide Web proficiently enough to locate relevant information? Studies indicate that they have substantial difficulties.[8] They preferred using the Web to print sources, but in most cases, they were unable to locate precise information for their needs.[9] Their enthusiasm could hardly match with their search abilities. Nevertheless, they were satisfied with their own search performance and search results, and believed that they knew all about Web searching, thus there was no need for them to learn more efficient way of searching.[10]

Information literacy skills have long been emphasized as important life skills for school children as well as general public. Back in 1991, a SCANS (The Secretary's Commission on Achieving Necessary Skills) report identified information competency as one of the five competencies required for

the 21st century workers.[11]   The information competency comprises of four elements: 1.acquiring and evaluating information, 2.organizing and maintaining information, 3.interpreting and communicating information, and 4.using computers to process information. In 1998, *Information Power*, a publication by AASL and AECT, lists nine information literacy standards for student learning and reiterates the importance of information literacy skills in this information age.[12]   These two documents, though published seven yearly apart, expressed the same idea about the importance of information literacy skills to function well at school and later in society.

In light of the importance of information literacy, selective studies on children's and youth's information seeking behaviors on the online catalog and the World Wide Web have been reviewed. It is found that children and youth experienced similar types of difficulties while searching either the online catalog or the World Wide Web. However, they encounter unique problems only when they search on the Web. The purpose of this chapter is to discuss the online searching behaviors of children and youth using the online catalog and the World Wide Web. Specifically, it is intended to esplain the similarity of searching problems on the online catalog and the World Wide Web, to describe unique problems of searching the Web, and finally to address implications for teachers and media specialists in information instruction.

Similarity of Search Problems

Most research on school children's use of online catalogs started in the late 1980s and continued until 1997 while studies on their use of the World Wide Web occurred mainly after 1997. The online catalog and CD-ROM databases are highly structured and carefully constructed while the Internet is a gigantic and fluid digital environment filled with unfiltered and uncontrolled resources.[13]   Although there is a great disparity about the scope and features of the online catalog and the World Wide Web, searching methods for both share some common elements. As a result, children experienced similar problems. These common problems can be roughly categorized into several types: spelling and keyboarding, search term, keyword concept, evaluation of search results. Because of multimedia environment, hyperlink capability, and huge resource base, children and youth encounter difficulties, which occur only when searching on the World Wide Web. The following table gives an overview of the similarity and difference of students' difficulties in using the online catalog and the World Wide Web.

**Table 1 Comparison of Searching Difficulties on the
Online Catalog and the World Wide Web**

Common Difficulties	Special Difficulties of Using WWW
Spelling and key wording	Rapid surfing
Search terms	Overuse of "Back" button
Keyword concept	Browsing strategy
Search strategy	Looking and evaluating first screen
Evaluation of search results	

A.Spelling and keyboarding

Research has shown that school children's lack of spelling or keyboard-ing skills played a major role in their search failures.[14] In a yearlong study on grades 1-6 student use of an online catalog, Solomon found that spelling was the most prevalent problem for all grades, especially among the very young children.[15]　High school students did not do much better in this aspect; they made typographical and spelling errors, and also errors in recording search results.[16]　Long and unfamiliar words, such as "environmental", "Isaac Asimov", "tyrannosaurus", and "vegetarians", were difficult for students to enter accurately on keyboards.[17]　Nahl and Harada found that misspelling was one of the nine types of errors including using inappropriate terms, neglecting word form variation, and not using Boolean operators.[18]

In Web searching, children and youth encountered similar spelling and typing problems.[19]　Mistyping URLs, especially long ones, and misspelling search terms affected more than half of high school students in pursuing a desired search path.[20]　URLs were difficult to type, particularly for students in the first and second grades made.　They made many keyboarding errors with complicated URL address code, even when URLs were written on a poster-sized chart for them to copy.[21]　To compound keyboarding problems, students forgot writing down URLs for future reference.　It is a small won-der that Small and Arnone claimed that children tended to have minimal typ-ing skills.[22]

B. Search term

Generating appropriate search terms was considered one of the most dif-ficult tasks for children in online catalog searching.[23]　According to Moore and St. George (1991), children and youth have troubles generating alternate terms; few repeated their failed terms without replacing them with similar terms. Errors in generating search terms occurred most frequently when stu-dents were required to produce an appropriate term from a search question or statement.[24] In her survey of 25 media specialists nationwide, Neuman (1995) found that employing proper search terms was students' number one

problem while they searched online databases. Younger children in grades 2-5 had more success rate when using concrete, simple, and single-word terms, such as cats, dogs, baseball, and dinosaurs, which happened to be the descriptors of Library of Congress Subject Headings.[25] Solomon found that children rarely used synonyms, alternative terms, or varied word forms, and that they were confused with homonyms, such as Wales and whales. Using incorrect syntax and neglecting word-form variations also echoed in the study by Nahl and Harada (1996). Walter, Borgman, and Hirsh (1996) attributed children's problems of generating proper search terms to their still-developing cognitive abilities and limited knowledge base. They could not recall a variety of terms from their reservoirs of memory because recall memory developed after recognition memory.

On the Web, information seekers are not required to use controlled vocabularies as those included in Sears List of Subject Headings or Library of Congress Subject Headings. However, children experienced similar difficulty with search terms on Web searching as they did with online catalog. It was reported that middle school students had problems selecting appropriate search terms, and that they had little inclination to think of synonyms, similar terms, or related terms.[26] Large and Behesti (1999) indicated that Back function, hypertext links and clicked search hits were employed more than other web activities. Children also employed incorrect search syntax in querying the search engines they used.[27]

C.Keyword concept

Using keywords to represent main concept contained in a search statement or a search question has been problematic for children in both online catalog and Web searching. Selecting keywords was a major-obstacle for sixth graders in their information retrieval process.[28] Chen (1993) found that some high school students entered a complete phrase or whole sentence verbatim as a search term. For example, students entered "problems of drug use by athletes" and "relationship of the United States and China after World War II" as search terms. In other words, they used natural language, as given to them in class, to launch a search. Nahl and Harada (1996) had similar findings about student use of common natural language. Novice searchers experienced great difficulty in extracting main concept from natural language and convert into succinct search terms.[29] The problem could have been caused by children's less developed intellectual and cognitive abilities while many online systems have been designed primarily with adults in mind Walter, Borgman, and Hirsh (1996). Nahl and Harada (1996) also noted students omitted a concept or added unnecessary concepts in generating keywords. Generally, a single concept term such as cats or dogs as mentioned earlier was easier than double or multiple concepts for children to

generate search terms.

On Web searching, children had same type of difficulty with keyword concept. Their structure of keyword searching was poor when using the child-oriented search engine Yahooligans.[30] Search breakdown was often due to using improper keyword or misspelling.[31] As in online catalog searching, many children used the natural language, i.e. an entire sentence or phrase, as search terms. Some examples of such query terms are "What are the three most common crimes in California" or "How to reduce crime in California."[32]

D.Search strategy

Information searching either on the catalog or the Web involves a set of complex skills, including vocabulary ability, knowledge base in a subject area for formulating search terms, and application of Boolean operators.[33] The background knowledge of a subject area is fundamental for one to know the structure and hierarchy of a discipline and its interrelationship. Without this base, it would be very difficult to generate appropriate search terms along with their alternate terms, related terms, or similar terms. Neuman (1995) discovered that planning effective search strategies was children's second largest problem, only next to formulating search terms.

Searching on the Web allows children a certain degree of freedom and flexibility in adopting or using search terms of their choice. They don't need to employ prescribed descriptors or thesaurus as those included in the index- ing of traditional print databases. To conduct effective searching, searchers must try another strategy or new query terms, if previous trials have not pro- duced fruitful search results. However, research indicated that some stu- dents continued to use the failed terms suggested in class, and did not make efforts to think of synonym or other related terms.[34] Fidel also found an interesting method used by students to solve search problems; they acted on their own to change assignment topics instead of thinking of a new strategy. Fidel et al. noted that students seldom searched for topics more specific than their original ones when reformulating search strategies. It seems that stu- dents lacked a hierarchical order within a discipline to narrow down a topi- cal area for restarting another search. They employed three tactics: 1. change of spelling of a word or using word variations; 2. change in the order of words in a search phrase; and 3. switching upper case to lower case.[35] When asked for advice for Web searching, half of the students in the study suggested simply typing in words or a topic. One student recommended entering a website address so that students could always come back to the same site. Perhaps because of highly interactive nature and interesting inter- face of the Web, children were found to be reactive searchers. They hardly employed sophisticated, systematic, and analytical searching strategies; they

searched information by excessive browsing.[36] Hardly any child utilized Boolean logic, exact term searching, nor truncation techniques. Browsing, a query free searching, constituted about 80% of children's information seeking behavior on the Web. A search plan was not been prepared nor search strategy constructed as they approached a search task on the Web.

E.Evaluation of search results

During a search process, evaluation is an essential step, in which information searchers evaluate search results, obtain needed information, or plan another strategy if results are not relevant. While searching the online catalog or the Web, children and youth appeared least interested in evaluating search results. In Chen's study (1993) though some high school students retrieved needed information on screens, yet they did not take time to review what had been obtained. Without recognizing it, they abruptly changed search terms and launched another search. Several students repeated a same search path several times, obtained same results, yet they were unable to see it. It seems that students did not know their precise information need nor did they spend time to discard kernel from chaff. During the process of searching, browsing, and selecting information for use, children spent little time in contemplating and evaluating what they had obtained on screens.[37] Hence, searching remains very much a process without getting much to the stage of evaluation.

F.Students'unique behaviors on the Web

While experiencing similar search difficulties in using the online catalog and the World Wide Web, children exhibit some unique behaviors as they navigate the Web. To many children, the World Wide Web is a convenient one-stop-shopping information mall.[38] They experienced joy and frustration at the same time in this information mega mall. To navigate in this mall, they used only a few skills, and were complacent with their performance without being concerned too much about more efficient ways to move around the mall.

G.Joy and frustration of the Web

What makes the World Wide Web such a fan place for children and youth? The Web, other than textual information, offers a wealth of information contained in a variety of attractive and interesting formats with different levels of specificity. Based on research,[39] children and youth loved the multimedia environment filled with colors, sound, graphics, video, movement, and rapid changing images. The interactive nature of the Web led them to believe that they needed little effort and preparation to begin a search. As soon as they typed in words and click, they were looking instantly at colorful and moving images with along text. They could see, they could listen,

and they could interact. Further, the multitude of subjects on the Internet empowered them to go around the world, see things, look for things, and learn about new things.

For high school students, a big advantage of the Web over the library is the ease and speed of information access. All it takes to search information on the Web, according to them, was type in words and click. During the search process, it entailed little physical or mental activities, such as looking up books, going to shelves, checking the index, or reading the table of content. When asked where to locate information for their next assignments, all students participating in the study said they would use the Web.[40] They also expressed that they already knew all they needed to know about search. Obviously, students believed it took much less effort and time and preparation to launch information on the Web. One student declared, "It's easier on the Web especially if you're lazy...... It's just sit and click."[41] Another student announced the electronic age would usher in the end of the book era. He said, "Because the computer is just easier to use and people don't like to struggle. They like to be able to get what they want and get it fast."[42] Many students also believed that the information displayed on the Web was more up-to-date than information contained in books. Despite the fun of Web searching, all students felt they would have more fun if they could simply have time for carefree surfing, exploring from sites to sites, not searching for school assignments.[43] Apparently, the type of searching children and youth enjoy is browsing plus more browsing.

On the other hand, children and youth also experienced frustration while searching the Web.[44] Their frustration was caused by three reasons. First, the Web did not produce search results. They were frustrated when they could not find the information. Second, they had little patience with long response time. Third, they were irritated when they came across dead links—links to a site under construction, a site that has moved, or a site that no longer exists. Another source of frustration came from long or wrong URLs. Even though it was a minor setback, they were overcome with a sense of helplessness if URLs given to them were wrong.

Many websites have not been constructed with children in mind, particularly for children under 4th grade.[45] Such websites feature big words, lot of text without pictures. Children usually skipped text-only websites and left them unexplored.[46] They preferred sites with colorful graphics and sites written in plain English. They also wanted quality audio, video, and interactivity. It has been found that children preferred websites with high visual content, but short and simple textual content. They liked more animation and interactivity on the Internet. Most importantly, they want websites with fast download time.
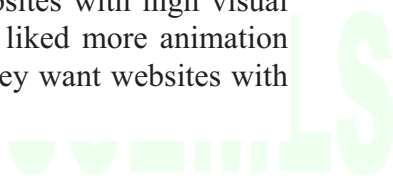
H.Rapid surfing on the Net

After words are typed and clicked, children and youth anticipate immediate response. They were impatient with slow downloading of websites, frustrated when a response was not instantaneous.[47] Most students scanned quickly; skimmed from one site to another, then clicked to move on. They had little tolerance for long lists displayed on result pages, and would quickly move to another place, in spite of the possibility of locating pertinent information. They rarely spent more than a few minutes at any site.[48] Their search behaviors on the Web consisted of lot of clicking and moving from place to place. A search was not considered fruitful if the response time went beyond what they considered a reasonable limit. Students were irritated and lost when they encountered dead links.

After search results being displayed on screens, students generally took a quick look at the first screen to determine the relevance of a website.[49] They seldom read beyond the first screen nor scrolled down to the bottom of a Web page. Schacter, Chung, and Dorr (1998) noted that high level of browsing and fast speed of surfing might indicate students did not spend much time or effort in reading or evaluating information.

Students used textual information on the Internet; they also relied on graphic, video, and other media formats for visual and audio information. Often, they checked graphics to judge the relevance of a web page; they used graphic clues to locate landmarks. A student stated, "Pictures can give hints of what the page is about."[50] If graphics or text did not appear interesting or engaging, they had no qualms to quickly move on to other web sites. Moving rapidly among websites is one prominent characteristic of student Web searching.

I. Browsing for information

Many children have difficulties in formulating search strategies, yet they are enthusiastic Internet users. The enthusiasm is not limited to students only of a certain age group, ability level, or social economic background. To many children and youth, the Web is a magical kingdom to browse around or just to hang out. They type, click, and information dressed in beautiful colors and graphics, complete with animation and inviting sound clips and video images display immediately before their eyes. If this is not one of the few good things that they can experience at school, what else? Seeking information via other information sources: printed materials, CD-ROMs, online catalogs, and online databases, definitely, cannot be compared with such elements as sound and fast paced changing images. No doubt, students love surfing the Internet.

Despite students'love of the Web, research studies revealed that students employed but a few Web techniques while seeking information. Beginning

searchers predominantly used browsing over analytical search strategies.[51] They especially favored Back command, and used it almost exclusively.[52] Of 26 Web activities categorized by Large, Beheshti, and Moukdad (1999), Back button was used most frequently. Next popular activity was clicking hypertext links; while the third was clicking search hits. Help, History features, or Boolean operators "Or", "Not" were hardly utilized by students in their search sessions. Neither, they employed shortcut features such as Go List, Home, or Bookmark. Indeed, their search was characterized by excessive use of Back button.

   Browsing is defined as "a clicking on a hyperlink, clicking an image link, clicking Back or Forward button, or clicking on a menu embedded in an image."[53] During the search sessions, students browsed, selected information to be saved, and did not contemplate much about information. Their search strategy mainly consisted of browsing from websites to websites, with a cursory look at them. Little evidence of serious reading or information evaluation was demonstrated by their search behaviors.

   Browsing appeals to children; it is query free.[54] For younger children, it may be appropriate strategy for it requires less cognitive demand than formulating a query. For highly directed tasks, a browsing strategy could turn successful. Student reactive searches did not involve much planning and using no elaborate, analytic, or sophisticated search strategies, no matter what was the nature of their given tasks, specific or vague.[55] However, it was highly possible that student's high level of browsing could be carried on at the expense of thinking about information need, planning for strategies, and evaluating obtained information.[56] On recommending searching strategies, students suggested clicking back a couple of times or going home in order to arrive in the "comfort zone" or starting points again.

Implications for Instruction

   Online information seeking is not an easy task even for adults. The study of Bilal and Kirby (2001) on search behaviors of 7th graders and graduate students majoring in information science found that potential information professionals in the study had utilized several similar web search moves like their younger counterparts, including overusing browsing strategy and not using "Help" feature . Information seeking, from the onset of recognizing information need, planning search strategies, using proper search terms, exploring information sources, evaluating search results, organizing and making sense out of obtained information, to the final state of presenting information, requires a set of complex skills such as cognitive and high order thinking skills. Increased information perpetuated by technological

advances complicates information seeking difficulties. To deal with the vast amount of information on the Internet, children sometimes used filtering and omission methods.[57] However, the methods are not what teachers and media specialists would like to recommend as effective search strategies.

To become information literate, students need to develop skills in three areas: specific web searching skills, the search process itself, and web reading strategy. The GUI based Internet browsers such as Internet Explorer and Netscape allow search by keyword or browsing. In spite of easy information access by browsing or hyperlink, other useful features such as shortcuts History, Go, Home, Help, Bookmarks need to be addressed in information literacy instruction so that students can fully utilize power of the Web searching, without relying too much on point and click, hyperlink, or looped search. Solely using browsing in searching would take more steps and time to gain needed information. Moreover, excessive browsing could easily get students sidetracked and opened up more possibility for aimless exploration on the Net.

To begin an information task, searchers must have a clear understanding of what they set out to look for, that is to know their specific information need, including the breadth and depth of information. Then, they plan search strategies, explore information sources, evaluate search results, synthesize information, and finally present information. Many children and young adults may start to look for information when they still have fuzzy notion of what they are looking for. Once they begin searching, most likely they cannot plan a search strategy to guide them for they have no defined information need or task. On the surface, students may appear looking for information, going through several steps in the process, yet they may not have clear idea of why and how they go through in the information seeking process. Several good information search models exist.[58] Some examples are ISP (information search process),[59] Big Six,[60] REACT model,[61] and I-Search.[62] An information literacy model which synthesizes the existing models can be integrated into areas of the curriculum for all students in all languages.[63] The information literacy model has three interdependence processes: the searcher's thinking, the search process, and the instructional strategies. This model combines all aspects related to information seeking, including searchers' feelings and emotion, their activities during search process, and instructional strategies designed to assist student in searching.

The media specialist can collaborate with the teacher in information literacy instruction and use a search model to enhance teaching effect. Use of a search model helps students better focused on a particular step and specific task that they have to go through and perform. The search model increases students' awareness of the process and reminds them of what they have

accomplished and what remains to be done. Knowing the searching itself may alleviate students' uncertainty, ambiguity, and frustration. Many schools integrate Kuhlthau's IPS model, Eisenberg's Big Six, or other models in their curriculum with great success.[64]

The amount of information available today for children and youth is staggering. When faced with information on the Internet, how do students cope with it? Read it all? That's just impossible for anyone. With regards to the question of reading, interpreting, evaluating search results, teachers and media specialists need to teach students new reading strategy for websites.[65] Up to the early 1980s, a majority of library users read from print to gain information or knowledge. Now, with the large quantity of information from the Internet, people cannot do thorough reading anymore. Reading from print and reading from screens take a different reading strategy. Skimming is more appropriate for reading the Internet since websites provide many graphic or other sensory cues, which also convey information.

Collaboration between the teacher and the media specialist in information literacy instruction is essential to turn students into effective and efficient information searchers and information consumers. Unlike library skill instruction of twenty or thirty years ago, information literacy skills must not be taught in isolation. Literacy skill taught in the context of a subject area is more meaningful and relevant to students for they can apply newly learned skills right in their research assignments. Collaboration between the teacher and the media specialist creates a meaningful context in which instruction of information literacy skills is incorporated into the curriculum.[66] Together they can educate and shape students into information literate citizens for the 21st society.

Conclusion

Research on information seeking behaviors in the past 15 years indicates that children and youth experience difficulties in using the online catalog and the World Wide Web. Several types of difficulties are common while a few others occur only when they search the World Wide Web. They have common problems in spelling and keyboarding, generating search terms, grasping keyword concept, planning search strategies, and evaluating search results, when using the online and the Web. They also encounter several other problems when searching on the Internet. Their search behaviors on the Web generally consist of excessive browsing, hypertext linking, and looped search. They rapidly move from websites to websites, spending little time in evaluating or contemplating search results. They look quickly at the first screen of a website and rely on text and graphic cues provided there to

determine the quality and relevance of a website.

The online catalog and the World Wide Web are both indispensable tools for students to search information. Students need information literacy skills to have successful learning at school and to live a productive life later in society. The best place to learn information literacy skills is in a school library.[67] Thus, teachers and media specialists must collaborate work together to provide information literacy instruction. Knowing student's search problems is the first step toward better planning information literacy instruction. Adopting an information search model in instruction will help students stay focused on a particular task during a certain stage. Today, information overload and new search environment constantly present an information challenge both for students as well as teachers and media specialists. However, it is hoped that better understanding of students' difficulties will help design effective and efficient instruction to cope with this challenge.

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