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Children's Search Engines from an Information Search Process Perspective

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A crucial component to using the Web satisfactorily is locating what one is looking for. The paper begins with a description of some of the cognitive and affective characteristics of children and teenagers that may affect their searching behavior. It reviews some of the literature on children's searching in online public access catalogs (OPACs) and using digital libraries. The focus of the paper is on Web search engines. Two search engines are profiled. Some of the difficulties children have searching the Web are discussed in the context of the Kuhlthau(of)-2( )-10(t)u-eb ar

paragraphs. Kuhlthau's ISP model, which contains cognitive and affective components, will also be described.

Cognitive Skills

Children do not demonstrate the same higher thinking skills that adults do (Neuman 1995). Obviously these skills are on a continuum and are more likely to be found in older children than in younger children. Furthermore, as Chelton and Thomas point out, there is a wide range "of developmental and maturational differences . . . in any group of adolescents" (1999, 8).

One example of a cognitive difference between children and adults that will affect their ability to perform a search is the lack of a developed recall memory (Borgman et al. 1995). While adults typically have better recognition memory than recall memory, the disparity between the two seems to be greater in children. Because children are often novices in the areas they are researching (Kuhlthau 1997), they are unable to create a schema for storing information (Borgman et al.). The lack of schema creates difficulties when a child must modify his or her search (Fidel et al. 1999; Nahl and Harada 1996).

Mechanical Skills

Solomon (1993) explored the OPAC searching behavior of elementary school children. He pointed out a number of mechanical skills necessary for effective searching: typing and keyboarding, spelling, adequate vocabulary, reading, and alphabetizing. These skills were often weak in the study's participants, particularly in the very young children. Not surprisingly, these mechanical skills increased with age.

In their research on the OPAC behaviors of third- through twelve-year-olds, Borgman and colleagues (1995) found similar results. Even among high school students, Fidel et al. (1999) found that misspellings created problems when searching. Their study examined Web use behavior and found that keyboarding errors, particularly when typing in URLs, were frequently a hurdle for searchers. They attributed this to the length and case sensitivity of URLs.

Subject Searching: Controlled Vocabulary and Boolean Logic

Two issues are consistently brought up in the literature on searching behavior: the application of Boolean logic and the constraints of controlled vocabulary. Research suggests that Boolean logic is confusing to apply, particularly for children (Borgman 1996; Borgman et al. 1995; Nahl and Harada 1996; Schwartz 1998; Solomon 1993). Many users may be unaware of the fact that the subject search terms are based on a controlled vocabulary, some of which is quite arcane. Evidence that many searchers are unaware of the role of controlled vocabulary is demonstrated by the fact that many of the children in the study enter their queries using natural language (e.g., "Are dolphins fish?") (Bilal 1998; Nahl and Harada 1996, Search, Chung, and Dorr 1998).

Affective Issues

Kuhlthau's early work on the ISP was groundbreaking in that it acknowledged the role of affect in the search process (1991). She addressed the effect of anxiety, the impact of uncertainty, and

the importance of sensemaking. She suggested ways that an information professional can address these components to facilitate the search process.

In her more recent work, Kuhlthau (1999) introduces the concept of "enough," and its implications in digital libraries. She suggests that searchers must define "the concept of enough as what is enough to make sense for oneself within a context and to accomplish the task at hand" (6). Within the framework of digital libraries, the concept of enough can be applied at each stage in the ISP to assure effective information seeking.

Motivational Issues Specific to Students

According to Kuhlthau, the role of motivation is particularly noticeable in the first stage of the ISP, during which "thoughts are commonly centered externally on 'What does the teacher want?'" (1999, 6). For a search to proceed effectively, the individual must develop an understanding of "what makes sense for oneself." This seems like it would be particularly problematic for children educated in a traditional school environment or for anyone conducting a search for someone else in which they do not feel a sense of ownership. The effect of externally imposed searches has been described by Gross (1998).

Kuhlthau (1997) introduced the concept of "abundance" in the context of digital libraries. In this atmosphere of "abundance" it seems particularly challenging for a library media specialist (LMS) or teacher to convince an unmotivated student to distinguish between an adequate and a better than adequate source. In my experience watching high school students try to locate

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must determine the quality of the source (Healy 1998). Jacobson and Ignacio (1997) noted that one advantage of having students create their own Web pages was that it made them acutely aware of how easy it was for anyone to become an author.

Unlike most other online resources, the Internet has commercial potential. On the Internet, a site's viability may require it to have advertising potential, which is a function of the number of visitors it attracts. This leads some less-than-scrupulous webmasters to load their sites with commonly used but inapplicable search terms in the hope of increasing the number of visitors the site attracts. Unfortunately for the searcher, this can produce hits that have nothing to do with one's search topic.

Another manifestation of the commercialism is advertisements, which can be distracting. Even if one can ignore them, they clutter the screen and reduce the amount of space available for information. The reduction in usable space often forces the creator to add scrolling additional links. Either makes the navigation task more complex for the user (Denning, Shuttleworth, and

Yahooligans. This search engine is designed for children ages seven through twelve. Like its parent search engine, Yahooligans provides a hybrid structure to locate Web sites. This approach is designed to avoid the problems associated with searching, such as misspelling and unfamiliarity with controlled vocabulary.

Most of the sites are submitted by users who classify them into one subcategory. Articles are listed in only one subcategory, although subcategories can appear in more than one place in the Yahooligans hierarchy. According to PC Magazine Online (Falkinburg 1998b), "most of the site's listed come by suggestion, leaving Yahooligans with sites designed to meet the social needs of 8- to 12-year old users." Enough said.

A query will search titles, URLs, and the description entered by the person who submitted the site for the search terms of interest. The help materials suggest using a query if you know exactly what you're looking for. Queries containing more than one search term will only produce hits that contain all of the search terms. Note that this equivalent of a default "and" cannot be overridden.

Yahooligans provides a help facility, but it contains very little information on searching techniques. It provides instruction for teachers, who will presumably pass the information on to

Subject Headings to refer to. Many researchers noted that unfamiliarity with indexing terms made it difficult to formulate the initial search and was even more of a barrier when an initial search failed and subsequent searches were needed (Bilal and Watson 1998; Borgman et al. 1995; Fidel et al1999; Nahl and Harada 1996).

Neither Yahooligans or AJ4Kids eliminated the major problem traditionally associated with online searching—knowing how to specify keywords. Furthermore, the search engines did not appear to be sophisticated enough to address the research needs of high school students, but although they may be a useful starting point. A high school student would probably be better served using Yahoo!, AskJeeves, or another search engine intended for adults, rather than their offspring. Note, however, that the screening of materials is not a feature of these engines.

To avoid some of the problems encountered in Web searching, Minkel and Hsu (1999) suggest using "webliographies," Web pages typically compiled by librarians or school districts containing many (presumably screened) annotated links to sites with materials that can be used for homework assignments or school projects.

As described in the preceding sections, some of the mechanical problems associated with OPACs have actually been addressed in the development of search engines. Spell checking, natural language processing, and readily available hierarchical directory structures avoid some of the problems created by misspelling, controlled vocabulary, and misapplication of Boolean logic. Furthermore, as Jacobson and Ignacio suggest "the electronic environment changes the structure, practices, and culture of information seeking" (1997, 773). This sentiment is endorsed by Kuhlthau (1997), who modified her description of the Information Seeking Process to encompass the wealth of data in digital libraries. The next section describes her model and applies it to the Internet search process.

Kuhlthau's ISP and the World Wide Web

In her work on the ISP, Kuhlthau (1991) described six stages of the search process. The searcher does not progress through them linearly but eventually must pass through for successful

		determinant of what students choc to research?
3. Exploration	Users may try to collect copious/consistent information before their focus is formulated (see next stage); complicated due to inconsistent info	There is even more information, it may be even more inconsistent, and it may not have undergone a review process. Tremendous amounts of time can be spent.
4. Formulation	Important for students to "formulate a focused perspective" and to get an "understanding of what is enough . . . to avoid feeling overwhelmed" (716)	It is almost impossible not to feel overwhelmed. Issue of "enough" is much more complex in abundant environment.
5. Collection	Gather information pertaining to focus	Evaluation of resources is more critical. As more time is spent in exploration, less time remains to peruse and evaluate critically. Librarian is not necessarily an authority, although she or he may still be perceived as such.
6. Presentation	Need to incorporate a personal perspective	Cutting and pasting makes it too easy to produce a report without incorporating a personal perspective. Complicated if formulation stage is not effectively resolved (which may be more likely to happen in digital library).

Although Kuhlthau was not speaking specifically about the Internet, the last column of table 1 contains an extension of her framework. Kuhlthau states that "the user's experiences of the stages in the search process is related to how much the person knows about the problem and the degree of construction that needs to be undertaken during information seeking" (1999, 2). The literature suggests that when children perform Web searches, the cognitive load needed to answer a simple question is relatively high, for all but the most experienced searchers (Bilal and Watson 1998; Fidel et al. 1999; Nahl and Harada 1996; Schacter et al. 1998). Therefore, the following paragraphs contain an examination of Web searching within the context of Kuhlthau's model. One can hypothesize that so

Other Relevant Issues Not Addressed in Detail

This paper focused on searching behavior primarily from an information behavior perspective. This is just one aspect of the very complex world of the Internet and consequently, many issues have not been dealt with.

Perhaps the most controversial of these is Internet filters. Not only are the technical issues involved with using filters complicated, but the application of filters quickly becomes an issue of free speech (Johnson 1998). It is not difficult to find out if a filter is running along with the Internet connection. However it is not as easy to find out what is being screened if a filter is running. Parents and teachers should be aware of the fact that computers in their children's school and public library may or may not use filters.

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