The Information-Seeking Behavior of Elementary Children:
An Annotated Bibliography

Erica Megan McCreery
Drexel University
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Introduction and Scope

The following bibliography covers the information-seeking behavior of children, specifically those of elementary age. Articles describe their experiences with books, CD-ROMs, online catalogs (OPACs), and the Internet in classroom or school library settings. The articles were published between 1991 and 2012. An emphasis was placed on items that examine information-seeking behavior from a technological standpoint, as this is largely representative of the current information environment that elementary school children encounter. Articles represent original research performed in Australia, Canada, Germany, Sweden, the United Kingdom, and the United States.

Description

Elementary children, who are approximately five to twelve years of age, have evolving information needs. They are active problem solvers with "a natural tendency to explore" (Borgman, Hirsh, Walter, & Gallagher, 1995, p. 665). "Today's generation of children were born into a world of digital technology and the Internet," noted Spink, Danby, Mallan, and Butler (2010, p. 191) and are often referred to as "digital natives" (p. 191). Elementary-aged children are at the outset of their formal education, and tend to rely on visual and auditory information instead of primarily textual sources (Cooper, 2002). Moreover, children in grades three and lower may be "nonreaders, emergent readers, or beginning readers" (p. 904).

Summary of Findings

Elementary-aged children represent a unique demographic, yet research focusing on their information-seeking behavior is somewhat fragmented. Fundamental studies were mostly initiated in the 1990s as technology entered schools. Many of these studies utilized both quantitative and qualitative methodologies, relied on relatively small numbers of users, and were primarily conducted under experimental conditions (Beheshti, Large, & Tam, 2010, p. 392). More recent research emphasizes information
seeking in the context of current technology, while simultaneously reexamining older hypotheses. However, much of this newer research is in preliminary stages and has yet to be fully distilled.

Elementary children seek information primarily to satisfy school assignments, increasingly using technological means to fulfill their needs as schools shift away from textbook learning in favor of an exploratory or "discovery" based curriculum (Borgman et al., 1995). Children are interactive information seekers, and they perceive information found through electronic resources to be more valuable than that in print (Schacter, Chung, & Dorr, 1998) though they may feel more comfortable and confident searching books (Cooper, 2002, p. 918).

The cognitive, physical, and affective states of users are an integral part of any information-seeking process (Kuhlthau, 1991). Elementary children are in a highly developmental stage and "do not have a vast amount of experience to fall back and intellectualize upon as yet" (Cooper, 2002, p. 906). The information process for younger children can be dominated by feelings of inadequacy due to limited experience in both searching for information and relying on the skills--such as reading--necessary for success (p. 917). They may have the ability to use textual or meta-information, but often will not due to a lack of confidence (p. 920).

Children of all ages confirm that "it takes time to learn to seek information on the Internet, and it can be stressful" (Enochsson, 2005, Conclusions section, para. 2). They are not always able to retrieve information efficiently and effectively (Beheshti et al., 2010) because their cognitive ability, problem solving skills, and mechanical skills are not as developed as those of adults (Bilal & Kirby, 2002). Evaluating ambiguous or universal information sources often results in memory overload and weariness, causing younger children to experience breakdowns during the search process (Kammerer & Bohnacker, 2012).

Carrying out successful searches presents a definite challenge for elementary children. The Web lacks indexing conventions, making information retrieval often imprecise (Kammerer & Bohnacker, 2012) yet most children seem to regard it as a natural starting point for an information search (Madden, Ford, Miller, & Levy, 2006, p.
Schacter et al. (1998) found that children, being primarily reactive information seekers, did not systematically plan their searches. Bowler, Large, and Rejskind (2001) observed that students' search strategies are often "long and circuitous" (p. 208) with "a clear lack of strategic thinking" (p. 210). Other problems include determining appropriate concepts, and translating those concepts to keywords (Beheshti et al., 2010). Hirsh (1999) confirmed that children have difficulty formulating and revising search queries. Yet elementary children are persistent searchers, making several attempts before abandoning a search (Borgman et al., p. 676).

Many children begin their search strategies by using broad one- or two-word statements (Bilal, 2002) and boys are especially prone to brevity, often expecting to find worthwhile information from searches comprised of just a single word (Large, Beheshti, & Rahman, 2002, p. 442). Invention of URLs is a surprisingly common strategy for younger children (Madden et al., 2006, p. 751). Significantly, while the vast majority of information retrieval systems are designed for keyword searches, children demonstrate a definite preference for browsing over keyword searching (Beheshti et al., 2010). Borgman et al. (1995) suggested that browsing is a natural extension of children's tendency to explore, and accordingly demonstrated better results.

Children are likely to encounter problems when evaluating the usefulness of the information they retrieve. Elementary children are concrete thinkers, and have difficulty with results that do not match their search queries exactly (Hirsh, 1999). They may become frustrated by too many results, and lack the ability to determine the most relevant items (Large & Beheshti, 2000). Topicality is the main relevance criteria that children apply to textual materials, followed by novelty—especially in later stages of the search process—and then interest (Hirsh, 1999, p. 1281). Interest is by far the dominant factor used to assess graphical materials (p. 1276).

Despite the abundance and depth of knowledge available on the Internet, there is no guarantee that children will access reliable information. Content is uncontrolled, and the quality of information cannot be guaranteed. Schacter et al. (1998) found that students perform an insufficient evaluation of the accuracy of information they find, assuming that all information found on the Internet is true and valid. A study by
Bowler et al. (2001) noted a conspicuous "lack of awareness of bias, opinion, or point of view" (p. 214). Hirsh (1999) suggested that children may need assistance in developing the critical thinking skills needed to "learn to analyze and challenge the authority of documents found on the Internet" (p. 1280) because it is difficult for elementary children to question the veracity of information.

Future exploration of the information-seeking behavior of elementary-age children promises to be equally interesting. The latest research confirms that "children succeed better using their own strategies than trying to apply adult strategies" in their search for information (Kammerer & Bohnacker, 2012, p. 187) and future studies will likely attempt to answer the question of how children are adapting their behavior to today's smarter technology. Researchers will continue to test older theories in the dramatically different information landscape of today, leading to the potential evolution of some long-held assumptions. Findings from these efforts will undoubtedly shape the information-seeking process and inform the methods used to educate children.

The body of research on children's information-seeking behavior continues to grow, yet much remains to be studied thanks to the steady progress of technology. Results of these studies can assist educators who work with elementary-aged children, helping to create the most supportive environments for their information needs. Those who develop media and information resources for elementary children will likewise benefit, as findings promise to offer important ideas about the most productive tools for their information-seeking process.

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Bibliography

Entry 1:


Abstract: "Transaction logs for a children's portal are analyzed to investigate search
patterns when the system users are presented with four search options. The results show that the subject taxonomy and alphabetic search options account for 83 per cent of all searches, indicating users' preference for browsing rather than keyword searching. The implications for designing children's portals are discussed."

**Annotation:** This research seeks to explore children's information seeking behavior through the analysis of four separate search options--keyword, topic taxonomy, alphabetical and advanced--on a web portal specifically designed for children. The study is unique in that it investigates real-life search patterns using a massive amount (more than 92,000) of queries to draw its conclusions. Findings include children's preference for browsing and for the use of topic searches to satisfy information needs. A potential drawback to the study is its use of general IP addresses and hence an inability to tie results directly to specific child users, but this is assumed negated given that the venue is a dedicated children's portal. Although this type of research is more realistic than a staged experiment, it only examines search decisions and not the processes used to make those decisions.

**Authority:** Dr. Beheshti is an Associate Professor and the Director of Library & Information Studies at McGill University and is the author of 47 articles in the area of information science and systems. Dr. Large is a professor at the School of Information Studies at McGill University with expertise in information seeking behavior and has published more than 80 information science articles.

**Scholarly Status:** According to Ulrich's Global Serials Directory, the *Canadian Journal of Information and Library Science* is a peer-reviewed, scholarly title. The journal's web site confirms that it uses a double-blind peer review process.

**Search Method:** Author search.

**Search Strategy:** I noticed that Large and Beheshti were the authors of several oft-cited articles, and seemed to be somewhat prolific researchers in this subject area.

**Database:** Web of Science, Social Sciences Citation Index, all years

**Search String:** Author=(Large A*) AND Author=(Beheshti J*)

**Entry 2:**

Abstract: "The third part of a research project that investigated the information-seeking behavior and success of 7th-grade science children in using the Yahooligans! Web search engine/directory is presented. In parts 1 and 2, children performed fully assigned tasks to pursue in the engine. In the present study, children generated their tasks fully. Children's information seeking was captured from the cognitive, physical, and affective perspectives using both quantitative and qualitative inquiry methods. Their information-seeking behavior and success on the fully self-generated task was compared to the behavior and success they exhibited in the 2 fully assigned tasks. Children were more successful on the fully self-generated task than the 2 fully assigned tasks. Children preferred the fully self-generated task to the 2 fully assigned tasks due to their ability to find the information sought and satisfaction with search results rather than the nature of the task in itself. Children were more successful when they browsed than when they searched by keyword on the 3 tasks. Yahooligans! design, especially its poor keyword searching, contributed to the breakdowns children experienced."

Annotation: The article presents results from the final phase of a study where seventh-grade children used an age-appropriate search engine (directory) to research a fully self-generated task. The information-seeking behavior of these children was examined from the standpoints of success rate, cognitive behaviors, physical behaviors and mechanics, and task preference. Results were compared to, and contrasted with, previous studies by the same author where tasks were fully assigned. Though this study was performed with seventh-graders (and not elementary-aged children) it warrants mention because it is the only research that examines the information-seeking behavior of children (of any age) during fully self-generated tasks and thus may prove instructive for upper-elementary children. Moreover, as it highlights web-based information behavior, the study remains highly relevant for the current digital environment.

Authority: This work has been cited 69 times according to the Web of Science. Dr. Dania Bilal is a Professor at the School of Information Sciences of the University of Tennessee who is the author of numerous research studies on the information behavior of children.

Scholarly Status: According to Ulrich’s Global Serials Directory, the Journal of the American Society for Information Science and Technology is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical.

Search Method: Keyword searching

Search Strategy: I performed a general topic search with keywords that seemed most relevant to the subject.

Database: Web of Science, Social Sciences Citation Index, all years
Search String: Topic="information seeking") AND Topic=(children)
Then refined by category: Information Science Library Science
Then performed a citation report to reflect number of times cited, highest to lowest

Entry 3:

Bilal, D., & Kirby, J. (2002). Differences and similarities in information seeking:

Abstract: "This study examined the success and information seeking behaviors of seventh-grade science students and graduate students in information science in using Yahooligans! Web search engine/directory. It investigated these users' cognitive, affective, and physical behaviors as they sought the answer for a fact-finding task. It analyzed and compared the overall patterns of children's and graduate students' Web activities, including searching moves, browsing moves, backtracking moves, looping moves, screen scrolling, target location and deviation moves, and the time they took to complete the task. The authors applied Bilal's Web Traversal Measure to quantify these users' effectiveness, efficiency, and quality of moves they made. Results were based on 14 children's Web sessions and nine graduate students' sessions. Both groups' Web activities were captured online using Lotus ScreenCam, a software package that records and replays online activities in Web browsers. Children's affective states were captured via exit interviews. Graduate students' affective states were extracted from the journal writings they kept during the traversal process. The study findings reveal that 89% of the graduate students found the correct answer to the search task as opposed to 50% of the children. Based on the Measure, graduate students' weighted effectiveness, efficiency, and quality of the Web moves they made were much higher than those of the children. Regardless of success and weighted scores, however, similarities and differences in information seeking were found between the two groups. Yahooligans! poor structure of keyword searching was a major factor that contributed to the "breakdowns" children and graduate students experienced. Unlike children, graduate students were able to recover from "breakdowns" quickly and effectively. Three main factors influenced these users' performance: ability to recover from "breakdowns", navigational style, and focus on task. Children and graduate students made recommendations for improving Yahooligans! interface design. Implications for Web user training and system design improvements are made."

Annotation: There are several research studies that have investigated how children use search engines that are designed for adults. This article presents the first research on how adults use search engines that are designed for children and attempts to examine similarities and differences in the information seeking behavior of children and adults.
The authors explore the cognitive, physical and affective behaviors demonstrated by seventh-grade and graduate students, observing notable differences in the ability to recover from breakdowns, navigational style, and focus placed on tasks. Though this research does not focus specifically on elementary-aged children (there are no studies on this topic that do so) this article is nonetheless important for its potential to provide insight into the behavior of those in upper elementary grades. Also, this is one of the few articles that attempt to make an 'apples to apples' comparison of the behaviors of children versus adults. Important to note is that both the adults and children in this study had only rudimentary knowledge about using the Web, an unlikely situation in the present day.

Authority: This work has been cited 61 times according to the Web of Science. Dr. Dania Bilal is a Professor at the School of Information Sciences of the University of Tennessee who has authored numerous research studies on the information behavior of children. Joe Kirby is likewise affiliated with the School of Information Sciences of the University of Tennessee.

Status: According to Ulrich's Global Serials Directory, Information Processing & Management is a peer-reviewed, scholarly title. According to the publication's web site, the journal is "devoted to refereed reporting" of basic and applied research in information science, computer science, and cognitive science.

Search Method: Keyword searching

Search Strategy: I performed a general topic search with keywords that seemed most relevant to the subject.

Database: Web of Science, Social Sciences Citation Index, all years

Search String: Topic=("information seeking") AND Topic=(children) Then refined by category: Information Science Library Science Then performed a citation report to reflect number of times cited, highest to lowest

Entry 4:


Abstract: "As we seek both to improve public school education in high technology areas and to link libraries and classrooms on the "information superhighway," we need to understand more about children's information searching abilities. We present results
of four experiments conducted on four versions of the Science Library Catalog (SLC), a Dewey decimal-based hierarchical browsing system implemented in HyperCard without a keyboard. The experiments were conducted over a 3-year period at three sites, with four databases, and with comparisons to two different keyword online catalogs. Subjects were ethnically and culturally diverse children aged 9 through 12; with 32 to 34 children participating in each experiment. Children were provided explicit instruction and reference materials for the keyword systems but not for the SLC. The number of search topics matched was comparable across all systems and all experiments; search times were comparable, though they varied among the four SLC versions and between the two keyword online public access catalogs (OPACs). The SLC overall was robust to differences in age, sex, and computer experience. One of the keyword OPACs was subject to minor effects of age and computer experience; the other was not. We found relationships between search topic and system structure, such that the most difficult topics on the SLC were those hard to locate in the hierarchy, and those most difficult on the keyword OPACs were hard to spell or required children to generate their own search terms. The SLC approach overcomes problems with several searching features that are difficult for children in typical keyword OPAC systems: typing skills, spelling, vocabulary, and Boolean logic. Results have general implications for the design of information retrieval systems for children.

Annotation: This research, though conducted on specific databases, essentially studies the differences in elementary children's information seeking behavior on browsing versus keyword systems. This article represents the first full analysis of a series of experiments on online catalogs undertaken in four different stages, as well as presenting results from one of the tranches for the first time. The article poses queries and examines results in the context of exploratory or 'discovery' learning (as opposed to rote learning), which is becoming increasingly prevalent in elementary classrooms and libraries. Findings remain relevant in informing the design and usage of current digital curriculum and library tools.

Authority: This work has been cited 103 times according to the Web of Science. Dr. Borgman serves as Presidential Chair of the Department of Information Studies at the University of California, Los Angeles and is the author of more than 150 publications in the fields of information studies, computer science, and communication. Dr. Hirsh is the Director of the School of Library and Information Science at San José State University and will serve as Association for Information Science and Technology (ASIST) president during 2015. Dr. Walter has served as Chair and Professor of the Department of Information Studies at the University of California, Los Angeles.

Scholarly Status: According to Ulrich's Global Serials Directory, the Journal of the American Society for Information Science and Technology (formerly Journal of the American Society for Information Science) is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical.
Search Method: Footnote chasing.

Search Strategy: The Beheshti et al. (2010) article noted below referenced this article in its "Background" section. Upon cross-checking this article in Web of Science, I immediately saw that it had been heavily cited and was one of the landmark studies on the topic of children's information-seeking behavior.

Database: N/A


Entry 5:


Abstract: "Reports results of a study to follow three Grade-six primary school students as they access, interpret and use information found on the World Wide Web in order to complete a class assignment. Comments upon information-seeking behaviours, information interpretation skills and information utilization by the students. Concludes by identifying a series of issues that educators must address if the Web is to be successfully incorporated into the classroom. The students' ability to integrate the Web successfully into their learning is dependent upon teacher understandings of learning outcomes and the instructional strategies used in the design of class assignments."

Annotation: This article examines the ways in which primary school children access, interact, and use content found on the Web in an attempt to formulate generalizations about information seeking behavior and information literacy. Framed in the context of children as information seekers, the research explores their successes and obstacles in completing an assigned task. The study emphasizes small group work rather than individual work, because many elementary classroom assignments are structured in this fashion. While the initial participant group was fairly large at 54 students, one drawback of this study is that the authors choose to focus on just one group of three students to make in-depth observations. Still, the depth and detail of the observations provides useful insight into the (Web-based) information seeking behavior of elementary children.
**Authority:** ProQuest shows that this article has been cited eleven times. Dr. Bowler is a professor of Library and Information Science at the University of Pittsburgh with a research focus on children’s information behavior. Dr. Large is a professor at the School of Information Studies at McGill University with expertise in information seeking behavior and has published more than eighty information science articles.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, *Education for Information* is a peer-reviewed, scholarly title based in the Netherlands. ProQuest confirms this as a peer-reviewed, scholarly journal.

**Search Method:** Footnote chasing.

**Search Strategy:** This article was mentioned in the article detailed below and also caught my attention as I scanned the References section due to the inclusion of Andrew Large as part of the research team; Large was the (co)author of several other useful articles.

**Database:** N/A

**Search String:** Referenced in:

**Entry 6:**


**Abstract:** "This article presents a case study of the information-seeking behavior of 7-year-old children in a semistructured situation in their school library media center. The study focuses on how young children who are in the process of learning to read cope with searching for information in a largely textual corpus, and how they make up for their deficit in textual experience. Children's search strategies are examined and discussed in the context of computer versus shelf searching, textual versus visual searching, and in comparison with adult search dimensions previously established."

**Annotation:** This article details research into younger elementary (age seven) children’s information seeking behavior; specifically, how children who are just learning to read find information in a textual environment. The study investigates the information seeking methods children employed for both print and digital sources, and also compares and contrasts some of these behaviors with those of adults. This is perhaps
the only study to focus on the period when the youngest elementary children are making the transition from visual to alphabetical information seeking, and provides a detailed examination of the methods they utilize to deal with both concrete and abstract types of information.

**Authority:** According to ProQuest, this article has been cited 17 times. Linda Z. Cooper is an Associate Professor at the Graduate School of Library and Information Studies, City University of New York, Queens College. One of her primary research interests is the information behavior of children.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, the *Journal of the American Society for Information Science and Technology* is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical, has been published continuously since 1950.

**Search Method:** Keyword searching

**Search Strategy:** I performed a command line search with keywords that seemed most relevant to the subject.

**Database:** ProQuest, Social Sciences subject area, using a combination of the ASSIA, ERIC, LISA and ProQuest Library Science databases

**Search String:** SU,TI,AB(information seeking behavior?) AND SU,TI,AB(children OR youth OR youngster*)

**Entry 7:**


**Abstract:** "Introduction. The aim of this article is to determine the various skills necessary for seeking information on the Internet in educational settings. Throughout the article there is also an aim to present the students' perspective on possibilities and difficulties when using the Internet. Methods. The approach is ethnographic, which requires various data collection methods. In total 110 students in four different settings have participated. Analyses. The analyses were partly made with the help of the software NUD*IST for qualitative analyses, where sentences both from interviews and field notes were coded. Some analyses were of qualitative nature and based on selected material from the coded texts. Others were strictly quantitative and compared data.
from coded qualitative material with questionnaires and computer logs in a database sheet. In ethnographic analyses the material is read several times and compared in different ways to see what themes will emerge. In this case the respondents have also commented upon the result. Result. The students regard six different skills as fundamental: language, knowledge about the technology, knowledge about different ways of information seeking, how search engines work, setting goals and being critical."

**Annotation:** This article presents research on children's information seeking on the Internet, highlighting behavior from the children's perspectives. The study followed 110 students in four different Swedish schools, at least 85 of whom were aged 6-11, seeking Internet-based information in conjunction with lengthy classroom discussion. This article, translated from Swedish and thus somewhat disjointed in English, is important in that the children themselves draw the primary findings. The study demonstrates that children deem language, basic computer skills, and critical thinking as imperative to successful information seeking on the Internet, suggesting a departure from earlier, search engine-centric theories.

**Authority:** This work has been cited two times according to Web of Science. Dr. Ann-Britt Enochsson is an Associate Professor in Educational Sciences at Karlstad University, Sweden, with a focus on Internet-based information seeking and educational information and communication technologies who has authored several dozen peer-reviewed articles and conference contributions.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, *Information Research* is a peer-reviewed, scholarly electronic journal. The journal details "The Peer Review Process" at length on its web site.

**Search Method:** Author search.

**Search Strategy:** Enochsson's research was mentioned in several of the articles that I reviewed during the course of my research. However, many of the articles proved elusive to find, perhaps because they were published in Sweden. I was finally able to locate a couple of items in the Web of Science database.

**Database:** Web of Science, Social Sciences Citation Index, all years

**Search String:** Author=(Enochsson A*)
Entry 8:


**Abstract:** "This study explores the relevance criteria and search strategies elementary school children applied when searching for information related to a class assignment in a school library setting. Results are presented for children selecting the topic, conducting the search, examining the results and extracting relevant results. A total of 254 mentions of relevance criteria were identified, including 197 references to textual relevance criteria that were coded into nine categories and 57 references to graphical relevance criteria that were coded into five categories. Students exhibited little concern for the authority of the textual and graphical information they found, based the majority of the relevance decisions for textual material on topicality and identified information they found interesting."

**Annotation:** This article details Hirsh's study on the relevance criteria used by children when they seek web-based or electronic information. Several studies prior to this one examined the relevance criteria used by adults in information seeking, but this is the first to examine how elementary children assess such information. Though the subject group is rather small at just ten participants, the findings are valuable in providing insight into how children determine the importance of information. Further, due to the subjects' exclusive use of electronic resources, the findings remain relevant for today's digital information environment. Hirsh distills nine specific criteria used by children to determine the importance of textual information, and another five criteria for graphic information; topicality is the foremost factor for textual items and interest is the primary factor for graphic items. Significantly, Hirsh finds that children of this age group place very little importance on the authority of the information they find.

**Authority:** This work has been cited 106 times according to the Web of Science. Dr. Sandra G. Hirsh is the director of the School of Library and Information Science at San José State University and will serve as Association for Information Science and Technology (ASIST) president during 2015.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, the *Journal of the American Society for Information Science and Technology* (formerly *Journal of the American Society for Information Science*) is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical, has been published continuously since 1950.

**Search Method:** Keyword searching.

**Search Strategy:** I performed a general topic search with keywords that seemed
most relevant to the subject.

Database: Web of Science, Social Sciences Citation Index, all years

Search String: Topic=\("\text{information seeking}\") \text{AND}\ Topic=\("\text{children}\")

Entry 9:


Abstract: "In this paper, we present work in progress on how elementary school children use modern search engines to solve informational search tasks. Specifically, in a laboratory study with 21 children aged 8-10 we investigated whether the use of natural-language queries leads to more successful search outcomes than keyword queries when searching the Internet with Google. Both quantitative and qualitative data are reported that indicate the advantages of natural-language queries. Along, based on our observations we present a query-reformulation tool for a search engine interface for children that we are currently developing."

Annotation: This study examines how elementary children use a modern search engine (Google) to seek information and questions whether newer technology is causing the evolution of their information seeking preferences (natural language vs. keyword searching). Conclusions of several earlier landmark studies examined herein (Bilal, Hirsh, and Schacter) are upheld in the process, while raising concerns about the merits of long-held assumptions about children's information seeking preferences. Though this item is a 'short paper' and presents preliminary results only, it is already being cited in the work of other researchers.

Authority: This article has been cited twice according to ACM Digital Library bibliometrics. Dr. Kammerer is a researcher with the Knowledge Media Research Center in Germany, with research focus on Information seeking and evaluation on the Web, whose eight published articles have been cited 32 times. Ms. Bohnacker is also affiliated with the Knowledge Media Research Center in Germany, with a focus on human-computer interaction and information retrieval.

Scholarly Status: According to the ACM Policy on the Publication of Conference
Proceedings in ACM Journals, "ACM journals and transactions are designed to publish research results which are the gold standard for the profession. Achieving this level of quality requires a review process that provides the time necessary for careful review by acknowledged experts in the field." The IDC 2012 Conference, according to their website, used a blind review process. Short papers (such as this item) were specifically required to report original work that was not previously published. Additionally, authors were encouraged to demonstrate work in progress and late-breaking research results showing the latest innovative ideas.

Search Method: Footnote chasing.

Search Strategy: This article was cited by an item that I ultimately discarded because it turned out to be a survey of research. However, this article was very current and looked interesting, so I went to the Drexel Libraries website and searched the catalog by article title. I was able to access the full text via the ACM Digital Library.

Database: N/A

Search String: Referenced in:

Entry 10:


Abstract: "The article discusses the users' perspective of information seeking. A model of the information search process is presented derived from a series of five studies investigating common experiences of users in information seeking situations. The cognitive and affective aspects of the process of information seeking suggest a gap between the users' natural process of information use and the information system and intermediaries' traditional patterns of information provision."

Annotation: This article presents a model of the ISP (information search process) from the user's perspective, a notable departure from previous research on information seeking that focused on the subject purely from a system-based perspective. Kuhlthau describes the ISP as "the user's constructive activity of finding meaning from information in order to extend his or her state of knowledge on a particular problem or topic" and insists that any model posited must incorporate the physical actions, affective feelings, and cognitive thoughts of the information seeking process. The
article then presents a six-stage model of ISP: initiation, selection, exploration, formulation, collection, and presentation. Of the many models of ISP and information seeking behavior available, Kuhlthau's is arguably the most important in any examination of children's information seeking behavior; most of the articles written about the subject cite this study (or its subtle subsequent revisions), especially those concerning elementary-aged children.

**Authority:** According to the Web of Science, this article has been cited 461 times. Dr. Kuhlthau is a Professor at the School of Library & Information Studies, at Rutgers, The State University, and has published nearly sixty journal articles related to the information seeking process. One of the most cited authors in the field, Kuhlthau bases her research on the practice of the school library media specialist.

**Scholarly Status:** According to Ulrich's Global Serials Directory, the *Journal of the American Society for Information Science and Technology* (formerly *Journal of the American Society for Information Science*) is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical.

**Search Method:** Footnote chasing.

**Search Strategy:** Some of the most frequently cited articles in this bibliography--Hirsh (1999), Borgman et al. (1995)--cite this work. Upon cross-referencing this article in Web of Science, I saw that it had been heavily cited and was one of the leading theories on information seeking. In the course of my research, I noticed repeatedly that Kuhlthau's work provided context for the majority of the articles about children's information behavior.

**Database:** N/A

**Search String:** Referenced in (amongst others):

**Entry 11:**

Abstract: "This article presents and discusses interviews with 50 grade-6 primary school students about their experience of using the Web to find information for a class project. The children discuss the quantity and quality of textual and image information on the Web versus traditional print sources, and the reasons why they made very little use of any moving images and sound clips on the Web. They also discuss how they searched for information on the Web and the ways in which this differs from looking for information in printed sources. The children overall demonstrate a sophistication both in their appreciation of the Web's strengths and weaknesses as an information source, and in their information retrieval strategies. In their reaction to the Web compared with traditional print sources, they can be categorized as technophiles, traditionalists, or pragmatists. The results from this research study suggest that although the Web can make an important contribution to information retrieval by school students, for the time being, at any rate, a role also remains both for other electronic sources such as CD-ROMs and print materials that are targeted specifically at young users. The Web needs both a more straightforward interface and more information specifically aimed at the young before it can seriously threaten its rivals."

Annotation: This article presents a study of upper-elementary students, exploring to what extent the Internet replaces traditional information sources in the school environment. The research seeks to expand upon earlier studies by directly seeking the feedback and reactions of elementary children to the Web, and presents findings in full detail. As opposed to earlier, purely experimental, research on the subject this study uses a real-life classroom assignment and a more ample subject pool of 53 students to draw its conclusions.

Authority: According to the Web of Science, this article has been cited 62 times. Dr. Large is a professor at the School of Information Studies at McGill University with expertise in information seeking behavior and has published more than 80 information science articles. Dr. Beheshti is an Associate Professor and the Director of Library & Information Studies at McGill University and has authored 47 articles in the area of information science and systems.

Scholarly Status: According to Ulrich's Global Serials Directory, the Journal of the American Society for Information Science and Technology is a peer-reviewed, scholarly title. The Association for Information Science and Technology (ASIS&T) web site confirms that the journal is a fully refereed scholarly and technical periodical.

Search Method: Keyword searching.

Search Strategy: I performed a general topic search with keywords that seemed most relevant to the subject.

Database: Web of Science, Social Sciences Citation Index, all years
Search String:  
Topic=(&quot;information seeking&quot;) AND Topic=(children)
Then refined by category: Information Science Library Science
Then performed a citation report to reflect number of times cited,
highest to lowest.

Entry 12:


Abstract: "This paper reports the results of an empirical study into gender differences in collaborative Web searching, conducted in a grade-six classroom of a Canadian elementary school. Searches undertaken by 16 same-sex groups of two or three students (six of boys, ten of girls) for information to support a class assignment were captured on videotape. The multiple search sessions took place over several weeks. An analysis of the search sessions reveals that the groups of boys formulated queries comprising fewer keywords than the groups of girls, the boys spent less time on individual pages than the girls, the boys clicked more hypertext links per minute than the girls, and in general were more active while online. The study overall demonstrates academic, affective and behavior differences between grade-six boys and girls working in same-sex groups on a Web-based class project."

Annotation: This article explores the ways in which children retrieve Web-based information, examining the similarities and differences in the information seeking behavior of elementary-aged boys and girls on the Internet. Specifically, this study compares and contrasts the analytic search moves, browsing moves, and information gathering methods demonstrated by both sexes. Previous research in this area was undertaken on OPACs or CD-ROMs (technology that is now underused or obsolete) and failed to establish definitive gender effects. This is the first study attempting to identify gender effects related purely to Internet searching, making its conclusions highly relevant to the present-day information seeking environment encountered by children.

Authority: This article has been cited 59 times according to the Web of Science. Dr. Large is a professor at the School of Information Studies at McGill University with expertise in information-seeking behavior and has published more than 80 information science articles. Dr. Beheshti is an Associate Professor and the Director of Library & Information Studies at McGill University and is the author of 47 articles in the area of information science and systems.

Scholarly Status: According to Ulrich’s Global Serials Directory, *Information Processing & Management* is a peer-reviewed, scholarly title. According to the publication's web
site, the journal is "devoted to refereed reporting" of basic and applied research in information science, computer science, and cognitive science.

**Search Method:** Keyword searching.

**Search Strategy:** I performed a general topic search with keywords that seemed most relevant to the subject.

**Database:** Web of Science, Social Sciences Citation Index, all years

**Search String:** Topic="information seeking") AND Topic=(children)
Then refined by category: Information Science Library Science
Then performed a citation report to reflect number of times cited, highest to lowest.

**Entry 13:**


**Abstract:** "Design/methodology/approach - A total of 15 children, aged 11 to 16, were each set three 'think aloud' internet searches. In the first, they were asked to recall the last time they had sought information on the internet, and to repeat the search. For the second, they were given a word, asked to interpret it, then asked to search for their interpretation. For the third, they were asked to recall the last time they had been unsuccessful in a search, and to repeat the search. While performing each task, the children were encouraged to explain their actions. Findings - The paper finds that the factors that determined a child's ability to search successfully appeared to be: the amount of experience the child had of using the internet; the amount of guidance, both from adults and from peers; and the child's ability to explore the virtual environment, and to use the tools available for so doing. Originality/value - Many of the searches performed by participants in this paper were not related to schoolwork, and so some of the search approaches differed from those taught by teachers. Instead, they evolved through exploration and exchange of ideas. Further studies of this sort could provide insights of value to designers of web environments."

**Annotation:** This study examined a group of children as they performed Internet-based information searches that were not specifically related to schoolwork, aiming to fully detail their search behavior at different stages of their schooling. Importantly, there were no restrictions placed on the actions and choices of the student searchers, so this study offers an accurate picture of children's abilities and inclinations on the Web. Though the research was performed on a relatively small group of students (of which
two thirds were of upper elementary age) findings are important in that this is one of the few studies to examine how children achieve success--or reach failure--by their own methods.

**Authority:** This article has been cited 14 times according to ProQuest. Andrew Madden is a researcher at the Information School (iSchool) of the University of Sheffield, UK. Nigel Ford is Head of the Educational Informatics Research Group at the iSchool of the University of Sheffield and also serves on the Editorial Board of the Journal of Documentation. Dr. Philippa Levy is the Head of School and a Professor of Higher Education Development at the iSchool of the University of Sheffield, also serving on the Editorial Board of Teaching in Higher Education. Messrs. Madden and Ford won a 2013 Award for Excellence from the Emerald Publishing Group.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, the *Journal of Documentation* is a peer-reviewed, scholarly title published in the United Kingdom. ProQuest confirms *Journal of Documentation* to be a peer-reviewed, scholarly journal. The journal's web site confirms: "All papers are subject to blind peer review by at least two referees."

**Search Method:** Keyword searching.

**Search Strategy:** I performed a command line search with keywords that seemed most relevant to the subject.

**Database:** ProQuest, Social Sciences subject area, using a combination of the ASSIA, ERIC, LISA and ProQuest Library Science databases

**Search String:** SU,TI,AB(information seeking behavior?) AND SU,TI,AB(children OR youth OR youngster*)

**Entry 14:**


**Abstract:** "The research reported here examined the effects of task structure on elementary school students' information seeking on the Internet. Thirty-two 5th- and 6th-grade students searched on 2 tasks (1 well-defined and 1 ill-defined) for information that was relevant to solving 2 problems. Information-seeking process behaviors were analyzed by collecting computer trace data of each students search. Information-seeking performance was measured by 2 adult raters and by students' own judgments of all documents found. Analyses of students' process behaviors illustrated that children are
interactive information seekers, preferring to browse rather than plan or employ
systematic analytic-based searching strategies. Performance results indicated that
children have difficulty finding relevant information on the Internet, however, children
did search more effectively on the ill-defined task than on the well-defined one. Further,
when judging their own performance, students rated their work equally on both tasks,
yet adult judges found that students performed significantly worse on the well-defined
task."

**Annotation:** This article presents a study that examines the processes that elementary-
aged children employ when seeking Internet-based information. Thirty-two children
are observed performing both well-defined and ill-defined queries, achieving far
greater success on ill-defined tasks. The research demonstrates that elementary
children are reactive searchers who do not utilize formal search strategies, and that
most believe any information found on the Internet is wholly accurate and
authoritative. The article also notes key gender differences found to have an effect on
searching. This study was the first to investigate the Internet-based information seeking
behavior of elementary children, and remains a foundation for subsequent and current
research in this area.

**Authority:** This article has been cited 110 times according to the Web of Science. Dr.
Schacter is a past Senior Fellow of Stanford’s Educational Leadership Institute and
currently lectures at the Department of Elementary Education, San Jose State
University. Dr. Chung is Assistant Director for Research Innovation at the National
Center for Research on Evaluation, Standards, and Student Testing (CRESST). Dr.
Aimee Dorr is Professor Emeritus and Dean of the Department of Education of the
University of California, Los Angeles.

**Scholarly Status:** According to Ulrich’s Global Serials Directory, the *Journal of the
American Society for Information Science and Technology* (formerly *Journal of the American
Society for Information Science*) is a peer-reviewed, scholarly title. The *Association for
Information Science and Technology* (ASIS&T) web site confirms that the journal is a
fully refereed scholarly and technical periodical.

**Search Method:** Keyword searching.

**Search Strategy:** I performed a general topic search with keywords that seemed
most relevant to the subject.

**Database:** Web of Science, Social Sciences Citation Index, all years

**Search String:** Topic=("information seeking") AND Topic=(children)
Then refined by category: Information Science Library Science
Then performed a citation report to reflect number of times cited,
highest to lowest.
Entry 15:


Abstract: "Purpose -- This paper aims to report findings from an exploratory study investigating the web interactions and technoliteracy of children in the early childhood years. Previous research has studied aspects of older children's technoliteracy and web searching; however, few studies have analyzed web search data from children younger than six years of age. Design/methodology/approach -- The study explored the Google web searching and technoliteracy of young children who are enrolled in a "preparatory classroom" or kindergarten (the year before young children begin compulsory schooling in Queensland, Australia). Young children were video- and audio-taped while conducting Google web searches in the classroom. The data were qualitatively analysed to understand the young children's web search behaviour. Findings -- The findings show that young children engage in complex web searches, including keyword searching and browsing, query formulation and reformulation, relevance judgments, successive searches, information multitasking and collaborative behaviours. The study results provide significant initial insights into young children's web searching and technoliteracy. Practical implications -- The use of web search engines by young children is an important research area with implications for educators and web technologies developers. Originality/value -- This is the first study of young children's interaction with a web search engine."

Annotation: This article details research into the information seeking behavior of very young elementary-aged children as they search for information on Google. Despite their developing spelling, language, and cognitive skills, the children demonstrated behaviors previously observed only in older children such as browsing, keyword searching, ability to create search strategies, and making relevance judgments. The study also suggests that information authority issues are present in the younger elementary-aged population; many participants viewed Google as a magical "answer machine." This article is important in that it is the first research initiated to study the youngest elementary-aged information seekers as they interact with the Internet.

Authority: This article has been cited four times according to ProQuest. Dr. Spink has published over 100 articles--more than 80 of them peer reviewed--and has expertise in the areas of information seeking and interactive information retrieval. Dr. Danby is Professor at the School of Early Childhood, Queensland (Australia) University of Technology. Dr. Mallan is a Professor at the School of Language and Literacy Education, Queensland (Australia) University of Technology. Dr. Butler is a lecturer at Loughborough (United Kingdom) University.
Scholarly Status: According to Ulrich’s Global Serials Directory, the Journal of Documentation is a peer-reviewed, scholarly title. The journal's web site states, "All papers are subject to blind peer review by at least two referees."

Search Method: Citation search.

Search Strategy: At some point during my research process, I began to perform Web of Science citation searches on articles I found to be particularly useful, reasoning that they might lead to other helpful articles. This was found by viewing all citing articles for the Bilal & Kirby article detailed below.

Database: Web of Science, Citing Articles Search


Conclusion and Personal Statement

Writing this annotated bibliography proved very informative and provided an excellent review of the key concepts learned during this term. Most importantly: any successful information-seeking process begins with a well-defined query that evolves into a logical search strategy built on appropriate concepts. The search strategy must then be commenced on a database or other information resource that is well matched to the subject area and intent.

A search--and by extension, a database--is only as good as the effort put into it. Identifying the appropriate database(s) for an information need is an obvious starting point, but so is an understanding of how a given resource can best be probed for information. Having a robust 'searcher's toolkit' is critical to finding relevant information. Taking time to understand the various components of respective databases--features, controlled vocabulary, refinements, and so forth--leads to more productive searches.

One of the most surprising things I learned during this process: more is not necessarily better when it comes to searching. Though it took many missteps,
eventually I came to the realization that a search is much like a fine painting: the details and small refinements are what create a masterpiece. A successful information search also requires an open mind, for an optimal strategy will likely require revisions and fine tuning as the process moves forward.

Interestingly, the best items are sometimes a product of (practiced) serendipity. I eagerly investigated the footnotes of every article I read. I particularly appreciated citation searching--both forward and backward--as it frequently led to articles of high value. Bibliometric data proved quite useful; if an article was oft cited it was a strong indicator that its information should merit serious consideration. I discovered many valuable articles by stepping beyond formal searches and looking at footnotes, citations, and authors.

Building the literature review was something that I enjoyed. For me it was like a treasure hunt, seeking out the most relevant pieces of information to convey the major components of my subject. After reading dozens of articles, major themes emerged in a relatively straightforward way. From there, it was a matter of refinement. The biggest challenge proved to be having a wealth of excellent topics; it was difficult to leave anything out.

Writing annotations provided an interesting juxtaposition to the lengthy and often verbose articles they summarized. I tried to be almost ruthless in writing them: if I could convey only the most crucial thing about an article, what would that be? What made an article special and worthy of a potential reader's time? Though some of the articles included here have minor drawbacks in the scheme of presenting important points, I discarded several items outright while writing annotations when their negatives outweighed their positives.

This assignment was challenging. Still, it was an ideal way to draw together all of the important concepts of searching. I came away not only wiser about the information-seeking behavior of elementary children, but with renewed confidence as a searcher.