
Introduction

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SEVERAL YEARS AGO, WHILE WORKING ON A review article about children and their use of electronic information retrieval systems, I was struck by the dearth of literature on the subject (Jacobson, 1991). General technology topics were receiving a great deal of attention: educational software, technology management issues, the role of the school library in promoting computer literacy, and so on. But, except in a few notable cases (see, for example, Edmonds et al., 1990; Walter & Borgman, 1991), most research on catalog use and information retrieval focused on the adult user.

Since my review article appeared, this field of inquiry has seen considerable evolution. The technology has, in a sense, caught up to children's needs. With more power and storage capacity available at the workstation level, there has been a shift away from remote mainframe dependence. New graphical information retrieval systems like the *Kid's Catalog* (Busey & Doerr, 1993) do not demand that children possess the cognitive skills of adults. Hypermedia has come of age, enabling the development of different types of interactive information tools. Perhaps most significant of all, massive developments in telecommunications technology have resulted in Internet availability for wide segments of the population. The World Wide Web is only about four years old yet is already forcing a paradigm shift in the way our culture views information and communication.

In addition to improvements in technology, we are also witnessing changes at the programmatic level—from the efforts of individual institutions to profession-wide initiatives such as the American Association of School Librarians' ICONnect project, directed by Pam Berger

(see <http://www.ala.org/ICONN/>). The information science literature is beginning to reflect these changes in the status quo. For example, the September 1996 *D-Lib Magazine* (<http://www.dlib.org/dlib/september96/09contents.html>) is a special issue on digital libraries and education. Articles range from descriptions of individual digital library research initiatives in schools (e.g., Wallace et al., 1996) to a big-picture piece by Masullo and Mack (1996), who discuss ways digital libraries can promote the realization of educational reform. Despite these examples, however, the digital library research literature has still focused primarily on the needs of expert communities—scientists and scholars—and thus on issues of access and collections rather than on issues related to learning and *cognitive* access to information.

What is a “digital library” in today’s world? I posit that it is currently a hybrid place, offering a variety of resources in a hodgepodge of different formats. In a given physical library space, it is possible to find a wide variety of workstations giving access to the library’s catalog, and educational software for children (some of these workstations linked in local area networks) as well as the traditional array of print access tools and resources. There is no single, monolithic “digital library” that is a self-contained repository of this hypothetical library’s holdings. In a week or six months or a year, the scene will look different, as this library will continue to be subject to rapid and profound change.

The authors represented in this issue of *Library Trends* take a hard look at children’s information needs in terms of the digital library. They examine the current hybrid state of affairs, innovative developments in software design and collection delivery, and implementation issues surrounding digital information tools. But technological advances are only part of the story. These articles also discuss the “socio-human” factors. What is the relationship between the user and the digital library collection? How is the collection made meaningful to the young user? What learning and teaching issues are involved?

My original view of this issue of *Library Trends* was that the articles would fall into logical discrete categories. I anticipated separate sections with headers like “Overview,” “Content Issues,” “Cognitive Issues,” and “Teaching Issues.” But, once the articles started arriving, I found that there was considerable blurring among my imposed categories. Most of the authors addressed some aspect of each category in one way or another. How could a learning theorist speak about cognitive processes without linking them to classroom situations? How could a content provider not consider cognitive processes during interface design? How could political issues like equity be considered apart from their impact on learning? In the end, I came to view these articles as a series of stories, each one describing a different aspect of the whole. Some of the perspectives overlap; all represent different lenses focused on similar phenomena.

The issue begins with Pam Sandlian's fantasy of a "what-could-be" future, beyond the haphazard hybrid state mentioned above. Her vision is what we would all like to see—i.e., the realized potential of the digital library for children. She describes a world in which there is no either/or dichotomy between print and electronic. In Sandlian's world, the digital library assumes all formats. The print and electronic worlds intersect so that the appropriate technology is applied to the appropriate use. The articles that follow Sandlian's confront the stages in between, the work to be done, before her vision can be realized.

Virginia Walter grounds us in an overview of the policy issues, keeping the needs of children at the core of her discussion. She takes on such thorny topics as intellectual freedom, filtering software, commercial aspects of the Internet which target children (i.e., the online version of Saturday morning cartoon-commercials), information literacy, and traditional assumptions about the librarian's role in collection development. She also addresses equity issues in terms of socioeconomic status, gender, and ethnicity. Walter concludes by describing a "policy narrative" process which takes into account the personal relationships children have with computers and positions adults as supporting characters who provide guidance at critical moments.

Moving on from dreams of the future and the vagaries of policy setting, concrete issues of content are addressed. *World Book Encyclopedia* possesses near-reverential stature as *the* quality reference tool for children. Robert Janus details how the producers of this highly esteemed title managed its transition to a digital format. His story reflects the perspective of a traditional print publisher—concerns regarding quality, product image and continuity, and marketing. He adeptly describes the technical mountains confronted during the conversion process and the difficulties of creating something new in a fluctuating technological environment. What should be done about hardware and networking developments that move faster than school and library budgets do? How does the information producer reconceptualize a product to take advantage of the new capabilities provided by electronic access without compromising ease of use and the integrity of the information? Janus also gives us a glimpse into plans for the future development of *World Book*.

Of all the articles in this collection, the piece written by Marvin Weinberger is the one that comes closest to describing a "true" digital library. The *Electric Library* is a vast *collection* in the way we think of libraries as being *collections*. It offers an eclectic body of work culled from a wide variety of sources, representing numerous points of view and traditions, and speaking to many different audiences. Rather than focusing on the specific technical features and functionality of this product, Weinberger has written an impassioned "why" piece—why such a product was envisioned and its role in terms of the tools that an educated

member of society needs. Two other articles in the issue (by Leander and Bruce and Jacobson and Ignacio) make reference to the use of *Electric Library* in a school setting.

Many think of children's literature—books—as being at the core of library service to children. What has happened to children's print literature itself in the age of the digital library? Eliza Dresang takes a close look at the evolution of this medium, delivering a new and eye-opening perspective on the impact of the digital environment on the entire body of children's literature and children's perception of it. The digital age has had influence far beyond the purely electronic realm. Missing from this issue is an article addressing digitized versions of children's literature. Picture books, story books, and other traditional forms of children's literature are now coming out on CD-ROM, ideally as interactive "experiences." There is disagreement concerning the success of these products, some arguing that the interactive elements are often gratuitous, distracting from the flow and intent of the original work (e.g., Kafai & Soloway, 1994), others advocating their use in tandem with print works (e.g., Sharp, 1994).

Returning to considerations of content for children in the digital world, notions of *cognitive* access become critically important. Edelson and Gordin (1996) observe that: "Most current digital library research is about availability because availability of resources is the primary issue for expert users." They conclude that digital libraries must be adapted for learners so that the content will be *accessible* as well as *available*. In this issue of *Library Trends*, the article by Chen, Fales, and Thompson confronts content and accessibility concerns in terms of the pedagogical goals of classroom teachers who are trying to use digitized primary historical collections previously unattainable for student audiences. As Bill Tally (1996) points out, primary historical collections *on their own* seem raw and lacking in context. They may be free from bland textbook treatment but are also unwieldy and cumbersome in classroom situations. Chen, Fales, and Thompson describe the efforts the Library of Congress and the Center for Children and Technology (CCT) are making to enable schools to take advantage of these rich resources in a way that is manageable, enhances learning, and will lead students to explore further. We are taken into a classroom to view a case study of how historical primary resource material is used in context.

The CCT effort represents one way in which children's access to digital library resources might be conceptualized and implemented. Clearly, however, multiple approaches are called for. For the students and teachers who are using the Library of Congress (LC) *American Memory* collections independently, the LC has sponsored a specially designed World Wide Web access point. The *Learning Page* helps teachers and students make sense of the massive collections by incorporating principles of Instructional Systems Design. Judith Graves, developer of the *Learning Page*,

describes the analytical process that shaped her design.

Together, the articles by Graves and Chen, Fales, and Thompson, provide us with two snapshots of the case of a single digital library “situation.” Together, they represent universal problems related to access and learning. Delia Neuman and Carol Kuhlthau direct our attention to broad theoretical views of the same issues. Their perspectives help define the boundaries of this field of study, guiding practice and development in the area. First, Neuman argues for a view of the digital library as a learning environment. Reviewing the research that demonstrates the role electronic information systems can play in the development of higher order thinking skills, she presents the digital library as a robust environment for staging such learning opportunities, although she does not minimize the potential pitfalls. She weaves together research from the fields of information studies and instructional technology to propose an overarching framework within the area of information literacy.

Kuhlthau extends her previous groundbreaking work in the Information Search Process (ISP) approach to application in the digital library environment. She argues that the “deadening impact of overload” can create serious obstacles to learning despite our appreciation of the welcome abundance of resources. She reviews the stages of the ISP, prescribes a series of instructional intervention strategies librarians can use, and proposes an emerging theory for creating learning environments in digital libraries. She accomplishes this by casting constructivist attributes of learning—acting and reflecting, feeling and formulating, predicting and choosing, and interpreting and creating—in a digital library context.

In contrast to the sweeping landscape provided by Neuman and Kuhlthau, Sandra Hirsh dives into the fine detail of children’s use of an information retrieval system. She describes results from the final study of the *Science Library Catalog* project, the substantive research program which launched a whole new approach to information retrieval system design for children. Hirsh focuses on types of search tasks to determine that task complexity and topic knowledge have great impact on children’s success in locating information. She concludes that information retrieval systems must make accommodations for the needs of children if they are to be used successfully.

In classroom settings, cognitive issues such as those addressed by Neuman, Kuhlthau, and Hirsh become inextricably linked with issues of context and situation. Without exception, the articles in this issue share a constructivist approach, one which places the student in the role of prime arbiter of the learning process. The last two articles in this issue employ the constructivist perspective but also tackle the tension between “authentic” activity and the reality of classroom expectations and reward systems.

Bruce and Leander evaluate digital libraries in the context of the situations in which they are used. They look at the notion of *practice*—the ways in which the habits and activities of teachers and students affect their use of digital libraries. They also look at library contexts and how activities in libraries convey special connotations depending on whether they are carried out in physical or digital spaces. Finally, Bruce and Leander support the idea of the digital library *hybrid*, invoking the dual benefits of the fluidity and fixity provided by a mix of library environments.

Emily Ignacio and I have added the learner's reflective processes to Bruce and Leander's argument that digital libraries cannot be regarded in isolation from the contexts of their various employments. Turkle (1996) notes that, when information technology crosses the line with communication technology, personal identity issues seem to migrate to center stage. Our perspective focuses on instructional interventions which help shape the internal narratives of learners. Drawing on the lessons of three recent cognitive learning theories, this article describes one pedagogical approach to teaching learners the art of self-aware navigation in digital library environments.

I like to compare Pam Sandlian's optimistic vision of the digital library to the dystopian portrait painted by Clifford Stoll (1995) who, from his selective reading of information science literature, assumes that a digital library is one without books or librarians: "I claim that this bookless library is a dream, a hallucination of online addicts, network neophytes, and library-automation insiders" (p. 176). By the same token, Sandlian's future library does not resemble a Nicholas Negroponte (1995) landscape, where computers reign supreme. Instead, her future is comfortably multicolored, full of choice, rather than a land which forces its citizens along a prescribed monotone path.

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