# Design Considerations for the Library of Congress Learning Page: Providing Learners Context and Access to the Collections

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ABSTRACT

THE LEARNING PAGE OF THE LIBRARY OF CONGRESS (LC) (<http://lcweb2.loc.gov/ammem/ndlpedu/>) was created using an Instructional Systems Design (ISD) analysis of LC's requirements; the needs of the target audience; and the tasks and skills necessary to access American Memory, LC's digitized historical collections on the World Wide Web. The resulting Web page organizes American Memory materials from a learner's perspective and provides supporting educational materials which focus on the research process and the use of primary sources in the classroom.

BACKGROUND

In 1990, the Library of Congress launched American Memory, a five-year pilot program to test the concept of utilizing digital technology to make some of its rare and unique Americana collections available to the community at large. More than twenty archival collections were digitized. During a two-year user evaluation, ten of these collections were placed on a hybrid CD-ROM/videodisk system and distributed to forty-four test sites, which included colleges, universities, state and public libraries, and elementary and secondary schools. The evaluation of this pilot program revealed the most active participants to be the K-12 schools, which were beginning to include more primary source materials in their classrooms (Veccia et al., 1993, p. 81).

In October 1994, based on the findings of this first large-scale evalu-

ation, the W. K. Kellogg Foundation awarded LC a three-year, $3 million grant to extend the resources of the National Digital Library to the K-12 educational community. LC's five objectives are to:

- shape selected Library of Congress historical collections for the K-12 community;
- produce descriptive guides to help teachers and students use the collections;
- explore CD-ROM, Internet, and cable television distribution channels to the schools;
- help teachers learn about using primary sources in elementary and secondary education; and
- engage in a distance learning initiative.

In July 1994, LC established its World Wide Web site (<http://www.loc.gov/>). One of the initiatives put forth to achieve the Kellogg grant objectives was the creation of a World Wide Web page for education and, in the fall of 1995, the design process for the Web page began. The Learning Page (<http://lcweb2.loc.gov/ammem/ndlpedu/>) debuted in March 1996 and received more than 100,000 hits in its first six months online. Although the Learning Page has grown substantially since its beginning, it has maintained its original framework, which is based on the principles of Instructional Systems Design (ISD).

Instructional Systems Design seeks to provide: a clear, orderly analysis of the learner; a comprehensive analysis of the content to be learned and its organization and presentation; and an analysis of the tasks and skills involved in the learning event. The resultant design will be a product of the interaction between the cognitive processing required to acquire the content, the strategies and methods that support these processes, and the characteristics of the technology that promote positive learning strategies and cognitive processing (Park & Hannafin, 1993, p. 67).

## DESIGN CONSIDERATIONS

From an Instructional Systems Design standpoint, the considerations in designing the Learning Page were:

1. the Library of Congress' goal of raising public awareness of the value of primary sources and its other objectives as set forth for the Kellogg grant;
2. the target audience, specifically learners and educators, and their characteristics, motivation for visiting LC's Web site, and skills and knowledge in searching for and using primary sources and the World Wide Web; and

3.  the tasks learners would perform to gain access to the primary source materials of LC and the skills needed to perform those tasks.

## DESIGN DISCUSSION

*Library of Congress Goals and Objectives*

The Library of Congress, a world-renowned research institution, serves expert researchers. A Web page for education should promote the learning and development of the skills necessary to become an expert researcher. Scaffolding techniques that support learners and lead them toward this goal should also be an integral feature of the design (Savery & Duffey, 1995, p. 33). LC, in pursuit of its goals and objectives, has gathered lesson ideas from experienced teachers on the use of primary sources, especially those of the American Memory collections (Library of Congress, 1995). Making these ideas available in an online archive would promote the collegial exchange of ideas among educators, providing support for educators as recommended by Honey and Hawkins (1996).

*Target Audience*

The American Memory User Evaluation (Veccia et al., 1993) has revealed that both elementary and secondary schools used the American Memory materials, with secondary schools being the more frequent users. A study (Center for Children and Technology, 1996b) done for the Library of Congress describes a wide variation in technical proficiency and Internet connectivity. Hardware and software availability vary from the Apple IIe to the Powerbook and from the 286 to the pentium with multimedia capability. Therefore, the Web page design must accommodate the technologically proficient while providing the same level of service to schools that are just beginning to come online.

The education community has been undergoing a transition to a more learner-centered approach in which the learner assumes an active role in the classroom by conducting research, working cooperatively in small groups, seeking the solutions to problem-based scenarios, and developing and presenting results, not only to the teacher but to classmates and to others via multimedia presentations, e-mail, and the World Wide Web. Teachers are developing lessons that take students beyond the declarative and conceptual knowledge domains into the critical thinking skills of analysis, evaluation, and synthesis of information. To help students achieve these skills, teachers are incorporating primary source materials into their lessons. Such materials provide relevancy and realism, adding context to topics being studied. They provide an intrinsic motivation and curiosity that can spur the budding researcher on to greater depths of discovery in the learning process (Center for Children and Technology, 1996a). Students in project-based curricula are researching and including primary sources in their projects. To aid in the development

of critical thinking skills, a Web page should be transparent in its ease of use, avoiding greater cognitive load on learners as they seek to locate materials for their research (Park & Hannafin, 1993, p. 68).

Margaret Honey, associate director of the Center for Children and Technology, in a white paper (Honey & Hawkins, 1996) prepared for the Department of Education, discusses the educator and the challenge digital libraries face in designing a Web site that supports the educator of today. She advocates descriptive, rather than prescriptive, support for teachers developing activities that promote higher-order thinking skills. Her organization has worked closely with the Library of Congress to develop descriptive guides to the online collections (Center for Children and Technology, 1996a). Portions of these guides are available on the Learning Page.

*Tasks and Skills Needed*

Students are novices in the research process and in using complex databases such as American Memory. Neuman (1995) argues that Instructional Systems Design principles have much to offer when designing an informational database "to encourage students to think about, process, and apply information in meaningful ways" (p. 26). In her study of high school students using online and CD-ROM databases, she concludes that "students' status as novice learners and novice researchers should be the basic determinant of the design of both the conceptual and the navigational components of databases and database systems used in schools" (p. 43). She describes her findings using a framework by Malcolm Fleming (1981, p. 26), whose work in instructional design has been elaborated upon by other researchers and synthesized from empirical principles to produce design guidelines for instructional hypermedia (Park & Hannafin, 1993). Neuman's recommendations are echoed in these guidelines and confirm the validity of an ISD approach for the conceptualization of the Learning Page.

*The "Rock, Paper, Scissors Model"*

For purposes of this discussion, these design guidelines have been grouped into three categories: meaningful communication, data organization, and hypermedia characteristics. As Fleming (1981) and Park and Hannafin (1993) both state, these guidelines are not distinct entities, but instead overlap each other. While one aspect at any one time may dominate another, that is not always the case. In fact, the relationship among the different guidelines is not unlike the game of "Rock, Paper, Scissors," where the rock can break the scissors, but the scissors can cut the paper, and the paper can cover the rock (see Figure 1).

As you look at the Rock, Paper, Scissors model, you see an inner triangle whose three points comprise the three aspects of instructional design for online hypermedia: meaningful communication; hypermedia

- interface design issues
- use of graphics
- fonts
- headings
- white space
- search engines
- scroll bars

**Meaningful Communication** involves the transfer of knowledge within relevant contexts.

**Data organization** provides the foundation on which to construct meaningful relationships.

**Learning** is the process of the reorganization of a person's knowledge resulting from interactions with the environment.

- analysis of learner content use patterns
- natural patterns of 'chunking' content into meaningful groupings
- interrelatedness of groupings created by linking
- learner tasks and implications for linking strategies
- internal page design and linking strategies

**Hypermedia** nodes and links provide dynamic interactions.

- hot links within the page
- hot links between page/ subpages
- links to/from database
- links to other sites
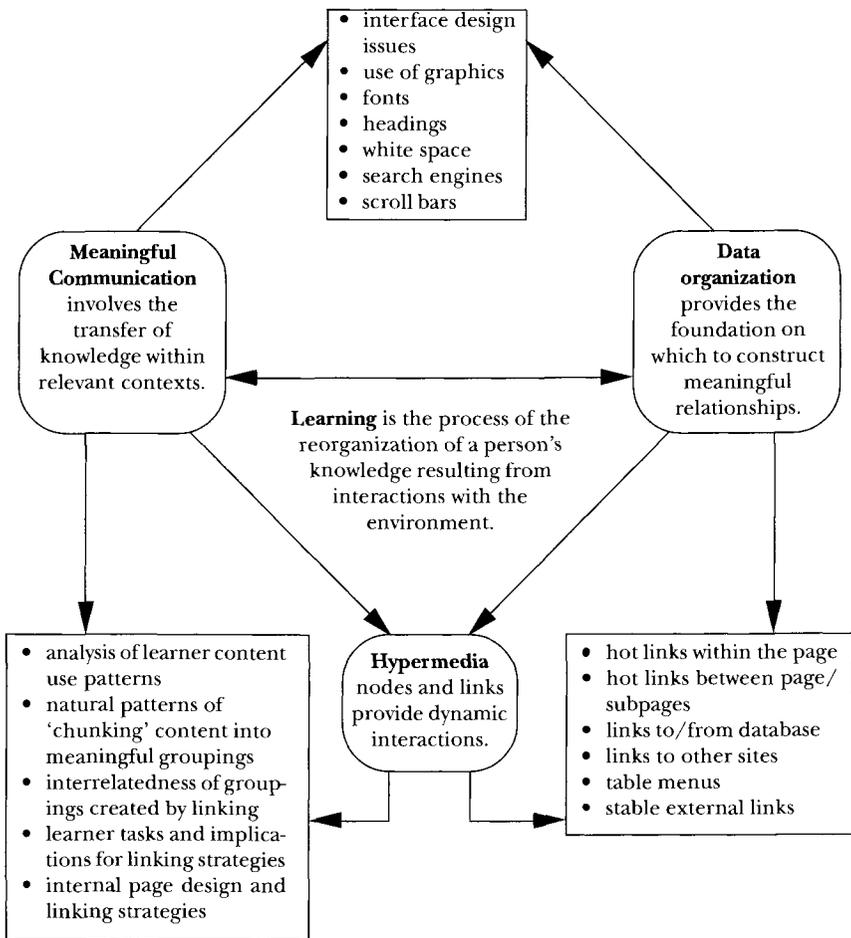- table menus
- stable external links

Figure 1. The Rock, Paper, Scissors Model of Instructional Design for Hypermedia Environments of the World Wide Web

characteristics; and data organization. At the center of the triangle is learning, which is described as the process of the reorganization of a person's knowledge resulting from interactions with the environment. This view of learning incorporates each of the three concepts. The environment is the context in which meaningful communication or the transfer of knowledge occurs; the organization of the new data in ways that are meaningful to the learner facilitates knowledge transfer; and the interactions among the data that lead to learning are facilitated by the dynamic interlinking possible in hypermedia.

The outer triangle represents the design guidelines that result when the three aspects of instructional design commingle. For example,

meaningful communication (*rock*) occurs when the context is unambiguous and the data organization (*paper*) is clear and recognizable to the learner. Implications for page design would include the use of graphics for multiple-channel recognition of meaning, the consistent use of headings, fonts, white space, and easily-recognizable categories for use in search engines. With data organization (*paper*) and hypermedia (*scissors*), clear and consistent hyperlinking among data points and to other sources allows for successful hypothesis formation and the perception of commonalities and differences among the data. Design issues would include the amount and type of hot links within the page and subpage(s) and with the database. With hypermedia (*scissors*) and meaningful communication (*rock*), thoughtful design of hypermedia linkages would allow the learner to build a mental model of the context in which meaningful communication and the transfer of knowledge could occur.

Each of the main design categories—meaningful communication, data organization, and hypermedia considerations—is discussed in terms of its relationship with the other categories, with comments regarding significant aspects relating to the design considerations of the Learning Page. The underlying objective of the design process of the Learning Page is to create a context in which research skills would be fostered and acquired. Students learn best when the skill to be acquired is situated within a context in which it occurs naturally (Young, 1993, p. 44). Designing an online hypermedia environment that provides a platform from which to support learners as they progress in skill level requires the careful integration and application of design guidelines necessary to achieve such an environment.

*Rock and Paper*

The goal, in addition to providing a context from which to begin the search into the Library of Congress' online collections, is to make the context meaningful in a deeper, more important sense. Selective perception focuses attention on material of interest or requirement. Organizing the content of the Library of Congress Web site into basic subject descriptors would not be enough to invite more perceptive investigation. Structuring the context to lead the learner to perceive similarities and differences or observations or evaluations on a surface level would be the first step in building curiosity about the contents of the collections, and curiosity leads to discovery.

Keys to self-initiated discovery are:

- recognition of familiar things—e.g., *Hey, that's my town. What do they have about my old high school?;*
- perceived anomalies in the usual—e.g., *Hot air balloons at Fair Oaks, Va. (*now a major shopping mall*) during the Civil War—no way!;*

- unusual portrayal of usual events—e.g., *Look at this old-time movie of New York City!;*
- recognition of the unusual or the extraordinary—e.g., *Film of* the *San Francisco earthquake, really?*

Discovery is aided by successful acquisition of a bit of knowledge—being able to retrieve the object of curiosity and examine it. One successful adventure encourages another and another. One unsuccessful attempt seriously undermines any further attempts. Self-initiated discovery is fragile and must be nurtured, and the dynamic linking capabilities of hypermedia must play a part.

*Paper and Scissors*
Dynamic linking of data that have been carefully categorized to maximize the contextual clues that provide meaning will yield success to learners in search of information meaningful to their needs. Well-designed linking systems seamlessly connect data points, satisfying curiosity or aiding in problem solving.

The database becomes a more powerful tool with the versatility and speed of linking information available in hypermedia. Care must be taken with the vocabulary chosen as link points or search words so that novice users will be able to find information. Within the research process, scaffolding can provide the learner with the terms of the expert.

Subject terms used in the Pathfinder Pages have been selected with the novice in mind, yet each is searchable in LC's cross-collection search tool, guaranteeing successful search results. Success sustains motivation and builds an experience base for future and more advanced search queries.

*Scissors and Rock*
Careful design of the links from the Pathfinder Pages into the database, as well as the links within and between the Pathfinder Pages, is important to avoid a sense of disorientation. The result of careful attention to internal design of the Web page offerings should be a learner with a clear idea of where the links will lead and whether the information found in these nodes will be useful.

The categories that are chosen both for Web page content and the search destination must be meaningful to the intended user—not the expert. Novice users will not have the specialized vocabulary of the expert. Learning the navigational system and the category vocabulary place an unnecessary cognitive burden on the learner.

One overriding linking structure will reduce the cognitive burden and allow the learner to concentrate on the content rather than on how to move within the Web page and the database.
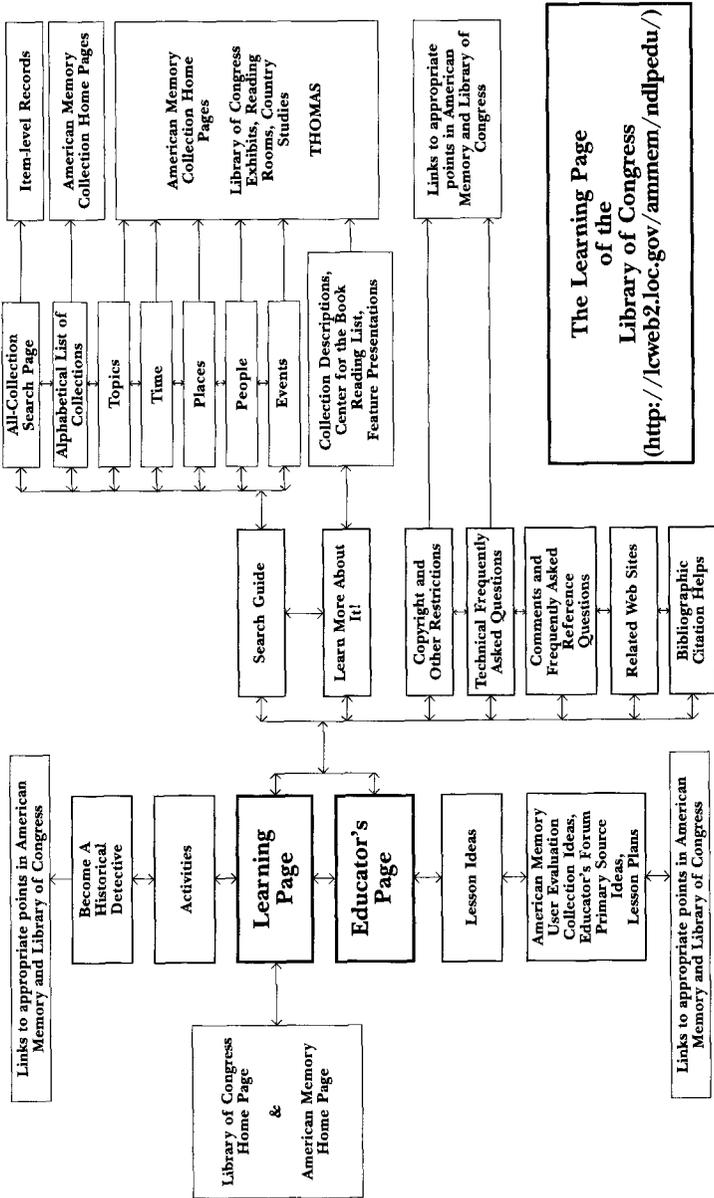
Figure 2. The Learning Page of the Library of Congress.

LEARNING PAGE FRAMEWORK

The Learning Page, accessed via the Library of Congress Home Page or the American Memory Home Page, is a system of seven main pages: Learning; Educator; and five Pathfinder Pages, with ancillary information available from each page (see figure 2). On the Learning Page—whose name symbolizes the active role of the student in the learning event—students will find two levels of information: links to supporting and contextualizing information for the primary source materials of the Web site and links to strategic information, such as bibliographic citation aids, copyright guidelines, and other resources. Learners find themselves in a context rich with resources and strategy-building activities to assist them in developing their skills as researchers. Resources are organized into utilitarian (bibliographic citation of online sources; copyright and fair use information; technical support; comment section; and further resources) and elaborative (collection highlights, topic-specific presentations, supplemental reading, and skill-building activities). These resources provide scaffolding, supporting the learner in acquiring the skills necessary for evaluating materials and preparing research reports or presentations.

Here, learners will find descriptive guides to the American Memory collections, a supplemental reading list from the Library of Congress Center for the Book, and an archive of feature presentations correlated to the school calendar. To assist learners in developing research skills, an activity, "Become a Historical Detective," invites learners to test their D.Q. (Detective Quotient). It is through this page that learners find tools to develop research techniques and hone their critical thinking skills. Hyperlinking allows the learner to work here then link directly to resources in the Library of Congress Web site for further exploration.

On the Educator's Page, Lesson Idea Archives and other educator-specific materials can be found. In the future, this page could host an online learning community in which educators exchange their experiences using primary sources with their classes. The power of hyperlinking provides interactivity with these materials and the primary sources to which they refer.

The Pathfinder Pages satisfy basic Instructional Systems Design principles of understanding the learner and the learner's task in approaching the research process. These five pages organize the material in terms of functions that a student might be expected to perform: report on an event (Events) or topic (Topics); construct a timeline (Time); prepare a biography of a historical figure (People); or study a locale (Places). They provide guided entry points into the primary source materials of the Library of Congress based on a student-level conceptual framework. In effect, the pages act as an advance organizer, providing learners with an overview of the content available to satisfy their individual research tasks.

To reduce cognitive load, each page follows the same presentation template: navigational text line, visual orientation banner, scope of page, alphabetical index line, and list of main subject headings. Placing the navigational text line at the top of the page allows return visitors instant access to the system page of their choice. Each visual orientation banner serves two purposes: one, to identify this family of pages; and two, to preview the resources within the collections. Navigational buttons on the model of the banner are located at the bottom of each page (Park & Hannafin, 1993; Lynch, 1996). Research shows that search strategies vary with task specificity: ill-defined topics produce browsing behavior; well-defined topics produce expedient search behavior (Lai & Waugh, 1995, p. 27)—the page allows for both search strategies.

Four of the Pathfinder Pages provide an alphabetized subject listing (Time provides a chronological listing) which indexes the pages' themes to relevant collections listed under each heading. Using the Pathfinder Pages, the researcher can immediately see the types and number of collections and other LC offerings on a particular subject. This provides support to the novice researcher who might be overwhelmed by American Memory's cross-collection search tool, which generates a multipage, item-level, relevancy-ranked list of all the possibilities of the search request.

Furthering research goals, the Pathfinder Pages also allow learners the opportunity to use the HTML (hypertext markup language) files as personal research tools. Research requires time for searching and thoughtful reflection. Classroom time militates against this with fixed class periods and limited access to computers. To aid students in reaching the materials related to their topics, the Pathfinder Pages are structured so that each can become an online gateway into the collections. The pages organize their subjects and related LC materials into smaller files by alphabetic character. These smaller files can be downloaded and kept on diskette. Each link mentioned in the pages contains the complete URL (uniform resource locator), rather than using the relational addressing convention. When the file is viewed through a Web browser, the links to the collections become active and enable the student to enter the appropriate collections or exhibits without a "Web trail," reducing the time necessary to reach the materials. Each click of the mouse draws the student further into the Web site, closer toward the goal of obtaining information pertinent to the student's research task. Disorientation is minimized by the Pathfinder Pages' overview subject listing of collections and LC materials to which the student may always return.

THE FUTURE

As with everything on the World Wide Web, the Learning Page is in a continual state of evolution. Its framework allows for expansion as the

Library of Congress adds more materials to its online presence. The Learning Page is designed as a system based on the needs of its constituents, and thus it will continue to be responsive to those needs. Its hypermedia design, based on principles derived from Instructional Systems Design, will mature as the state of the online hypermedium called the World Wide Web matures. The Learning Page can provide LC with an online gateway and speedy access to its digitized collections to further its goal of raising the public's awareness of the value of primary sources.

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