Creating an Online Tutorial and Pathfinder[*]

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Mr. Hook explores the educational potential of Web-based tutorials and pathfinders. He discusses how the multimedia environment can effectively reach a broad range of learner types, explaining how the disciplines of information architecture and information visualization can contribute to designing a successful tutorial and pathfinder.

More and more people are information workers, and increasingly we view the world through the two-dimensional window of a Web page. In an information economy, the ability to convey facts and ideas clearly may be the most valuable skill of all.[1]

¶1 There are strong pedagogical reasons for a library to create online multimedia tutorials and pathfinders. They are responsive to a number of educational theories and they can successfully reach a broad range of learner types concurrently. The emerging disciplines of information architecture[2] and information visualization[3] offer important lessons on how to craft online tutorials and pathfinders to ensure that they achieve their intended purposes. An analysis of these topics in this article provides compelling reasons for the creation of online tutorials and pathfinders. To this end, I provide design suggestions based on my experience creating an online federal legislative history tutorial and pathfinder for the University of Illinois law library.[4]

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1. Thomas E. Weber, *Mistakes of 'Butterfly' Ballots Offer Lesson to Site Designers*, WALL ST. J., Nov. 20, 2000, at B1.

2. *See* Roger C. Parker, *Built to Order: Information Architects Construct Their Sites With a Unique Blueprint—A Foundation of Testing, A Floor Plan of Accessibility and a Tower of Functionality,* PUBLISH: INTERNET COMM. FOR NEW ECON., July 2000, at 38, 39–40: Information Architecture offers a more holistic approach to [Web] design. Information architects combine several skills: the psychologist's ability to listen and prioritize, the architect's ability to create a framework, the writer's ability to simplify and the designer's ability to provide selective emphasis. . . . Information Architecture is more concerned with the structure and accessibility of information than its appearance or format.

3. STUART K. CARD ET AL., READINGS IN INFORMATION VISUALIZATION: USING VISION TO THINK 5 (1999) (Information visualization is the exploiting of "the dynamic, interactive, inexpensive medium of graphical computers to devise new external aids enhancing cognitive abilities.").

4. FEDERAL LEGISLATIVE TUTORIAL AND PATHFINDER, Albert E. Jenner Jr. Memorial Law Library, Univ. of Ill. Coll. of Law, *at* http://www.law.uiuc.edu/library/home/libguide/refserv/Legislative_ History_(Federal)/legis.htm (last updated Feb. 26, 2001).

Reasons For Web-Based Tutorials and Pathfinders

¶2 Online tutorials and pathfinders can make an important contribution to the educational mission of any library. They are a lifeline when reference assistance is unavailable or when a user is accessing library resources from offsite.[5] Online tutorials allow users to learn when it is most convenient for them to do so.[6] And because tutorials are self-teaching, they allow a patron to internalize information at his or her own pace.[7] Once the tutorial or pathfinder has been brought to the attention of the various Web search engines, the potential audience increases to the entire World Wide Web.

¶3 Web-based tutorials appeal to a broader spectrum of learner types than print-based tutorials through their use of multimedia interactive elements and the control over learning they give to the user. And particularly for subject areas in which a significant amount of the material is online, it makes sense that the corresponding tutorial and pathfinder are online as well. This enables a user to follow hyperlinks directly from the tutorial or pathfinder to the resources it describes. Finally, Web-based tutorials make excellent online textbooks for use in a computer lab instructional environment or to supplement traditional classroom teaching.

¶4 Although seemingly synonymous, there is a subtle distinction between a tutorial and a pathfinder. Tutorials are short articles that give generalized information on a topic. Pathfinders give more particularized information about how to locate specific information. For instance, as to my legislative history tutorial and pathfinder, I regard the portion that describes the legislative process and the documents created by that process as the tutorial portion of the work. I regard the pages that give the location of specific legislative history documents as the pathfinder portion of the work. Conceptually, the difference is important—a user may visit the tutorial portion of the Web site to learn generally about legislative histories, but on return visits may frequently bypass the tutorial and go directly to the pathfinder portion of the site to quickly determine how and where to find specific legislative history documents. While this subtle difference may have very real implications for the design of the site, most of the suggestions given in this article are applicable to both tutorials and pathfinders. Therefore, except in those instances where the difference has design implications, I use "tutorial" to refer to both concepts.

Pedagogical Strength of the Online, Multimedia Environment

¶5 The amazing possibilities created by Web-based instruction provide an ideal

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5. Stephanie Michel, *What Do They Really Think? Assessing Student and Faculty Perspectives of a Web-based Tutorial to Library Research*, 62 C. & Res. Libr. 317, 320 (2001) (citations omitted).
6. *Id.* (citation omitted).
7. *Id.* at 319. In the educational parlance, this concept is known as "learner control." For a general discussion of this topic, see Tony Brown, Multimedia in Education, *at* http://scs.une.edu.au/Materials/573/573_3.html (June 25, 1997).

solution to teaching complex legal research skills. The World Wide Web's multi-media environment allows two-dimensional, static, page-based tutorials to become interactive, sensory-rich learning environments capable of appealing to several different learning types concurrently. The visual and spatial nature of the Web requires a Web author to more concretely reveal the conceptual framework of a particular research topic. In this manner, the multimedia environment makes it easier for users to understand how and why legal research tasks are performed. Additionally, the self-directed learning inherent in online tutorials makes them particularly appealing to adult learners. The online multimedia environment is also responsive to issues raised by the educational theories of situated cognition and anchored learning.

The Onion of Learner Types

¶6 The field of cognition is the study of how knowledge is acquired and used. Learning styles are the different ways that individuals focus on, process, internalize, and remember information.[8] Cognitive researchers have identified several different groupings of learning styles. One pair of researchers has referred to these different groupings as layers of an onion.[9] There are four different learning style layers.[10]

¶7 The first and deepest layer of learning styles focuses on personality models. This grouping makes the distinction between *separate knowing* and *connected knowing* as well as *field independent* and *field dependent* learners.[11] "Separate knowing emphasizes objectivity, detachment, and rational thinking. Connected knowledge encourages subjectivity, involvement, and intuition."[12] The distinction of field independence or dependence is determined by how little or how much an individual is influenced by his or her surroundings during the learning process.[13] Thus,

> FIs [Field Independent Learners] perform more efficient searches in shorter time and are more comfortable jumping around ("surfing") in hyperspace. FDs [Field Dependent Learners] more often report feeling disoriented or lost, navigate more linearly (frequently using Back or Home keys), and tend to follow sequences instead of jumping around, accepting the environment as presented. This may be because FIs use active approaches such as hypothesis testing; form mental models of how the Internet is constructed and information is organized, revising them continuously; use metacognitive strategies (planning, monitoring, reflecting, regulating); and transfer concepts and search methods to new

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8. Robin A. Boyle & Rita Dunn, *Teaching Law Students Through Individual Learning Styles,* 62 ALB. L. REV. 213, 214 (1998).
9. CHARLES S. CLAXTON & PATRICIA H. MURRELL, LEARNING STYLES: IMPLICATIONS FOR IMPROVING EDUCATIONAL PRACTICES 7 (1987).
10. *Id.*; LYNNE CELLI SARASIN, LEARNING STYLE PERSPECTIVES: IMPACT IN THE CLASSROOM 3–4 (1999).
11. *See* Eileen B. Cohen, *Teaching Legal Research to a Diverse Student Body,* 85 LAW LIBR. J. 583, 586–88 (1993).
12. *Id*. at 586.
13. *Id*. at 587.

situations. FDs prefer to be guided and want a global overview, such as explicit menus listing all possible choices.[14]

¶8 The second learning style layer focuses on how learners process information. This group includes: *cognitive learners* (process information in pieces), *perceptual learners* (process information holistically), *behavioral learners* (process information by actively doing), and *affective learners* (process information by bringing feelings and emotions to the learning process).[15]

¶9 The third learning style layer focuses on how students interact in the learning environment. One pair of educational theorists has identified six types of students: (1) *independent students* ("think for themselves"); (2) *dependent students* ("have little intellectual curiosity and learn only what is required"); (3) *collaborative students* (learn through sharing with others); (4) *competitive students* (motivated by the desire to do better than others); (5) *participant students* (like learning the course content and attending class, but do little that is not required); and (6) *avoidant students* (do not participate and are not interested in the course content).[16]

¶10 The fourth and final learning style layer focuses on the learner's instructional preference. That is, what primary sense does the learner prefer to use during the learning process? These perceptual learning preferences include: visual, auditory, and tactile (also known as haptic or kinesthetic). While the multimedia interactive environment responds to many of the different groups of learning styles I have identified, it is particularly successful in reaching these perceptual learning styles.

Using Multimedia to Appeal to Multiple Learning Preferences

¶11 Students learn better when information is conveyed in a manner consistent with their learning style.[17] There is a growing body of literature discussing how the online, multimedia environment is successful in reaching many different learning styles concurrently.[18] Online tutorials and pathfinders can readily appeal to the different learning types associated with the primary sense that a user favors during the learning process. Cognitive development is strengthened when students are able to proceed through an online tutorial by exercising options that are consistent with their own learning preferences. Better tutorials give users more choices in how they can navigate the tutorial; they provide and reinforce information in a variety of ways. Better tutorials are highly interactive. A high level of interactivity allows a user to cater the learning experience to his or her individual learning style.

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14. SANDRA KERKA, LEARNING STYLES AND ELECTRONIC INFORMATION 3 (1998) (citations omitted).

15. SARASIN, *supra* note 10, at 14–15.

16. CLAXTON & MURRELL, *supra* note 9, at 40–41 (citing S. Reichmann & A. Grasha, *A Rational Approach to Developing and Assessing the Construct Validity of a Student Learning Style Scales Instrument,* 87 J. PSYCHOL. 213 (1974)).

17. Boyle & Dunn, *supra* note 8, at 216.

18. *See* KERKA, *supra* note 14, at 3 (providing a thorough bibliography of works on this topic to 1998).

Visual Learners

¶12 Visual learners remember about 75% of what they see or read.[19] Fortunately for learners with a visual preference, online tutorials and pathfinders are inherently visual. In addition to displaying textual information and navigational graphics, Web-based tutorials can effectively reach visual learners through numerous value-added elements. These include photographs of sources described in the text, a map of where to find the sources within the library, and illustrations of how the sources are used. The latter often contain images of a representative page that has been either highlighted or marked in red. Additionally, Web-based tutorials might also contain actual video segments of an instructor explaining how a source is organized and used.

¶13 New York University's *Federal Legislative History Virtual Tour* is an example of a tutorial that contains numerous visual elements.[20] It has photographs of the various legislative history resources contained within the library.[21] Visual learners can more readily locate an item in the library once they have seen it pictured on the library's online tutorial. The user's experience is further enhanced when he or she is able to click on a hyperlink to the referenced source and see a representative page of the item discussed.

Aural Learners

¶14 Similarly, learners with an aural learning preference remember 75% of what they hear in a normal fifty-minute lecture.[22] Though less common than the use of visual elements, the online multimedia environment can also reach out to aural learners. For instance, the Chicago-Kent online legislative history tutorial has various audio components.[23] Users of the Chicago-Kent tutorial can hear portions of a congressional hearing as well as a congressional floor debate. For users with an auditory learning preference, these brief sound bites strongly reinforce the user's understanding of a congressional hearing or floor debate. As the ability to incorporate audio segments into Web sites improves, the information provided by the text contained in a tutorial will be enhanced for users who have a strong aural learning preference.

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19. Boyle & Dunn, *supra* note 8, at 228 (citing RITA DUNN & KENNETH DUNN, TEACHING SECONDARY STUDENTS THROUGH THEIR INDIVIDUAL LEARNING STYLES 402 (1993)).

20. N.Y. UNIV. SCH. OF LAW, FEDERAL LEGISLATIVE HISTORY VIRTUAL TOUR, *at* http://www.law.nyu.edu/lawyeringprogram/virtualtour/legist/index.html (last visited Jan. 7, 2002). Another example of a law library online tutorial with video segments is CHICAGO-KENT SCH. OF LAW, ILL. INST. OF TECH., EMPIRICAL RESEARCH: A MULTIMEDIA TUTORIAL, *at* http://www.infoctr.edu/tutorial/empirical/ (last visited Jan. 7, 2002). *See* Gretchen Van Dam, *Web Tutorials for Teaching Legal Research,* JURIST: LEGAL EDUC. NETWORK (May 2001), *at* http://jurist.law.pitt.edu/lessons/lesmay01.htm (describing extensive use of video capabilities in Chicago-Kent's empirical research tutorial).

21. *See, e.g.*, N.Y. UNIV. SCH. OF LAW, *supra* note 20, *at* http://www.law.nyu.edu/lawyeringprogram/virtualtour/legist/usccan.html (picture of low shelving in NYU Law Library containing volumes of *United States Code Congressional & Administrative News*).

22. Boyle & Dunn, *supra* note 8, at 228.

23. CHICAGO-KENT SCH. OF LAW, ILL. INST. OF TECH., FEDERAL LEGISLATIVE HISTORY: A MULTI-MEDIA TUTORIAL, *at* http://www.infoctr.edu/tutorial/leghist/ (last visited Jan. 7, 2002).

¶15 Technology making this feasible is already available. Microsoft Corp. produces software that allows a tutorial designer to illustrate content by having an automated software agent, such as Merlin the Magician, deliver spoken remarks.[24] The designer types in the words to be spoken, gives additional instructions as to inflection, and the software agent uses speech emulation technology to deliver the spoken text.[25] Concurrent with the audio presentation, it is possible to have a dialogue box appear above the agent's head in which the text is also displayed. In this manner, a tutorial designer is able to reach both visual and aural learners simultaneously.

Tactile Learners

¶16 The hands-on, click-through environment of the World Wide Web is well suited for tactile learners. These learners use "fine motor skills, fingers, and hands while concentrating."[26] Tactile learners learn best from materials they can manipulate.[27] Fortunately, computer interaction is inherently tactile and interactive. Users of my legislative history tutorial/pathfinder use an elliptical navigation image to click through descriptions of the various legislative history documents. Another way to appeal to behavioral learners—who learn best from a hands-on, active approach[28]—is by using interactive quizzes to test a user's understanding of the concepts presented in the tutorial.

Other Ways Multimedia Enhances Learning

¶17 Appealing to multiple learning types is just one of the lessons to be learned from the field of educational psychology. Educational psychologists also stress a number of other considerations. For instance, it is important for an educator to explicitly reveal the structure of the information he or she is conveying. Additionally, it is important for an educator to be sensitive to the unique ways in which adults learn. It is also beneficial for an educator to convey information in the same context in which it will be used. Finally, an educator should be familiar with the benefits of teaching from a problem-based perspective. As described in the following section, online tutorials may be responsive to all of these considerations.

Semantic Network Theory

¶18 The semantic network theory of learning states that our memory is organized into networks consisting of interlinked nodes. Nodes are basic pieces of information or individual words. The interlinking of nodes forms knowledge structures or schemas. Learning is the process of building new knowledge structures by acquir-

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24.   *See* Microsoft Agent Homepage, *at* http://www.microsoft.com/msagent/ (last visited Jan. 7, 2002).

25.   Ray August, *Animating Web Lectures With Agent Technology,* Jurist: Legal Educ. Network (Feb. 2001), *at* http://www.jurist.law.pitt.edu/lessons/lesfeb01.htm.

26.   Boyle & Dunn*, supra* note 8, at 229.

27.   *Id.*

28.   Sarasin, *supra* note 10, at 15.

ing new nodes. These new nodes are interrelated with existing nodes and with each other. When learners form links between new and existing knowledge, the new knowledge is integrated and comprehended.[29]

¶19 Research has shown that "ideas with any sort of structure are better recalled than unstructured lists of ideas."[30] Having a good understanding of the "structural organization of a knowledge domain is a better predictor of being able to problem solve in an area than aptitude (as measured by standardized test scores) or past performance on a similar set of problems."[31] Additionally, research has shown that what separates expert and novice problem solvers is the well-developed and interconnected knowledge networks of the experts that facilitate both the interpretation and solution of a problem. Whereas experts apply abstract principles from their semantic networks, novices focus on the literal characteristics of a problem.[32]

¶20 Any expert attempting to convey information, whether a textbook writer or a tutorial designer, will instinctively structure the information based on his or her knowledge schema for that particular knowledge domain. Readers or users who are able to discern the author's schema are better able to remember and internalize the information than those who don't recognize the author's organizational framework.[33] Studies also show that learners who are regarded as having good reading comprehension instinctively search out the author's organizational structure and use it to recall content.[34]

¶21 Semantic networks are conveyed intrinsically and explicitly. The sequencing of content often intrinsically signals the author's structural organization of a topic. Content structure also is explicitly conveyed through signals such as titles and subtitles and through various noncontent words that convey the relationship between ideas (i.e., for example, therefore, next, in contrast, etc.). Preview statements, introductory paragraphs, and concluding paragraphs are another means by which authors explicitly convey their structural organization of a topic.[35]

¶22 Structured overviews, spider maps, concept maps, and cognitive maps are ways to explicitly depict the organization of content through graphics.[36] These nontextual methods of representing knowledge provide an alternative means for the user to assimilate a knowledge schema. In other words, graphic representations of content provide visual scaffolding for the assimilation and comprehension of ideas in a knowledge domain.[37]

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29. DAVID H. JONASSEN ET AL., STRUCTURAL KNOWLEDGE: TECHNIQUES FOR REPRESENTING, CONVEYING AND ACQUIRING STRUCTURAL KNOWLEDGE 9 (1993).
30. *Id*. at 8.
31. *Id*. at 10.
32. *Id*.
33. *Id*. at 110.
34. *Id*.
35. *Id*. at 107.
36. *Id*. at 16
37. *Id*.

¶23 The multimedia environment greatly facilitates the creation of nodes and linkages for users to flesh out their conceptual framework of the information presented. It does so through the use of images, sounds, and the spatial presentation, sequencing, and ordering of text. The multimedia, hypertext world of online tutorials makes the author's organizational structure explicit to the user.[38] The wealth of navigation options inherent in HTML design allows the online tutorial designer to explicitly display the relationship of the various portions of the content. Often, each page in an online tutorial represents only one unique concept. When understood, the user clicks through to the next related concept. In this fashion, the content nodes are clearly defined. Additionally, graphics, audio, and video facilitate the creation of associations between these nodes, thus enhancing recall and use.

Andragogy—The Study of Adult Learning Preferences

¶24 Andragogy is the study of how adults learn.[39] (Andragogy is distinguished from pedagogy—*peda* meaning child, *andra* meaning adult.)[40] There are four general premises of andragogy. The first is that adult learners are self-directing. "[A]dults prefer to make their own decisions and manage themselves rather than having the will of the teacher imposed upon them."[41] The second premise of andragogy is that adults learn best through experiential techniques—"laboratory experiments, discussion, problem-solving cases, simulation exercises, [and] field experience."[42] The third is that adults must be ready to learn. In other words, adults learn best when they are motivated by real-world concerns. The final premise of andragogy is that adult learners see education "as a process of developing increased competence."[43]

¶25 Online tutorials and pathfinders are inherently self-directing, the first premise of andragogy. Users work through them at their own pace, focusing on skills they feel they need to learn and ignoring topics they feel they have already mastered or do not need to know. Online tutorials are available when students need them most. Posted to the Web, an online tutorial is readily accessible the moment an individual discovers that he or she must learn something in order to complete a task. This capability fits well with the premise of andragogy that adults learn best when they are "ready to learn." For instance, I have found that no one is motivated to really learn legislative history research until they are faced with an actual

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38. *See* BROWN, *supra* note 7, *at* http://scs.une.edu.au/Materials/573/573_9.html (citing David H. Jonassen, *Designing Structured Hypertext and Structuring Access to Hypertext,* EDUC. TECH., Nov. 1988, at 13, 14).

39. *See generally* Kristin B. Gerdy, *Making the Connection: Learning Style Theory and the Legal Research Curriculum,* LEGAL REFERENCE SERVICES Q., 2001, no. 3–4, at 71, 73; Kelly Brown, *Adult Learning: An Oxymoron?,* AALL SPECTRUM, Nov. 2001, at 18.

40. Gerdy, *supra* note 39, at 73.

41. *Id*. at 73–74.

42. MALCOLM S. KNOWLES, THE MODERN PRACTICE OF ADULT EDUCATION: FROM PEDAGOGY TO ANDRAGOGY 44 (rev. ed. 1980).

43. *Id*.

assignment that requires the use of such skills. With its convenient accessibility on the Web, my tutorial satisfies an important premise of what is needed for effective adult learning.

Situated Cognition

¶26 The educational theory of situated cognition holds that knowledge should be acquired in the same context in which it will be used.[44] Therefore, tutorial designers should work hard to present material in a manner consistent with how it is most likely to be used by the intended audience. Applying this guideline to my own work, most researchers are interested in legislative history because they wish to divine legislative intent. In other words, the context for these individuals is that they have identified a particular law which is ambiguous and are trying to discover sources that will help them interpret the law in a manner consistent with the meaning intended by Congress.

¶27 I kept this fact in mind throughout the creation of the tutorial. I included a section that gives the views of several scholars and jurists as to the worth of various legislative history documents for the purpose of divining legislative intent. I also discussed these considerations when I described each of the legislative history document archetypes. However, consistent with the principle of situated cognition, I could have gone further and structured the entire tutorial from the vantage point of how a court would work through a legislative history for the purpose of divining legislative intent.

Anchored Instruction

¶28 If knowledge is not structured in a way that allows it to be manipulated for problem-solving purposes, it is said to be inert.[45] In order to prevent this, "information should be taught in context and must be seen to have some relevance by the learner."[46] This may be accomplished via a problem-based approach. A problem-based approach to education is known as anchored instruction. "Anchored instruction suggests that learners construct richer and more easily transferable mental models and can more easily solve problems in ill structured domains if instruction is centered around, or anchored on, a particular problem or set of problems."[47] At least one study suggests "that students who had received information in a problem solving context were much more likely to remember it and to spontaneously use it in new situations than those who had received it in a non-problem-solving context."[48]

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44. STEPHEN W. HARMON & MARSHALL G. JONES, A QUALITATIVE ANALYSIS OF SITUATED WEB-BASED INSTRUCTION 4 (2000).
45. *See* BROWN, *supra* note 7, *at* http://scs.une.edu.au/Materials/573/573_12.html (citation omitted).
46. *Id.*
47. HARMON & JONES, *supra* note 44, at 5.
48. BROWN, *supra* note 7, *at* http://scs.une.edu.au/Materials/573/573_8.html (describing study reported in J. D. Bransford et al., *Anchored Instruction: Why We Need It and How Technology Can Help*, *in* COGNITION, EDUCATION, AND MULTIMEDIA: EXPLORING IDEAS IN HIGH TECHNOLOGY 115, 129–30 (Don Nix & Rand J. Spiro eds., 1990)).

With this in mind, an effective way to organize a tutorial is around an actual problem to be solved.

Information Visualization

¶29 After exploring the lessons of educational psychology, the author of a Web-based tutorial should next consider some important discoveries of two relatively new fields, information visualization and information architecture. The first, information visualization, focuses on the succinct conveyance of information in the form of graphics, tables, diagrams, and charts.

¶30 To be successful, tutorial writers must present the complex research problems they seek to explain in an orderly and easily digestible manner. Fortunately, the field of information visualization offers lessons that enable a designer to craft an online tutorial that achieves these goals. Information visualization responds to the human brain's tremendous capacity and reliance on spatial and visual clues in order to process, retain, recall, and use information. Information visualization shows how to exploit "the dynamic, interactive, inexpensive medium of graphical computers to devise new external aids enhancing cognitive abilities."[49] Information visualization is a way of "'seeing' information without resorting to the use of text."[50]

¶31 There are numerous reasons why information conveyed either as an image or in conjunction with images is superior to information conveyed only as text. Images have a mnemonic benefit, helping one to recall or recognize information.[51] Researchers believe that textual and visual information are stored in different areas of the brain.[52] Visual information stored in the nonverbal memory region can be highly effective in cuing memory stored in the verbal region.[53] Furthermore, images used in conjunction with text signal that the adjacent text is important, causing many readers to pay closer attention to it than they might otherwise have done.[54]

¶32 Another tenet of information visualization is that textual or visual information is easier to remember if it can be stored and located spatially.[55] Studies

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49. CARD ET AL., *supra* note 3, at 5.
50. Steven Anderson, *Information Visualization at the Turn of the Century: Bleeding Edge to Leading Edge,* AALL SPECTRUM, Oct. 2000, at 4, 4.
51. George A. Miller, *Psychology and Information,* AM. DOCUMENTATION, July 1968, at 286, 286 ("Concrete visual images are easy to remember, especially if they are remarkable or even a little bizarre.").
52. Raymond W. Kulhavey & William A. Stock, *Reference Maps as a Framework for Remembering Text*, *in* COMPREHENSION OF GRAPHICS 153, 154 (Wolfgang Schnotz & Raymond W. Kulhavey eds., 1994).
53. *Id.*
54. *See* Mark A. MacDaniel & Paula J. Waddill*, The Mnemonic Benefit of Pictures in Text: Selective Enrichment for Differentially Skilled Readers, in* COMPREHENSION OF GRAPHICS, *supra* note 52, at 165, 178.
55. Miller*, supra* note 51, at 287; William Winn, *Contributions of Perceptual and Cognitive Processes to the Comprehension of Graphics, in* COMPREHENSION OF GRAPHICS, *supra* note 52, at 3, 20.

reveal that the spatial dimension of memory and learning is more important than nonspatial features such as color.[56] Both animals and humans "learn associations between places and actions more readily than between forms, colors, or sizes and actions."[57] An additional general principle of psychology is that "recognition is usually easier than recall."[58] For example, people often cannot recall a person's name but may easily pick out that same person's name from a list of five. Effective spatial and visual presentation of information in an online tutorial works in the same way to heighten a Web user's recall potential. A highly spatial and visual tutorial makes it easier for a user to revisit the site and extract the precise information that he or she may remember encountering on a previous visit.

¶33 The hypertext, multimedia environment is inherently visual. All of the images on a Web page serve to enhance memory and the recall of where specific information is located. The hypertext environment also has an implied spatial component. If an informational site is organized correctly, users who click through successive screens should become aware that they are going deeper within the organizational structure of a particular topic. In this way, the hypertext environment responds to the human brain's preference for information that is organized spatially.

¶34 I was conscious of these considerations when I organized the component legislative history documents of my tutorial and pathfinder by using an ellipse to convey the progression of time. The elliptical organizing of the component documents on the frontispiece allows users to form a vivid mental image of the roughly linear sequence in which legislative documents are likely to appear. (See figure 1.) This mental image, or memory map, complete with spatial characteristics and objective stimuli, helps users remember textual information stored in the verbal memory portion of their brains.[59] In other words, the use of the elliptical frontispiece to navigate the tutorial awakens the user's spatial orientation and serves to heighten recall of the material.

Conceptual Rigor Needed to Create a Web-Based Tutorial

¶35 There is a strong need at the planning stage to imbue one's tutorial and pathfinder with conceptual rigor. The bedrock underlying conceptual principles that organize and structure the Web site should be incorporated into as many elements of the design of the site as possible. It is important to spend time at the planning stage identifying the audience for the tutorial. Objectives can be established once the audience has been clearly identified. And information about the audience or user population, including their information needs and the objectives established to help meet them, ultimately serves to drive the design of the tutorial.
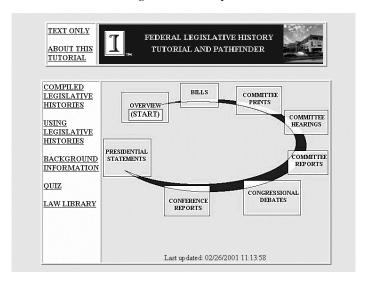
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56. Miller*, supra* note 51, at 287.
57. *Id.*
58. *Id.*
59. *See* Kulhavey & Stock, *supra* note 52, at 154–55.

Figure 1

Navigation Frontispiece

Importance of Planning

¶36 The creation of well-designed tutorials and pathfinders is a labor-intensive process. Even with the aid of HTML editors, graphics editors, the use of style sheets, or the cutting and pasting of HTML pages for the creation of similar pages (in order to maintain stylistic cohesiveness), it takes a long time to produce a logical and informative site. By carefully sketching and diagramming the organizational layout and look of the tutorial, one can minimize the risk of having to make global changes later. Although perhaps less engaging than HTML composition, thorough planning on paper allows one to troubleshoot before one is locked into a particular organizational schema. This was particularly true for my tutorial/pathfinder. As a novice creator of graphics, my intensely graphic frontispiece took me about twenty hours to create.[60]

¶37 It is also a good idea to do mock-ups of the Web site on poster-board or butcher's paper in order to solicit feedback while it is still easy to make changes.[61]

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60. Having created my tutorial/pathfinder "on the fly," there are numerous things that I wish I would have done differently and plan to do on subsequent iterations. For instance, by examining the work of other law librarians, I was sensitized to both the value and the rareness of markup transcripts. Markup transcripts are a record of proposed amendments to the original bill at either the subcommittee or committee stage and how each of the committee members voted as to the markup. On a subsequent iteration of the tutorial, I might consider including markup transcripts as one of the archetypal documents on the elliptical frontispiece.

61. For instance, my colleague, Paul Callister, suggested that I construct the tutorial so that when the user mouseovers one of the archetypical documents on the elliptical frontispiece, the corresponding time component lights up on a legislative timeline. In other words, Paul wanted to make explicit what I had only heretofore implied. Had I received this wise advice sooner, it would have been far easier to implement his idea.

Feedback should include the views of those who are knowledgeable about the topic of the tutorial and also members of its target audience. People with little understanding of the tutorial's subject matter are in the best position to comment on how intuitive the navigational elements and information flow will appear to novice users and problem solvers.

Audience

¶38 It is a fundamental principle of information architecture that the needs of the user should determine the design of the site.[62] Therefore, it is crucial to think about the user group, or audience, of the tutorial before setting out to create one.[63] As a reference librarian at a large academic law library, I knew that my library had a broad user population interested in legislative history—law students, practicing attorneys, other graduate students, and the occasional undergraduate student. Having identified the potential users of my tutorial, I was able to design it with all of them in mind. For instance, in all of the pathfinder pages of the site, I put subscription resources available to the entire university community before resources that are available only to law students and law faculty (i.e., Westlaw and LexisNexis).

Objectives

¶39 Once a tutorial designer has defined the target audience, it will be easier to specify the objectives of the tutorial. It is also important that the designer establish quantifiable benchmarks of success to use in testing whether the objectives are being met by the tutorial once it is available to users.

¶40 The tutorial designer may consider using an online, interactive quiz to test whether the objectives are being met. There are several online Web authoring sites that will assist a designer in creating interactive quizzes.[64] If possible, the interactive quiz should test for higher-level thinking skills such as synthesis and evaluation rather than mere recall and comprehension.[65] Additionally, a tutorial designer should incorporate a comment and evaluation form for users of the tutorial to give feedback. In this way, the designer can explicitly solicit feedback as to whether certain objectives have been met.

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62. *See* Parker, *supra* note 2, at 40 ("Start with an open mind. Assume nothing. Study your intended Web site visitors, identify their information needs and then present the information in the language and order they expect it. Test, test, test.").

63. Shalini Malhotra, *Understanding Users,* Computers Today, Mar. 31, 2001, at 68, 68 ("For a successful product, application or Web site, it is vital to identify the target audience, assess their behavior and understand fully their requirements from the product. . . . User-centered approach aims at 'designing a product that fits the users' and not 'acquiring users that fit the design.'").

64. *See, e.g.*, Hot Potatoes Half-Baked Software, *at* http://web.uvic.ca/hrd/halfbaked/ (last visited Jan. 9, 2002) ("[I]ncludes six applications, enabling you to create interactive multiple-choice, short-answer, jumbled-sentence, crossword, matching/ordering and gap-fill exercises for the World Wide Web.").

65. *See* Taxonomy of Educational Objectives: The Classification of Educational Goals: Handbook I, Cognitive Domain 204–07 (B.S. Bloom ed., 1956).

¶41 For my tutorial, I established three categories of objectives, relating to the legislative process, documents produced during the process, and tools for legislative research.[66] In general, I wanted users to become familiar with the legislative process and to be able to know where in the legislative process certain documents are likely to be created. I also wanted users to be able to use compiled legislative histories to find legislative history documents and, if need be, to be able to compile their own legislative histories. I used these objectives to determine the structure and the interactive elements of the tutorial.

Conceptual Underpinning and Organizational Schema

¶42 Consistent with semantic network theory,[67] every tutorial should have a rigorous and well-defined conceptual underpinning and organizational schema. The ordering principle for my tutorial hailed from a conversation with a colleague, Michael Robak. It is Michael's thesis that there are three important labels when considering legal information: process, documents, and tools. It is a legal process that creates documents (or artifacts), which in turn creates the need for tools (or finding aids) to organize and locate the various documents. I strove to incorporate this conceptual clarity into every aspect of my tutorial. I even discuss it explicitly in the "About This Tutorial" section.[68]

¶43 Conceptually, the elliptical ordering of information also worked well with the process, documents, and tools schema. Employing the elliptical device, I was able to display the basic kinds of legislative history documents, or archetypes, in a way that informs the user about the roughly linear nature of the federal legislative process.[69] The relationship between the documents and the legislative process is further reinforced by the fact that the elliptical frontispiece is one of the two principle means of navigation through the tutorial. If a user desires to visualize where he or she is in the chronological flow of the legislative process, he or she may do so by returning to the elliptical image rather than proceeding directly to the next document type.

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66. The specific goals were as follows. Process: Students will become knowledgeable about the many subparts of the legislative process and demonstrate that knowledge by being able to put the various legislative steps in chronological order. Documents: Students will become knowledgeable about where in the legislative process specific kinds of legislative documents are created. Students will demonstrate this knowledge by being able to put a body of legislative history documents in chronological order and by being able to identify in which subpart of the legislative process a particular document was created. Tools: Students will become familiar with the various legislative history-finding tools and be able to identify the strengths and weakness of the various print and online tools. Using the various finding tools, students will be able to compile a legislative history. In addition, students will be able to locate specific legislative history documents within the Law or Government Documents library at the University of Illinois.

67. *See supra* ¶¶ 18–23.

68. *About This Tutorial*, *in* Federal Legislative Tutorial and Pathfinder, *supra* note 4, *at* http://www.law.uiuc.edu/library/home/libguide/refserv/Legislative_History_(Federal)/about.htm (last updated Feb. 8, 2001).

69. For an interesting discussion of how humans structure information in a linear and sequential fashion in order to convey it, see Michel Denis et. al*., Identifying and Simulating Cognitive Strategies for the Description of Spatial Networks, in* Comprehension of Graphics, *supra* note 52, at 77, 78–79.

Pathfinder Issues

¶44 As to the pathfinder portion of any tutorial/pathfinder, the designer should seek to incorporate the various Web style elements to differentiate between the different types and levels of sources. A Web designer may use bullets, different font sizes, multiple pages, and different colors to accomplish this end. The designer may also consider linking directly to the appropriate document-specific portion of each of the online databases. While this is not a problem with federal government resources (GPO Access, Thomas, the House of Representatives home page), it is best that a tutorial creator first get the permission of each private vendor before "deep linking" to a particular page within a vendor's site.[70]

¶45 I organized my pathfinder around the fact that at present the library's patrons can find legislative documents in two places—online and in the print collection. Consequently, I made two pages for each document archetype—one for the online location and one for the print version held by the law library. I listed the online page first since my experience is that most users prefer to locate documents in electronic format rather than print. Additionally, the online databases often give more powerful and user-friendly keyword access.

Information Architecture and Web Design Considerations

Navigation

¶46 Navigation is perhaps the single most crucial element contributing to the usability of a Web site.[71] For my tutorial/pathfinder, I used the elliptical ordering of the legislative history documents as the chief navigation means through the site. I tried to be as explicit with the navigational structure and elements as I could. Every page except the tutorial's home page has two links back to the home page— one in the upper left corner, "TUTORIAL HOME," and the other at the bottom of each page, "BACK TO THE TUTORIAL HOME PAGE." I include these two

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70. Deep linking occurs when one links to a specific page within a Web site without bringing the user to that site's home page as was perhaps intended by its designers. Deep linking is one of the largest legal issues facing the Web community. *See* Nicos L. Tsilas, *Minimizing Potential Liability Associated With Linking and Framing on the World Wide Web,* 8 COMMLAW CONSPECTUS 85 (2000); Joseph A. Tontodonato, Comment, *Deep-Linking: Sure You Can Exploit My Trademark, Weaken its Strength, and Make Yourself Money While Doing It,* 22 T. JEFFERSON L. REV. (2000); Allison Roarty, Note, *Link Liability: The Argument for Inline Links and Frames as Infringements of the Copyright Display Right,* 68 FORDHAM L. REV. 1011 (1999); Mark Everett Chancey, Comment, *Meta-Tags and Hypertext Deep Linking: How the Essential Components of Web-Authoring and Internet Guidance are Strengthening Intellectual Property Rights on the World Wide Web,* 29 STETSON L. REV. 203 (1999); Brian D. Wassom, Note, *Copyright Implications of "Unconventional Linking" on the World Wide Web: Framing, Deep Linking and Inlining,* 49 CASE W. RES. L. REV. 181 (1998).

71. "Navigation that works should: Be easily learned; Remain consistent; Provide feedback; Appear in context; Offer alternatives; Require an economy of action and time; Provide clear visual messages; Use clear and understandable labels; Be appropriate to the site's purpose; [and] Support users' goals and behaviors." JENNIFER FLEMING, WEB NAVIGATION: DESIGNING THE USER EXPERIENCE 13–14 (1998).

prominent links because it is important to provide users a clear place to go to if they get lost or confused.[72] Also, I made my hypertext links the conventional blue color that has come to be universally recognized as the symbol of hyperlinked text.[73] Additionally, if possible, a library should maintain "consistency with navigational aids, not only within a particular system but over all the ones that a particular group of users has access to."[74] This should help to reduce the learning time for the navigation and use of each of the library's tutorials.

Branding

¶47 It is important to employ the marketing concept of branding in Web site design. All the pages of the site should have a consistent look and feel.[75] Each page of the site should have the same color scheme, the same identifying graphics, and the same placement of navigational, graphic, and textual elements on the page.[76] This consistent branding of the Web site lends each individual page an imprimatur of authority based on the premise that the site was created by an official institution or a reputable law firm. Additionally, a well-branded site lets a user know whether, after clicking to another page, he or she is still within the tutorial or has left it for another site.

¶48 To the extent possible, I branded my tutorial/pathfinder to make it appear part of the University of Illinois law library's Web site. I used the same light gray/blue background color of the library's Web site for my tutorial background. In addition, I created a banner employing the university logo and picture of the law school to give the tutorial a stamp of authority based on its being hosted by a law library at a well-known academic institution.

Cross-Platform Design Issues

¶49 Unfortunately, the two competing Internet browsers, Microsoft's Internet

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72.　*See generally id.* at 183–204.
73.　*See* Jakob Nielsen, Designing Web Usability 62 (2000) ("When non-standard link colors are used, users lose the ability to clearly see which parts of the site they have already visited and which parts remain to be explored.") [hereinafter Nielsen, Web Usability]; Jakob Nielsen, *End of Web Design,* Alertbox (July 23, 2000), *at* http://www.useit.com/alertbox/20000723.html.
　　　　Users spend most of their time on other sites. This means that users prefer your site to work the same way as all the other sites they already know. . . . It has long been true that Web sites do more business the more standardized their design is. Think Yahoo and Amazon. Think "shopping cart" and the silly little icon. Think blue text links.
74.　Brown, *supra* note 7, *at* http://scs.une.edu.au/Materials/573/573_10.html.
75.　"Transferring a brand identity from a printed page to a Web site is not particularly difficult. The key word is 'consistency.'. . . Adapting a brand image to work across a multi-page site means that you have to treat the whole site as a homogenous entity. Each page must relate to the others through consistent application of logos, colors, backgrounds, layouts or other visual anchors—and even writing style. The fact that you have to work within the web's bandwidth constraints actually helps here. The reuse of cached pictorial elements not only makes for more efficient loading times, it helps to hold a site together visually." Joe Gillespie, *Branding on the Web,* Web Page Design for Designers, *at* http://www.wpdfd.com/H5/497.htm (last visited Jan. 9, 2002).
76.　*Id.*

Explorer and Netscape's Navigator, do not display HTML code in exactly the same way. In fact, each browser is imbued with proprietary features designed to lock users into using it exclusively. Additionally, differences in the way the various operating systems (Windows, Unix, Macintosh) display information can also lead to unintended display consequences. Consequently, a Web designer must constantly check to ensure that the page he or she is creating will display adequately on all browsers and operating systems.[77]

¶50 During the creation of my tutorial/pathfinder, I discovered that Netscape displayed a table's cell that had no content as if it did not exist. This was particularly troubling as I often used tables to control the indentation of information on the page.[78] It was very noticeable when Netscape did not display a blank cell because the background color of the empty cell did not appear as I had intended. Although it was only a minor annoyance to go back into the HTML code and insert a simple return or "enter" keystroke for the cells that were not being displayed, the frequency of this occurrence slowed my productivity. One solution is to make sure the HTML editor you are using codes in the most forgiving manner for all browsers.

¶51 For ambitious Web designers there is another way to gain control over the appearance of one's site on many different browsers, screen sizes, and platforms. This is by using cascading style sheets. Cascading style sheets employ a separate format file to which all pages in the site are linked. In addition to being a great way of ensuring the visual coherence of a site, style sheets make it possible to address the problem of different platforms, screen widths, and browsers with a different style sheet format optimized for each.[79]

Screen Size—Formatting and Limitations

¶52 Web designers also must be sensitive to the fact that different users will view the displayed information on monitors with different screen widths. Consequently, one should design for the lowest common denominator to eliminate the need for users with smaller screens (such as laptop users) to scroll horizontally in order to take in all of the information on the page. According to recent surveys, most users have monitors that are at least 800 by 600 pixels (800 pixels being the horizontal

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77. "No matter how much effort a Web site designer puts into his or her work, there are millions of people out there who will see something other than the designer intended. Some of the differences are caused by different browsers and some by different computers, monitors and operating systems. In a perfect world, the Web site designer would have a bank of monitors like the television studio each running different browsers on various computer platforms. Dream on . . ." Joe Gillespie, *It's the Difference That Makes the Difference,* WEB PAGE DESIGN FOR DESIGNERS, *at* http://www.wpdfd.com/H5/797.htm (last visited Jan. 9, 2002).

78. I discovered later that the use of tables as layout elements is discouraged by WORLD WIDE WEB CONSORTIUM, WEB CONTENT ACCESSIBILITY GUIDELINES 1.0, at 14 (Wendy Chisholm et al. eds., 1999) [hereinafter ACCESSIBILITY GUIDELINES], *available at* http://www.w3.org/TR/WAI-WEBCONTENT/ (Guideline 5: "Tables should be used to mark up truly tabular information ('data tables'). Content developers should avoid using them to lay out pages ('layout tables')."). I hope to rectify my use of tables for layout purposes on subsequent versions of my tutorial/pathfinder.

79. *See* NIELSEN, WEB USABILITY, *supra* note 73, at 81.

width and 600 pixels being the vertical width.)[80] However, one should design for a pixel width that is less than the maximum displayed in order to allow the browser to display a vertical scroll bar.[81]

¶53 Another design solution to the problem of different monitor sizes is to set table widths as a percentage of the maximum screen width. This is known as relative table sizing. For instance, one can set a particular table (or cell) to be 20% or 80% of the available screen width. However, this method of proportional table and cell sizing becomes unworkable when a Web designer chooses to nest several tables within other tables. The nesting of tables is common in Web design because it allows the webmaster to exert the most control over the appearance of the site. However, the rampant use of tables raises another crucial design consideration, accessibility, that will be discussed later.[82]

¶54 The size of the computer screen is a limitation in another sense. Contrary to the printed page which is usually longer than it is wide, easy to get close to, and readily touchable in order to mark one's place, a monitor is often a fixed behemoth that cannot be touched (without leaving obscuring fingerprints) or viewed too closely for long periods of time (because it is an active light source shining directly into one's eyes). Consequently, information displayed on a monitor must be larger than that on paper.

¶55 As an example, I found for my tutorial that the highly detailed flow charts frequently used to explain the legislative process in books were much less effective when scanned and displayed unaltered on the computer screen. Complex diagrams and flowcharts do not scale down well to the scarce real estate of the average computer monitor.[83] Increasingly, information that is linear in nature is now represented using a circular, elliptical, or horseshoe ordering of the text. By folding a linear progression under itself, more information can be conveyed without making the text too small. It is for this reason that I organized my tutorial/pathfinder's graphic frontispiece using an ellipse.

Accessibility[84]

One in five Americans aged sixteen and over has a disability of some kind. As our popula-

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80. *See Design for the Smallest Screen Size, at* http://malektips.envprogramming.com/wdev0003.html (visited on Dec. 11, 2001) ("According to latest Web usage surveys, a large majority of users now have their screens set to at least 800x600. So it may be safe to design for these resolutions. However, you should still avoid 1024x768.").

81. *See* Tom Dahm, *Design Tip: Screen Width,* 1 Webmaster Tips Newsl. (Sept. 1998), *at* http://www.netmechanic.com/news/vol1/design_no1.htm.

82. *See infra* ¶¶ 56–57.

83. *But see* Univ. of Mich. Documents Ctr., Legislative History Process, *at* http://www.lib.umich.edu/govdocs/legchart.html (last updated Oct. 5, 2001) (example of an effective legislative flowchart even though it is dense and requires much scrolling by user).

84. For a general discussion of principles to keep in mind while designing Web pages, see Amy M. Kautzman, *Virtuous, Virtual Access: Making Web Pages Accessible to People with Disabilities,* Searcher, June 1998, at 42.

tion ages, the number of learners with vision, hearing, and physical limitations will continue to grow.[85]

¶56 Public libraries are under both a moral and legal[86] imperative to ensure equal access to all of its resources. This is true not only for books, bricks, and mortar, but for the online world as well. In my short time as a librarian I have already assisted several blind patrons with online information retrieval. It takes only a few such experiences to realize how difficult it is for people with vision problems to conduct research in today's online environment. Fortunately, there are technologies that permit the visually impaired to make use of the Web. However, it is crucial that designers be aware of these technologies and code their pages in a manner that accommodates maximum access.

¶57 There is software that will generate a verbal rendition of the contents of a Web site. However, these screen readers have trouble with frames, tables, and images.[87] To accommodate visually impaired users accessing my tutorial/pathfinder through the use of a screen reader, I included a text-only page for every aspect of my tutorial/pathfinder.[88] Because screen readers read from left to right, top to bottom,[89] I placed my text-only option at the upper, left-hand corner of each page. This allows a visually impaired user navigating my tutorial with the help of a synthesized voice output reader or a refreshable Braille display to quickly find the tutorial's text-only option and navigate the tutorial much more efficiently by using the text-only pages.[90] Additionally, I kept my layout consistent throughout

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85.   WEB-BASED EDUC. COMM'N, THE POWER OF THE INTERNET FOR LEARNING: MOVING FROM PROMISE TO PRACTICE 3 (2000), *available at* http://interact.hpcnet.org/webcommission/index.htm.

86.   *See* 42 U.S.C. § 12132 (1994) ("[N]o qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of a public entity, or be subjected to discrimination by such entity.").
        The Department of Education's Office for Civil Rights sought to make California community colleges more compliant with the Americans With Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973 by encouraging them to do a better job of providing access to print and computer-based information to students with visual impairments. (Docket Number 09-97-6001). Letter from Stefan Rosenzweig, Director, San Francisco Office, Office for Civil Rights, to Thomas J. Nussbaum, Chancellor, California Community Colleges, http://www.ed.gov/offices/OCR/letters/caccres.html (Oct. 1, 1998).

87.   For information about the technologies that make Web sites accessible to people with disabilities as well as programming tips to accommodate these technologies, see ACCESSIBILITY GUIDELINES, *supra* note 78.

88.   *See id.* at 10, Guideline 1 (Checkpoint 1.1: "Provide a text equivalent for every non-text element. . . .").

89.   Kautzman, *supra* note 84, at 44.

90.   *See* Jakob Nielsen, *Disabled Accessibility: The Pragmatic Approach*, ALERTBOX (June 13, 1999), *at* http://www.useit.com/alertbox/990613.html:
        The WAI [Web Accessibility Initiative] continues to promote the original ideal of Web design: a *single HTML page that will adapt to all different usage* circumstances, from huge monitors to small hand-helds and from seeing to blind users. . . . But I am *not sure that single-design pages will be able to deliver optimal usability in the future*. For example, screen sizes will soon differ so drastically between high-end office workstations and small mobile devices that the same pages will not satisfy both. And I also think that one can make pages much more usable for blind users and users with other disabilities by designing explicitly for these groups. The old approach of a "text-only" alternative may rise again: both for mobile users and for disabled users, though the two different sets of circumstances lend themselves to different designs, even within a text-only paradigm.

the numerous pages of the tutorial. Beyond assisting users with disabilities,[91] this basic principle of design assists everyone in their navigation of the tutorial by eliminating the step of relearning each time where one has to click to move forward or backward, or where one looks for particular types of information.

Biographies

¶58 Research shows that users want biographical information about the creators of Web sites.[92] This makes them much more personal and provides the user with the means of assessing the site's credibility and authority.[93] As to my tutorial/pathfinder, I included a picture of myself and my current position on the "About This Tutorial" page. I also indicated that I have a law degree.

Avoid Frames

¶59 The use of frames allows a Web author to divide the user's screen image into multiple, scrollable segments.[94] Frames should be avoided when designing a tutorial. Frames are a conceptual problem in Web design because "the unit of navigation is different from the unit of view."[95] In other words, frames make it very difficult to bookmark or link to a site with precision because there is a high probability that the link or bookmark will not point back to the exact same page image as the one the user had in mind when creating the bookmark or link.[96] Additionally, frames make it difficult to print a Web page.[97] If a Web designer feels that the benefits of using frames are too compelling to ignore—such as providing the ability to include a table of contents frame—at the very least the Web designer should provide a link to a "no frames" option.[98] These are pages providing the same content but without using frames to do so.

Printing

¶60 It is inevitable that students will want to print out a tutorial or pathfinder to use when they are in the stacks searching for materials described in the online work but don't have access to a computer. Additionally, many users prefer not to read large amounts of material from a computer screen. Consequently, a tutorial or

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91. Kautzman, *supra* note 84, at 45 ("For the non-visual user, navigating a Web page is an exercise in memory.")
92. "My first Web studies in 1994 showed that users want to know the people behind information on the Web. In particular, biographies and photographs of the authors help make the Web a less impersonal place and increase trust. Personality and point-of-view often wins over anonymous bits coming over the wire." Jakob Nielson, *The Top Ten New Mistakes of Web Design End of Web Design,* ALERTBOX (May 30, 1999), *at* http://www.useit.com/alertbox/990530.html.
93. *See id.*
94. FRAMES: AN INTRODUCTION, *at* http://www.netscape.com/assist/net_sites/frames.html (last visited Feb. 6, 2002).
95. NIELSEN, WEB USABILITY, *supra* note 73, at 86.
96. *Id.*
97. *Id.* at 87.
98. *Id.* at 85.

pathfinder should have an option that allows a user to print off the entirety of the document quickly. In other words, there should be a "click to" version of the tutorial or pathfinder that contains all the content aggregated on one continuous page.[99]

Conclusion

¶61 Technology has placed librarians at the dawn of a brave new world. The online multimedia environment provides a powerful tool to target multiple learning preferences. It also allows librarians to better reach today's law students—many of whom have been weaned on spectacularly interactive video games rich with detailed graphics. To effectively convey complex legal research methodologies and techniques, the law librarian should make every effort to employ the lessons of educational psychology, information visualization, and information architecture.[100]

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99. "My recommendation is to generate two versions of all long web documents. One version should be optimized for online viewing by being chunked appropriately into many files using plenty of hypertext links and a screen-oriented style sheet. Another version should keep the entire document in one file with a layout that is optimized for printing." *Id*. at 94.

100. In a famous 1932 dissent, Justice Louis D. Brandeis noted that he viewed the individual states as laboratories in which to try "novel social and economic experiments." New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J. dissenting). Similarly, the more than 180 different academic law libraries in the United States may be viewed as individual laboratories of experimentation as to how law librarians can most effectively convey legal information in the online environment. During the creation of my online tutorial/pathfinder, I visited as many of the online legislative history tutorial and pathfinder sites as I could find. By doing so, I was able to significantly improve both the look and the content of my tutorial/pathfinder. I plan to continue to monitor these and other sites as new ideas are implemented. No one site or webmaster has a monopoly on applying educational theory to tutorial design, or employing good information architecture and good information visualization.

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