Web-Based Instruction

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Evaluation Guidelines for Web-Based Course Authoring Systems

Lisa Hansen and

Theodore W. Frick

Introduction

The potential to use the Web for delivering instruction appears to be good. Historically, authoring systems such as Plato, TenCORE, ToolBook, and HyperCard have allowed developers to create instructional programs for specific computers. We can now do similar kinds of things with the Web for instruction, with the major advantages being that courseware is no longer platform dependent, and is accessible through the Internet.

To create Web materials, we presently use text editors, graphics programs, and CGI scripts. What would be ideal is a set of integrated software tools which make this whole design process as easy as it has become with tools such as Authorware, ToolBook and HyperStudio on personal computers.

This chapter may be useful for course instructors or classroom teachers who are looking for a WBI authoring tool. We present guidelines for evaluating such tools as they become available for creating Web-based instruction (WBI). Instructors will be making decisions about which tools to purchase, and these decisions will be driven by a variety of factors. We provide a set of questions to help you decide which program will work best for your situation. Also, we provide a set of representative tasks that can be used to evaluate software under consideration.

Information, Interaction, Assessment, and Course Management

We have found it useful to think about WBI in four areas: presenting information, providing human interaction, assessment of learning, and course management.

Information is the content made available for learning during the course. It can be in the form of printed text, lectures, videos, demonstrations, simulations, etc. Presenting information is the Web's strong suit. This is what the Web was originally designed to do, especially through hypertext or hypermedia formats.

Human interaction is that component of a course where students and instructors talk with each other. Interaction can be in the form of face-to-face class discussions or through other means, such as electronic mail or writing notes on paper. This is an important part of most learning environments; students need to communicate with the instructor and other students. The Internet (and the Web) make it possible for such communication to not be bound

by time and space. Such communication is asynchronous. Two people do not have to be at the same place and time to carry on a conversation.

Assessment is the third aspect that is important in instruction. Teachers need to know how well students have learned, and so do students themselves. The Web shows promise here as well. Similar to stand-alone computer authoring tools, it is possible to create quizzes and tests of student learning. Such assessment can be computer-based or computer-mediated. Computer-based assessment is when the computer does the grading; computer-mediated assessment is when the computer is used as the conduit between student and instructor. This component is what sets apart WBI from conventional computer-mediated assessment, because it can occur at a distance. The conduit is the Internet.

Course management pertains to administrative tasks such as student enrollment, keeping records on student progress, giving grades, creating student transcripts, etc. Historically, some of these clerical tasks have been done by teachers themselves, and others done by administrative support staff. The Web makes it possible to integrate or at least interconnect some of these activities. For example, when students register for a college course, a WBI course login and e-mail distribution list could be created automatically for an instructor. Similarly, when the instructor turns in grades, these could be seamlessly added to administrative records and student transcripts.

Remember the Old

The use of programs to develop, deliver, and manage computer-based instruction is not new. PLATO was one of the earliest and most successful of authoring systems (Woolley, 1994), and is especially relevant now:

a. PLATO was not simply a development tool; PLATO was also used to deliver the instruction and manage courses.

b. Interaction with the mainframe computer was used for assessment.

c. PLATO incorporated a Notes system that allowed for interaction between instructor and user (Woolley, 1994).

TenCORE, ToolBook, HyperCard, Authorware, and Director are examples of course authoring tools that emerged as the personal computer market grew, with courseware being distributed on computer disks and CD-ROMs. Now, with the advent of networks and the Internet, centralized delivery of instruction at a distance is again appearing, as it has for 30 years on PLATO (now Novanet).

Consider the New

New authoring programs are on the horizon that will make development on and for the Web a simpler process. Already, programs are being created that streamline the development process, automating or shortening the time it takes to do simple actions (see Table 1).

However, for the Web to become the primary delivery format for instruction, programs must be created that allow for integrated development of all aspects of a Web-based course.

Finding the new. Searching Alta Vista, Lycos, Open Text, and Yahoo for the next great authoring tool yielded tens of thousands of hits, none of which produced a single integrated program. We found several instances of methods created by institutions; for instance, *SCALE*, at the University of Illinois at Urbana-Champaign, is an organization that has developed a way to streamline the development process, using a variety of helper tools (Oakley, 1996). However, the most commonly found item was a tool that performed one task or another, but not all elements.

Table 1. A brief list of Web development tools and resources.

Web Page Creation

- Inter Network's Home Page Creation Center
  http://www.inetw.net/lib/start.html
- Web-Lint HTML Checker
  http://www.indiana.edu/~mgrwww/tool_guide_info/web-lint.html
- The Webmaster's Page—List of graphics programs
  http://miso.wwa.com/~boba/masters1.html#10
- HTML Converters
  http://www.w3.org/pub/www/Tools/Filters.html

Electronic Communication

- FirstClass for Macintosh
  http://www.writer.yorku.ca/files/fc/mac.html
- WebNotes for Windows
  http://www.inetw.net/lib/start.html

Creating Online Assessment

- Learn to Write CGI-Forms
  http://www.catt.ncsu.edu/users/bex/www/tutor/index.html
- Carlos' FORMS Tutorial
  http://robot0.ge.uiuc.edu/~carlosp/cs317/cft.html

Administration

- Shareware CGIs
  http://128.172.69.106:8080/cgi-bin/cgis.html
- West
  http://www.west.ie

General

- The Webmaster's Page
  http://miso.wwa.com/~boba/masters1.html
- WebReference—Developer's Corner
  http://www.webreference.com/dev/

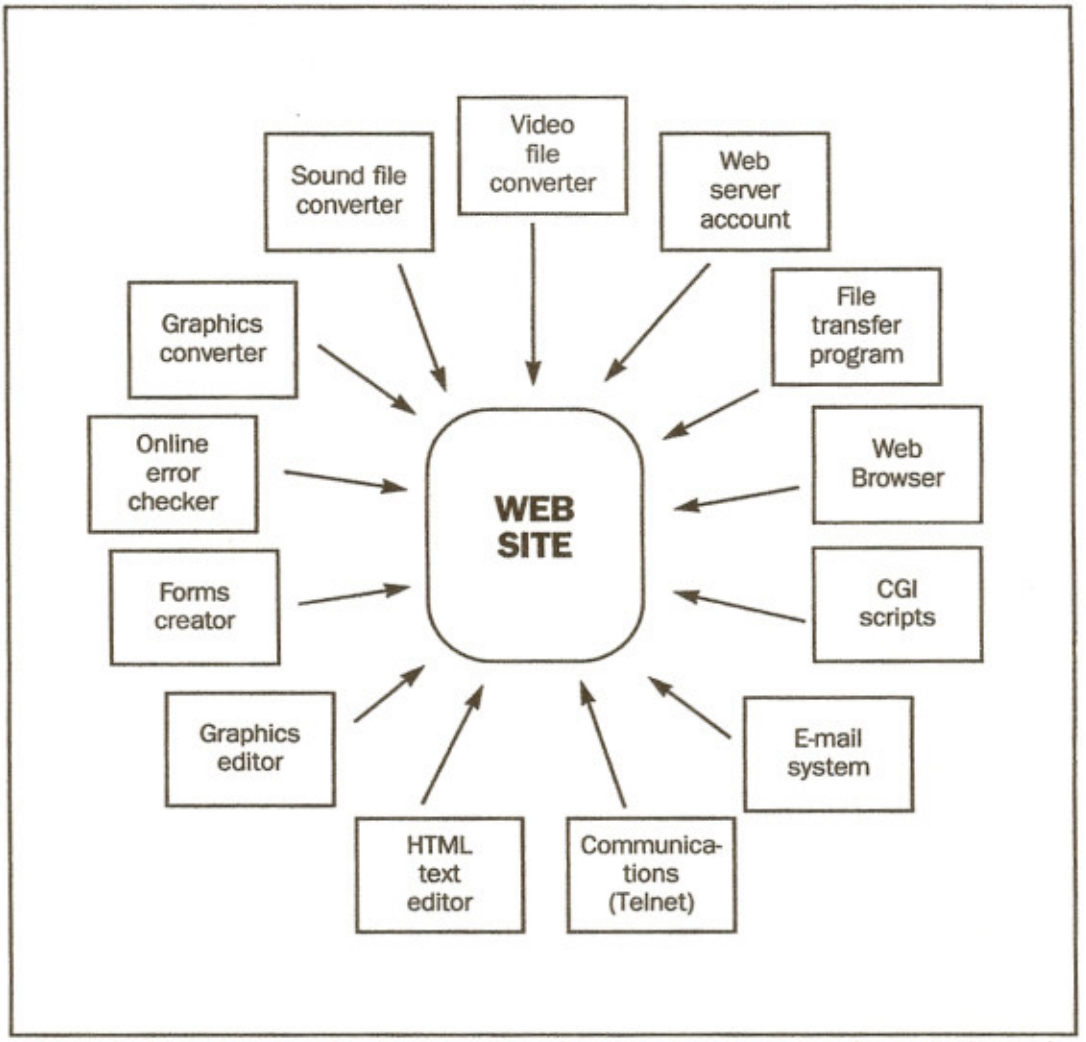

Figure 1. Current method for creating a Web site without a comprehensive authoring tool.

(Figure 1 represents some of the most basic programs used for Web design. Each box represents a separate program that is often used in creating a multimedia Web page.) For instance, West is a program that streamlines the administration of a Web-based course, but does not appear to provide development assistance. An example of an integrated authoring tool being created is *Web-CT* (Goldberg *et al.*, 1996).

Which Should We Choose?

Before a decision can be made about which authoring tool to use to develop WBI, one must carefully consider the way the course will be conducted. Is it primarily presentation of information, with limited discussion or tests? Will most interaction be done as part of a graded test or quiz, or will there be extensive dialogue? Knowing what aspects your course will emphasize can assist in the final decision. Next, consider the following questions when deciding which program to obtain:

How proficient is the developer in creating Web-based materials? This will strongly influence your choice. Are you buying a program for a highly skilled campus Web development team affiliated with Computer Services, or are you looking for something that a sociology instructor, who is not a computer expert, can use? The level of expertise of Web developers varies widely. If you expect instructors to do the WBI development, you should avoid purchasing a system that is primarily CGI scripting (i.e., computer programming).

How difficult is the suite of programs to learn? If possible, get an evaluation copy of the software and try it out. A program should have an interface that gets even the novice developer up and running in a few minutes. Ideally, a tutorial or step-by-step development option should be provided, rather than simply a collection of tools with no obvious starting point.

Does the program come with sufficient documentation, on-line help, and support? If the program does not have easy-to-use print and on-line manuals and a help system, consider one that does.

How much does the program cost? Price plays a major part of any software purchasing decision, and should be considered here as well. There are many free programs that can do certain parts of Web development very well. Be willing to pay for extraordinary capabilities, not simple HTML scripting.

Is the program Web-based or platform-dependent? If your instructors are working on one platform (all Macintosh, for instance), a program that is system-specific may not be a problem. A cross-platform program is better, since it allows for a variety of computers to be used as needed. The best alternative, however, may be a program that actually resides in Web space, can be accessed from any type of machine, and does not require instructors to always work in one place.

Does the authoring tool perform all of the functions needed to create all aspects of the planned course? An authoring tool should let you create every aspect of your proposed on-line course. This includes the elements of information, interaction, and assessment, as outlined above. Specific components of a Web-based course are used as benchmark tests, described below.

How well does the program convert components from other multimedia programs? A good program should allow an instructor to incorporate existing materials from other programs into the new on-line course. Certain browsers, such as Netscape, offer plug-in options, which many multimedia programs are providing. These plug-ins jump the user out to a player version of an application (i.e., HyperCard Player, RunAPM) which automatically launches a certain file. This does not fully integrate non-Web multimedia, but does offer one option for use. Ideally, an authoring tool should convert items from a multimedia program into a format that can be directly accessed from the Web.

How much of the development work does the program do for you? This issue is important for those people planning to develop many courses, or who do not have the time or inclination to decide every aspect, especially visual design issues, which are often time-consuming. A good program should provide step-by-step creation methods, templates, clip art graphics, sample Web pages that can be adapted for individual use, automatic generation of CGI scripts, and basic instruction for creating standard components.

What Can It Do?

There are many methods for evaluating software. Many books about computer-assisted instruction contain checklists of things to do (for instance, Azarmsa, 1991, p. 47). The simplest way to evaluate software for comparison purposes is to create and conduct a series of benchmark tests. We have determined that the following tasks cover most activities done while creating WBI. See Figure 2 for a sample form that can be used for evaluation.

Create a basic Web page. There are many HTML editors and Web page development tools available. A good WBI tool should incorporate basic HTML development. For this test, include the following items on your page and note how you created them:

a. Title (Did you use HTML, or did the program designate it?)

b. Header (Did you use HTML, or is the development tool WYSIWYG?)

c. Navigation tool or tools (Did you use HTML and have to test your own links? Did the program prompt for graphics to use as navigation buttons? Did the program begin to create some sort of flowchart or hierarchy in order to organize multiple pages?)

d. Graphic (Were you able to edit or create a graphic within the program, or were you only able to import from a support program?)

Create or convert a multimedia document (graphics, sound, video). At this time, multimedia components of Web pages are external files in a variety of formats that are supported with varying degrees of success by the helper programs the Web browser accesses. A WBI authoring tool should allow the instructor to:

a. Import text documents with minimal loss of formatting or odd symbols.

b. Convert graphics into formats compatible with Web standards (i.e., GIF, JPEG).

c. Convert sound files into a usable Web format.

d. Convert video files into a usable Web format.

Establish a means of asynchronous communications. A WBI authoring tool should either provide a communications system or incorporate an existing system (i.e., FirstClass, WebNotes). Here, see if the tool in question can:

a. Create a form for asking questions of the instructor.

b. Create a page that allows students to leave public messages for the group (this page would be similar to a Web-based newsgroup or bulletin board).

c. Create a method for the instructor to post a response to a student question from within the system (although e-mail would be a simple alternative if this cannot be accomplished).

d. Incorporate an existing Web-based communications system, such as WebNotes.

Create a test; create an assessment item. A good Web authoring tool should have the capability to create tests, quizzes, and guided practice with feedback. It should:

a. Take the instructor through creating the assessment interface (i.e., a form for multiple choice tests; a Web page with a dialogue box for short answers and a response area; a form which will be submitted to the instructor for grading; a page that streamlines electronic file transfer of papers or other documents from student to teacher and back again; a self-assessment response form; an adaptive test with feedback for both students and instructor).

b. Generate the CGI script that will be used to grade, examine, and provide feedback without direct instructor involvement.

Program Name: _____

Cost

Single: $ _____

Multi (# _____): $ _____

Site license: $ _____

Support

Manual: _____

Online: _____

800-number _____

Training

Tutorial: _____

Demo: _____

Development Platform(s)

Windows: _____

Macintosh: _____

UNIX: _____

Contains

Page templates _____

Forms templates _____

Wizards (step-by-step creation tools _____

CGI scripts _____

Clip art _____

Media converters _____

Performance [1–Poor → 5–Excellent]

TASK	QUALITY OF PRODUCT	EASE OF USE
1. Create basic Web page.	1 2 3 4 5	1 2 3 4 5
2. Convert media.	1 2 3 4 5	1 2 3 4 5
3. Create and use an asynchronous conference.	1 2 3 4 5	1 2 3 4 5
4. Create quizzes.	1 2 3 4 5	1 2 3 4 5
5. Perform course administration.	1 2 3 4 5	1 2 3 4 5

Figure 2. A sample form for evaluating WBI authoring tools.

c. Create the files that contain the results from tests or other interactions that the instructor would like to examine; these files should also be automatically forwarded to the appropriate location, such as the instructor's e-mail account.

Perform course management. An authoring tool should provide a simple method for allowing the instructor to keep track of who is accessing the site, what they are doing, and when they did it. Administration of the Web site is extremely important when students are paying for the privilege of attending this "virtual classroom."

Conclusion

Creating a Web-based course is not a simple task, and the tools for creating it are hard to find. The elements of information, interaction, assessment and course management should all be addressed by a WBI authoring tool if it is to become a standard for development. Determining the computer competency level of the instructor, the support offered by the authoring tool distributors, the costs and capabilities of the program, and the amount of work the program does for you are all elements you should consider when choosing an authoring tool. Also, using the benchmark tests of creating basic pages, creating usable multimedia elements, establishing interaction elements, creating assessment elements, and creating administration tools, will enhance your evaluation. A good WBI authoring tool will combine all of these tasks into one unified process.

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