



Web-based Learning Environments: Guidelines for Development and Implementation

Janette R. Hill, Ph.D.
Assistant Professor of Educational Technology
University of Northern Colorado

The potential of using electronic technologies for the delivery of instruction continues to become more viable. Not only is the technological infrastructure (i.e., the Internet) expanding in terms of its capabilities and power, distant learners have easier access to the technologies needed to acquire and share information with other learners.

Learning from a distance is not a new phenomena (Garrison and Shale 1990). Correspondence study has been used for decades. As technologies are introduced to the educational arena, they have been used for distance learning. Techniques and methodologies have been developed and tested to guide the use of various technologies for distance learning, and have proven effective (Bates 1995).

Methodologies and techniques specific to the development and implementation of distance learning via Web-based environments are beginning to appear (Hill, Owston 1997). As the Web and other Internet-based technologies (e.g., e-mail, CUSeeMe) continue to grow in popularity and use, creating and establishing guidelines for Web-based technologies is vital if they are to reach their potential for educational use.

The purpose of this paper is to discuss Web-Based Learning Environments (WBLEs) and their viability for distance learning. Issues related to distance education and Web-based technologies will be presented. Guidelines for the creation of WBLEs will be suggested. Findings from a current research effort will be presented as examples of how these guidelines can be applied. Finally, the prospects and challenges these environments hold for educators and policy makers will be offered for consideration.

Distance Learning and Web-Based Technologies: Issues and Considerations

Distance learning refers to instruction delivered via print or electronic media to persons engaged in learning in a place and/or time distinct from that of the instructor(s) and/or other students (Moore, Cookson, and Donaldson 1990). Since its inception, distance

learning has incorporated several technologies to satisfy the "media" requirement, including pen and paper, radio, television, and computers (Sherow and Wedemeyer 1990).

Of the methods incorporating computer technologies (e.g., e-mail, listserves, chat rooms), the Web holds the greatest potential for promoting engagement of, and interaction by learners (Shotsberger 1996). The ability of a WBLE to provide multiple types of information, as well as afford a variety of techniques for information presentation and retrieval (e.g., text, audio, graphics, and video), creates the opportunity to increase interaction and engagement in distance-learning environments.

The level of interaction and engagement between instructor and learner, as well as between learners, is an ongoing concern for educators. In distance-learning environments, this concern increases exponentially. Another considerable challenge faced in distance-learning environments is the power of the technological infrastructure. While considerable gains have been made in both the hardware and software available for the distance delivery of instruction, this is not widespread nor consistent among the primary receivers of the instruction: the learners. The question raised by these challenges: How do we create WBLEs which promote interaction and engagement, yet remain practical within the current technological infrastructure?

Guidelines for the Creation of WBLEs

Design, development, delivery, and technological considerations become relevant when creating a distance-learning environment via the Web. Creating engaging and active learning environments is a challenge regardless of the delivery medium employed. Fundamental Web attributes such as access to multiple media, the ability to access information asynchronously, and "required" reading increase this challenge exponentially.

Several guidelines discussed in this section assist the creation and implementation of WBLEs. The guidelines are presented using a framework established by Schrum, which includes three areas for consideration: pedagogical, technological, and organizational (Schrum 1995). Examples of the use of each guideline in a current WBLE research effort are included.

Pedagogical

Guideline One: Understand the constraints WBLEs place on the learning environment.

In distance-learning environments, mode of delivery is an important factor. Constraints of the medium often drive the methodology. This, in turn, creates constraints on instruction (Winn 1990). While one could argue this is no different than face-to-face (i.e., "traditional") learning environments, reliance on technology for delivery of instruction increases the constraints exponentially. The incorporation of varied pedagogical methodologies and strategies in

the distance-learning environment can assist in reducing the constraints (Joyce and Weil 1996).

The WBLE created for a school library media course (SLMC WBLE) utilized several techniques to overcome some of the technology constraints. Listserves and Web-chat areas were established to increase interactivity. Simulations were included to facilitate engagement in problem solving based on real-world scenarios. A variety of resources (e.g., project examples, course materials, related Web links) were provided to assist the learner in building understanding.

Guideline Two: Develop strategies which empower the learner.

Distance-learning environments can have a negative impact. A concern often expressed by learners in distance-learning environments is that they feel isolated and unconnected. Developing strategies which encourage both cooperative and independent work, as well as interaction, can be used to overcome these concerns (Davie and Wells 1991).

In the SLMC WBLE, a variety of elements were incorporated to facilitate learner empowerment. Simulations were discussed via e-mail or listserves to encourage group interaction. To assist learners in overcoming feelings of isolation, a Web-chat area was used for the discussion of weekly course topics.

Guideline Three: Be aware of the dangers of information overload.

Working in an environment filled with information in a variety of formats can create feelings of confusion. This may be closely related to the issue of dissonance often associated with hyperlinked environments (Hill and Hannafin 1997, Marchionini 1988). Techniques to assist the learner in overcoming the "lost in hyperspace" phenomena should be incorporated into the WBLE design.

Several design techniques were used to assist the learner with spatial awareness within the SLMC WBLE. The primary technique used was a series of pop-up menus located across the bottom of the screen within the course Web site. Created using frame technologies, the pop-up menus were always present, much like the menus associated with word-processing applications. When information was selected from a pop-up menu, it was displayed in the "window" (i.e., frame) above the menus, keeping the learner in a "consistent" space on the Web. While analysis is still underway, use of this configuration (pop-up menus and frames) appeared to reduce the disorientation typically associated with use of the Web.

Guideline Four: Incorporate synchronous as well as asynchronous activities.

Web environments are multi-level and "multi-speed" (Harris 1994). Learners have the capability of accessing materials across time; as such, they also can participate in activities over time. This

can lead to a lack of cohesiveness, presenting a considerable challenge for establishing themes for interaction and discussion (Harris 1994, Schrum 1992). Incorporating activities which require synchronous as well as asynchronous interaction by class participants can help alleviate some of the feelings of isolation.

The Web-chat interactions in the SLMC WBLE were designed to be used synchronously. During the first three uses of the Web-chat areas, learners engaged in discussions in real-time from their respective locations. However, they commented that having everyone posting at the same time made it difficult to read and to follow a line of discussion. While this may be related to the ways in which the Web-chat areas were designed, it could also have been related to learners feeling overwhelmed. As of this writing, the interaction was being changed to mix synchronous and asynchronous responses for the weekly discussion. Results were not available; however, it is suspected that mixing real-time and off-line interactions would prove helpful for learners.

Technological

Guideline Five: Be aware of the technology your learners are using to access your WBLE.

In the current technological infrastructure, WBLEs require access via a computer, modem, and network connection. This makes access to hardware and software, as well as some form of telephone connection, a necessity. In some instances, the Web site may require specific hardware and software. Without access, interaction in a Web environment is not possible (Hannafin, Hill, and Land 1997). Prior to the creation of your WBLE, it is recommended that you evaluate how your learners will access the WBLE to ensure their technological infrastructure is sufficient to efficiently and effectively use the WBLE.

In creating the SLMC WBLE, great effort was made to facilitate use of the WBLE through a variety of technological configurations. One way mixed configurations were accommodated was in the creation of two versions of the SLMC WBLE: frames and non-frames. While it has created double the workload in terms of updates and maintenance, it was important to reach as many learners as possible without creating a demand for them to buy new computer hardware and/or software.

Guideline Six: Be aware of the "technological savvy" of your WBLE users.

Even if you overcome hardware and software issues, other technological challenges may arise. Use of computer technologies, particularly Web-based technologies, is not widespread. This creates a situation where "technology novices" are enrolled in Web-based courses. Technological intimidation and fear are issues which must be considered (Boston 1992). This may affect the creation of the WBLE as well as how the course is implemented.

Learners using the SLMC WBLE varied a great deal in terms of their technological expertise and experience. Some of the learners could create the WBLE they are using for the course; others were just beginning to understand ways in which the Web can be used beyond search and retrieval via search engines. The technology backgrounds of the learners in the SLMC WBLE significantly influenced the design of the course. Creating two versions (frames and non-frames) of the course was also prompted by learner comfort with the technology.

How the course was implemented was also affected by the learners' technological savvy. For example, some students expressed a need for more guidance in terms of using the Web-site as well as in configuring their own systems. One-on-one assistance was provided as-needed throughout the course. Detailed guidelines for configuring computer systems for the course were also provided.

Guideline Seven: Be prepared for the network to crash.

Perhaps the biggest challenge associated with the technological side of WBLEs are the frustrations associated with "technological difficulties." Frustrations can generate from lack of knowledge in relation to hardware and software; they can also mount from an inability to connect to the network, in waiting while information downloads, or from a system-level crash (Schrum 1992). Informing your learners of these possible aggravations *before* they happen, as well as having contingency plans in place for when they do, will help guide frustration reduction.

Network problems were encountered throughout the implementation of the SLMC WBLE. These problems ranged from an institutional level to challenges with individual learners. While we did attempt to alert the learners to potential frustrations in advance, we found it did not really assist in alleviating stress, particularly over specific course activities such as turning in assignments by a particular date. One strategy that assisted in raising learners' comfort levels in regard to network uncertainties was to demonstrate flexibility in how and when assignments were received. This appeared to reassure the learners that we were aware that the problems were beyond their control.

Organizational

Guideline Eight: Plan and prepare well in advance.

Course planning and preparation are important activities in distance-learning environments (Schrum 1995, Wolcott 1995). Challenges faced in a traditional learning environment are magnified as preparations must begin several weeks or months ahead in order to produce the WBLE and any required materials. Planning and preparing well in advance can help reduce the frustrations for the course facilitators and learners at the point of implementation.

Preparation time for the SLMC WBLE was substantial. It took the concentrated efforts of a full-time research assistant and professor over a three-week time span to prepare the WBLE for the first course

meeting. This intense preparation period was prefaced with months of planning, pulling together resources, and creating outlines and storyboards for the Web site. In total, six months were devoted to planning and preparation. While they encountered challenges which took them back to redesign of the WBLE, overall the professor and research assistant felt that allowing substantial preparation and planning time assisted in smoothing out the rough edges of implementation.

Guideline Nine: Make plans for ongoing support during WBLE implementation.

Continued support, both technological and human-based, throughout a course is vital if it is to maintain momentum and be successful. The support needed is a constant challenge throughout a Web course (Boston 1992).

In the SLMC WBLE, evaluation data were received throughout the course. Ongoing evaluation came from both the learners and facilitators in the course as well as from external reviewers. Modifications were made throughout implementation. While allowing sufficient time for planning and preparation is important, ongoing maintenance should also be factored into the time and cost plans for a WBLE.

Web-Based Learning Environments: Prospects and Challenges

The potential the Web offers for creating distance-learning environments is considerable. Harasim shares several visions of the use of electronic technologies in learning environments, each of which falls within the realm of possibility (Harasim 1990). The Web's ability to deliver instruction via multiple media enables the creation of a dynamic learning environment. Through the careful and thoughtful use of these tools, an active learning environment becomes possible, one which affords the learner opportunities to engage and think.

The Web has the ability to reach a variety of remote learners, which also increases its viability as a distance-learning technology. The potential of reaching all types of learners (in-service teachers, adult learners changing careers, or traditional graduate students) in ways that are most convenient for them offers appealing prospects for learners, educators, and policy makers.

The Web also opens a seemingly infinite world of resources for instruction and learning. Whether the resources are provided in advance through pre-established links or gathered by learners as they explore and engage in building understanding, access to this level of information at the tip of one's fingers is a reality in WBLEs. This creates exciting possibilities which cannot be replicated in other kinds of learning environments, whether distant or face-to-face.

The challenges associated with WBLEs are just as abundant as the opportunities. Many challenges are associated with the technology itself. These range from technological barriers to ethical concerns

related to access (e.g., unreliability of network accessibility). For the Web to reach its full potential as a distance-learning environment, these challenges must be overcome.

Other WBLE challenges are related to the creation of a community of learners. Creating a learning community is different from establishing an educational environment. Many of our current communication patterns rely on face-to-face interaction. The lack of visual cues in WBLEs (instructor to learner, learner to learner) creates challenges in establishing collaboration and active learning environments. The creation of a virtual community of learners is critical for providing the support needed to move a WBLE toward a learning environment (Dede 1995).

Conclusions

Web-based learning environments are on the threshold of becoming viable and rewarding distance-learning environments (Filipczak 1995). The promise seems boundless; however, significant challenges remain. While guidelines for development and implementation can assist educators in the creation of their own WBLEs, this is only one component. Enabling easy access, and creating more powerful tools and networks will also help. Yet, the most significant influence on the successful use of WBLEs lies in the professional development of WBLE designers, educators, and learners (Dede 1995).

The interest in Web-based technologies for creating distance-learning environments has been established. What remains to be discovered is how best to use Web-based environments for learning. Continued efforts to answer this fundamental question are critical if we are to continue developing understanding in regard to WBLEs.

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About the Author

Janette R. Hill (Ph.D., Florida State University) is an assistant professor of Educational Technology at the University of Northern Colorado in Greeley. Her research interests include open-ended learning environments and emerging information systems.

Hill has held a variety of positions in the field of instructional technology within educational, business, and government settings. Most recently, she completed a Faculty Fellow appointment at the Johnson Space Center in Houston, Texas, where she assisted in the design and development of a performance support system to assist NASA colleagues with astronaut training.