

Designing accessible Web-Based Instruction for All learners

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Introduction

Instruction through the Web has brought various issues and problems unexplored in education. The shift to Web-based instruction (WBI) has also exposed enormous challenges to instructors and their institutions. For example, many potential students have not received the support and consideration they deserve (Morgan & Tam, 1999) because of their political, socio-economical, cultural, and physical differences (Bolt & Crawford, 2000; Compaine, 2001; Mack, 2001; Norris, 2001). One of these new sets of issues and challenges to be solved for implementing WBI effectively is Universal Design for Learning (UDL), specifically Web accessibility in this study.

There is a little research on UDL or Web accessibility, but the majority of the studies are more focused on technical aspects of Web development-related tools than on instructional or pedagogical perspectives (Chang, Tremblay, & Dunbar, 2000; Collins, 2002; Fichten, Asuncion, Barile, Fossey, & De Simone, 2000; Kirkpatrick & Morgan, 2001). In addition, most participants of those studies are mainly Web developers or instructional designers, not Web-based instructional personnel (WBI personnel) and their students who have directly taught or learned WBI. As a result, WBI personnel cannot know about what kinds of problems their students really have in taking their courses through the Web, and why and how to make their WBI accessible. Without appropriate Web-based instructional design strategies, standards, and guidelines, we cannot expect that those WBI personnel can make their WBI accessible for all students.

Universal Design for Learning (UDL) and Web Accessibility

The Center for Applied Special Technology (CAST) (2000) defines UDL as “a new paradigm for teaching, learning, and assessment, drawing on new brain research and new media technologies to respond to individual learner differences.” According to Rose and Meyer (2002), UDL broadens the concept of universal design in two ways: applying the idea of built-in flexibility to the educational curriculum and supporting not only improved access to information within classrooms, but also improved access to learning. In this study, we define UDL as alternative instructional design strategies which make WBI accessible for students with different physical and/or psychological backgrounds, learning styles, and abilities or disabilities in Web-based instructional environments.

According to Bowe (2000), WBI personnel need to consider “ways to make education more convenient for time-pressed students, more comfortable for people from diverse backgrounds, and more flexible for persons having different styles” (p. 4). He further suggested that in order to prepare universally designed curricula and materials, including Web pages, they should consider the following things (pp. 4-5):

- Present information in multiple ways
- Offer multiple ways for students to interact with and respond to curricula and materials
- Provide multiple ways for students to find meaning in the material and thus motivate themselves
- Make good use of personal and course Web pages

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On the other hand, Henry (2002) suggests that “A primary focus of accessibility is access by people with disabilities. The larger scope of accessibility includes benefits to people without disabilities”(p. 7). Waddell (n.d.) also defines Web accessibility as “development of information systems flexible enough to accommodate the needs of the broadest range of users... regardless of age or disability.” These two definitions are slightly different because the former is more focused on content, while the latter focuses on physical structure. In this study, Web accessibility is an index of how accessible and flexible a Web site is designed to accommodate the needs of the broadest range of users, regardless of age or disability.

Why Do We Need to Consider Universal Design for Learning (UDL) and Web Accessibility?

Survey results by the National Center for Education Statistics (NCES, 1999) showed that more than one third of the nation’s 2-year and 4-year higher education institutions, regardless of the size, offered some distance education courses during 1997-98 and an additional 20 percent planned to start offering such courses within the next three years (Palloff & Pratt, 1999). The survey results also show that about three-quarters (72%) of these 2-year and 4-year higher education institutions enrolled students with disabilities in 1996-97 or 1997-1998 and almost all (98%) public 2-year and public 4-year institutions enrolled students with disabilities, compared with those of private sectors (63%).

One of the greatest obstacles students with disabilities confront in learning through the Web is that most courses offered on the Web are of alarmingly poor quality (Kirkwood, 1998). Some courses appear appropriate for traditional students but are not compatible with the needs of underrepresented students (Morgan & Tam, 1999). In reality, some common features of the Web make navigation difficult because students with disabilities are not particularly considered in designing WBI. As a result, many students with disabilities felt that sophisticated design extravaganzas of WBI were more of a burden than an aid.

The Purpose of the Study

There are two purposes of this study: 1) to identify the perception about UDL, specifically Web accessibility, of WBI personnel in postsecondary institutions and their students with disabilities, and 2) to find out effective Web-based instructional design strategies actually used by WBI personnel to design and develop accessible WBI for students with disabilities.

Research Questions

To achieve these purposes mentioned above, the following research questions are addressed in the study:

- To what extent are WBI personnel in postsecondary institutions currently aware of Web accessibility?
- What kinds of WBI design strategies are currently used by WBI personnel for developing accessible WBI to meet the needs of students with disabilities in higher education settings?
- What are the practical constraints WBI personnel in postsecondary institutions face in making their Web sites accessible for all students, especially for students with disabilities?

Methodology

Participants. Eight participants were involved in this study: two online educators, two administrators, and four students with disabilities. They were all from a mid-western university. One online instructor has taught for two semesters through the Web; the other instructor for six semesters. They designed and developed most of their course web site by themselves, or with the help of technical staff. One administrator came from the Disabled Students Services; the other

administrator from the Adaptive Technology Center. Four students varied in terms of the types of disabilities and onset day of their diseases: Two students with blindness, one student with cerebral palsy with language problem, and one student with learning disability with attention deficit disorder. The two students with blindness can only see some light perception. The first three students were born disabled, and the last student was diagnosed with attention deficit disorder when she was 13 years old.

Data Collection. To acquire data regarding participant perceptions about Web accessibility and Web-based instructional design strategies WBI personnel have used for developing accessible WBI, eight individual interviews were conducted in a semi-structured manner. The data were audiotaped with the permission of the participants. However, because of two students' physical conditions, email interviews were more appropriate. The interview protocol consisted of a series of questions to address the questions mentioned above. Depending on participants' physical conditions, the duration of the interview varied from 45 minutes to 6 hours (one of the students with blindness spent 6 hours to finish the email interview).

Reliability and Internal Validity of Data. To increase the reliability and the validity of the data, both researchers conducted each interview together. The interview data were also transcribed by the researchers, and then sent to each interviewee for member checks. Except three interviewees because of their jobs and disabilities, individual interviewees involved ensured the credibility of their interview data. In the case that there were differences between the interviewers' transcript and interviewee's opinion, the data were reviewed until the differences were reconciled.

Results

Lack of Awareness and Unpreparedness About Web Accessibility

Most WBI personnel and their students with disabilities did not know or hear about UDL or Web accessibility and its standards and guidelines. Nevertheless, most WBI personnel have used several guidelines or standards when they designed and developed their WBI although guidelines or standards used were very limited in terms of scope. For example, according to Section 508, WBI personnel have to provide a text equivalent for every non-text element such as "alt" for image. Still they have missed giving those alternatives for other contents like audio- or visual-elements, but most of them gave alternatives for image, without specific reasons. In addition, two administrators indicated that even though Section 508 was already enacted, only a few faculty members were aware of Web accessibility and tried to prepare for the future classes.

Providing Equality of Opportunity and Quality of Life to Students With Disabilities

WBI personnel should consider Web accessibility as the right thing to do because "It serves to open doors for individuals with disabilities in ways that were not previously possible (Foley & Regan, 2002)" The participants in this study had the same perspective on considering Web accessibility for students with disabilities.

Providing Various Methods to Access Web-Based Instruction

Depending on the types of disabilities students have, it is recommended that WBI personnel should accommodate their WBI by using various methods in order to help students with various types of disabilities access easily. In this study, WBI personnel mainly used three different formats in order to communicate with their students: email, listserv, and online forum. They used email for communicating individually with the student, an email distribution list for announcements, and a web forum for communicating publicly. Since it was not as easy to determine students' progress with a WBI course as it

was in the traditional classroom, online educators frequently used individual email to check students' progress and to give individual feedback.

Using Appropriate Web-Based Instructional Design Strategies

To address the needs of diverse students with or without disabilities and make their WBI access to all students, WBI personnel have to first consider the physical and psychological characteristics of potential students and use appropriate Web-based instructional design strategies based on that consideration. The online educators interviewed in this study recommended several instructional design and/or teaching strategies to accommodate the needs of those students with disabilities: 1) providing more one-to-one interaction by spending extra time for emailing, 2) scaffolding and supporting supplementary help, 3) providing visual aids such as giving visual outlines or pre-organization planner.

Improving Knowledge and Skills for Making Web-Based Instruction Accessible

The online educators with extensive experience felt that applying Web accessibility standards and/or guidelines was not difficult and complex because those standards and guidelines were clearly stated. However, the educators who did not have much experience felt that even though those guidelines and standards, especially W3C's guidelines, gave some specific examples about how to use those specific guidelines, still it was not easy for novice WBI personnel to apply them because of their vague statement. An administrator, however, clearly indicated that the difficulties in applying those standards and guidelines into their real works were caused by the lack of their Web development knowledge and skills, not the standards or guidelines themselves.

Passing Web Accessibility Standards or Guidelines Is Not the Final Step

To address Web accessibility at a minimum, Web developers in U.S.A. must follow Section 508 standards or W3C's Priority 1 items. However, the standards and guidelines of other countries such as Canada and England are stricter than those of U.S. For example, in England Web developers have to follow from priority 1 to priority 3 items of W3C's guidelines to make their WBI accessible. Even when WBI is accessible in the U.S.A., therefore, it is not guaranteed that there is no problem in accessing that instruction in other countries.

Discussion

This study revealed that WBI personnel did not know about Web accessibility, broadly UDL. As a result, Section 508 standards and W3C's guidelines were rarely used. The results indicated that the main reason why those standards and guidelines were not frequently applied mainly came from the lack of knowledge, skills, and experiences of the WBI personnel.

Second, Bowe (2000) suggested that WBI personnel should consider various ways which make "education more convenient ... more comfortable...and more flexible for persons having different styles" (p. 4), present information in multiple ways, offer multiple ways for students to interact with and respond to curricula and materials, provide multiple ways for students to find meaning in the material and thus motivate themselves, and make good use of personal and course Web pages. The findings confirmed his suggestions that WBI personnel should provide various methods and use appropriate Web-based instructional design strategies to help students with disabilities easily access their WBI.

Finally, even though there was a discrepancy between the WBI personnel who had much experience and the WBI personnel who did not have much experience in designing WBI in terms of the difficulty and

applicability of Web accessibility standards and/or guidelines, the participants of this study agreed that WBI personnel should have knowledge and skills for making their WBI more accessible to all students.

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Biographical Sketches

Seak-Zoon Roh is an instructional consultant, Instructional Consulting, School of Education, Indiana University Bloomington. His research topics are mainly focused on Web-based instructional (WBI) design strategies and Web accessibility for students with disabilities in higher education setting. He is also interested in online collaborative learning, distance learning program evaluation, and professional development for distance education. He is a co-researcher of Yu, B-M., & Roh, S.-Z. (2002). The effects of menu design on information-seeking performance and user's attitude on the World Wide Web. *Journal of the American Society for Information Science and Technology*, 53(11), 923-933.

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