Accessibility and Universal Design

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ABSTRACT

The potential of the World Wide Web (Web) lies in its universality. Most websites, educational courseware, and online learning environments (OLEs) are created for those who possess adequate vision and manual dexterity. Universal design allows products, information and communication to be accessed by all users without the need for adaptation or specialized equipment. According to the United States Census Bureau, some type of long lasting condition or disability affects nearly one person in five. In addition, it has been estimated that the ability of over 30 million people in the United States is compromised by inaccessible computer design.

Information on the Web is routinely integrated into teaching and learning in the K-12 classroom and college levels. Students with special needs, who cannot access online information, are limited in their ability to fully participate and obtain an education that is equivalent to the one received by their peers. Educational institutions must become aware of the needs and issues of individuals with disabilities in order to develop accessible websites and OLEs. Through the universal design of online learning resources, greater independence and participation can be provided for all users, including those with disabilities.

Keywords: Universal Design, Online Learning Environments, Students with Disabilities, K-12 Education, WWW.

INTRODUCTION

Computers are readily available twenty-four hours a day, seven days a week. Many people cannot conceive of life without computer access. A combination of the Internet and Web provide a wide array of unique opportunities for delivering information to people with various types of disabilities [12]. Through the use of the Internet, people can span the globe without leaving their homes, colleges, or places of business. For those whose disabilities require that they remain homebound, the Web is a valuable resource for making information readily available. People with disabilities are now capable of accessing information that has previously been difficult and sometimes impossible for them to obtain. The Web has the potential for providing greater independence for individuals with disabilities through resources that encourage active participation. However, it could fail to do so if websites and courseware continue to be created that can only be utilized by those who possess adequate visual ability and manual dexterity. Universal design has been developed as a means of addressing this problem. Universal design allows products, information and communication to be accessed by all users without the need for adaptation or specialization design [8;10].

In higher education, the problem of universal design takes on monumental importance since information on the Web is routinely integrated into teaching and learning. Students who cannot access the Internet and Web resources are limited in their ability to gather basic course information, conduct research, participate in assignments, and interact with the community of learners. Rowland [8] states that when sites are not accessible, students with disabilities are affected in at least two ways. First, without accessibility, these students may not have educational experiences that are equivalent to their non-disabled peers. In addition, students with disabilities may be barred from opportunities that will enable them to learn how to gather and utilize Internet-based information. Limited access to the resources on the Web can reduce the levels of students’ basic skills and impact their ability to access online data. By not providing students with disabilities opportunities for developing basic technological skills, these students will lack the foundation for success in gaining future employment.

Despite the increase in educational opportunities through distance education and legislative measures, individuals with disabilities in the United States (U.S.) remain underrepresented in post-secondary education. According to McNeil [6], students with disabilities who have obtained high school diplomas are less likely to enroll in public four-year colleges and those who do enroll are less likely to graduate. This is evident even
though a large majority of people with disabilities, under the age of 65, are intellectually capable of succeeding in post-secondary education [9].

According to the U.S. Census Bureau, nearly one person in five is affected by a particular physical, mental, emotional, cognitive or sensory impairment. Research findings from Census 2000 [15] indicate that 49.7 million people had been affected with some form of long lasting condition or disability. Of that amount, 7.7 million individuals had difficulty seeing letters in ordinary newspaper print and 1.8 million had responded that they are blind. In addition, it had been estimated that the ability of over 30 million people in the U.S. had been compromised by inaccessible computer design.

Statistical information from the U.S. Census Bureau reveals that over the last decade, the number of individuals with disabilities in the U.S. has risen by 25 percent [15]. McNeil attributes the rise in the percentage of individuals with disabilities to aging baby boomers who are faced with visual and hearing impairments, arthritis, and other functional limitations [6]. While many people are born with disabilities, others find that physical or mental abilities diminish over time. The relationship between increased life expectancies and the percentage of individuals having some form of disability is directly proportionate. As we age, the likelihood of acquiring a disability increases. For example, the incidences of age-related visual impairments, such as macular degeneration, glaucoma and cataracts, increase. In addition, accidents and diseases may occur that also limit abilities.

ACCESSIBILITY AND UNIVERSAL DESIGN

In the next section, background information will be offered that will provide the reader with an understanding of the term accessible. The World Wide Web Consortium (W3C) [18] is an organization that was created in October 1994. The goal of the W3C is to develop common protocols for ensuring the interoperability of Internet websites.

The W3C established the Web Access Initiative (WAI) for the purpose of developing Web accessibility standards for users with disabilities [19]. The W3C has studied this topic in depth and has published a set of guidelines that define accessibility. These guidelines provide a framework for organizations setting Web accessibility standards. The U.S. government has relied heavily on the research findings of the WAI and has considered national standards for Web accessibility. The WAI is currently pursuing Internet accessibility through five primary areas of work:

- Ensuring that Web technologies support accessibility,
- Creating guidelines for browsers, authoring tools, and content creation,
- Developing evaluation and validation tools for accessibility,
- Conducting education and outreach, and
- Tracking research and development.

The concept of accessibility, or barrier-free design, has appeared in various U.S. regulations over the years. The term accessibility relates to the removal of architectural barriers that prevent wheelchair users from entering buildings and using physical facilities. Accessibility has evolved over the years into the broader notion of universal design, which extends into all design disciplines such as architecture, interior design, product development, and communications. The benefits of universal design are apparent when wheelchair ramps and redesigned sidewalk curbs assist those who are not disabled such as cyclists and parents with baby carriages. The universal design of Internet websites not only assists those with disabilities, but will also aid those who are limited through older computers, small bandwidth, and hand-held devices.

The value of adopting a universal design can be realized when one considers the needs of the entire intended audience. Universal design eliminates the need for developing two formats of the same online material. Additionally, forms of delivering information and facilitating communication must be created that serve diverse users. Although a specific product may not be usable by the entire population of online users, the goal of adopting universal design standards is to enable materials that are placed online to be usable by as many people as possible. Online materials that are designed for a diverse population can result in an increase in audience. According to Tim Berners-Lee [18], W3C director and inventor of the World Wide Web, "The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect."

Recent legislation reflects the concern and importance that accessibility standards have in our global society. In the United Kingdom (UK), the Disability Discrimination Act 1995 [13] states that "it is unlawful for a provider of services to discriminate against a disabled person…it is irrelevant whether a service is provided on payment or without payment." Examples include "access to, and use of, information services." If a website is not accessible to disabled users, it is in violation of the Disability Discrimination Act.

In the U.S., Section 508 of the Rehabilitation Act of 1998 requires that federal agencies’ electronic and information technology be accessible to people with disabilities, including employees and members of the public [17]. This legislation ensures that educational and other online resources will be made available to everyone. Educational institutions are governed by a variety of state and federal laws that require students to have equal and equitable access to their programs and services. A series of recent legal rulings have further defined the equal and equitable requirement to mean that it is necessary to provide the same level of access to individuals with disabilities as is provided to individuals who are not disabled [14].

ONLINE LEARNING ENVIRONMENTS

When developing online learning environments, it is critical that educational and software engineering communities collaborate in the development of requirements for pedagogical soundness and universal access [4]. At the present time, online learning environments require exclusive use of visual and/or high
degrees of manual dexterity. This may prevent individuals with disabilities from participating in educational and lifelong learning opportunities.

Recent advances in digital information and telecommunication technologies present tremendous opportunities for individuals with disabilities. This is particularly true for those with print disabilities, who, because of blindness, visual impairment or motor problems, may have difficulties attending traditional on-site programs. Schmetzke [9] states that it is unfortunate that, the very technology that has opened the door to unprecedented access to information and communication also harbors the possibility for the very opposite. Just as there are enabling and disabling conditions in the physical environment, so are there conditions associated with digital technology that result in the inclusion or exclusion of certain individuals. Without considering the full spectrum of human disabilities, it is likely that website developers will continue to include barriers for people with print disabilities [9]. While inaccessible design of online resources puts on-campus and online students with print disabilities at a disadvantage, the impact is most significant in an online learning environment.

Helping disabled individuals learn course content is one advantage of an online learning environment. Another benefit is increasing an individual’s independence and self-reliance. In an online conference, participants function at the same level. The anonymity of individuals on the Web allows an individual’s disability to go unnoticed. The technology permits genuine mainstreaming because physical appearance and disabilities become invisible.

THE RESPONSIBILITY OF EDUCATORS

The medium that brings the learning environment to disabled students can also be the obstacle that prevents them from fully participating. Without careful consideration to the design and development of websites, a large percentage of the online learning population will become disadvantaged. Educators have a moral and legal obligation to provide equal access to learning environments and to empower learners with diverse cultures, characteristics, abilities and socio-economic backgrounds [5; 17].

The U.S. Department of Education has assumed a leadership role through the development of requirements for accessible electronic and information technology design [16]. Educators can promote changes in the attitudes of website planning committees and state lawmakers. It must be realized, however, that this process will take time, even for the most committed institutions.

PLANNING FOR ACCESSIBLE WEB CONTENT

Non-compliance in the universal design of online learning materials may result from a lack of understanding at many institutions. Once Web developers become aware of the need for universal design, strategic planning can begin. Resources and the expertise that is necessary for developing accessible OLE content can then be acquired.

The W3C has recommended Web Content Accessibility Guidelines in order to standardize websites and Web browsers [19]. It is suggested that institutions developing Web accessible sites establish an institutional policy that is based on the following advice:

- Identify all applicable laws and regulations.
- Investigate the standards adopted by similar institutions.
- Adopt the Web Content Accessibility Guidelines for use as a framework.
- Seek the input of all interested parties including administrators, Web developers, faculty members, students, and individuals with disabilities.
- Develop a system to identify and maintain contact with individuals who place content on the Web for the institution (e.g. a registration process which allows individuals to be contacted by email).
- Develop methods for ensuring accountability for the accessibility of each webpage.

CREATING UNIVERSALLY ACCEPTABLE OLEs

Shneiderman [11] states that user interface design should begin with an understanding of the product’s intended users and consider the context in which the product will be used. Focusing upon the user early in the developmental process will result in a higher level of user satisfaction [1; 11]. Since online courses are available to students with a wide range of physical requirements, OLEs must adhere to guidelines established by the W3C, [19] and Section 508 Standards of the Federal Rehabilitation Act [17].

According to the National Research Council [7], in order for user interfaces to fulfill the needs of all users, they must possess the following elements:

1. Multimedia Design - User interactions must include multimedia and multi-modal elements that take advantage of as many senses as possible for communicating information effectively.
2. Adaptability - User interfaces must adapt to the needs and abilities of the individual user interactively tailoring the form and content of the material being presented and providing customized help when necessary.
3. Integration - Interaction must be integrated smoothly and naturally into the instructional process.
4. Collaboration – Learning tasks must include group activities and support collaborative work and play.
5. Responsiveness - Sufficient resources must be available that allow basic tasks to be accomplished comfortably.
6. Empowerment - Users must be able to accomplish individual learning tasks and should feel a sense of accomplishment in doing so.
WEB ACCESSIBILITY TRAINING PROGRAMS

Two online programs provide instruction on how to develop universally designed websites. The Center for Information Technology Accommodation (CITA) has been charged with the task of educating federal employees in the development of websites that support Section 508 implementation [2]. Designing Accessible Web Sites is part of the U.S. Federal government’s OLE, the 508 Universe. Further information is available at http://www.cyberwriter.com/SCCC/design/fall2002/DHTML_1/section508.html.

Equal Access to Software and Information (EASI) is a non-profit organization, whose mission is to make information technologies more accessible to users with disabilities [3]. EASI offers three interconnected programs that have been specifically designed to support institutions that are making their computer and information technology systems accessible to students, staff and faculty with disabilities. The EASI course titled Designing Accessible Course Content Using Familiar Software leads to a certificate in accessible information technology. Information about EASI courses and certification can be found at http://easi.cc/workshop.htm.

CONCLUSION

Significant progress has been made towards the goal of integrating the use of technology into the educational system. In order for computer technologies to become an essential tool for meeting the needs of a diverse population of learners, the Web must be made accessible to all. Educational institutions must be provided with guidelines that will ensure that their websites and online learning environments are universally accessible. Through the availability of guidelines, legal obligations can be met and equal access can be provided to all students.

REFERENCES


