FOSTERING INCLUSIVE ONLINE LEARNING ENVIRONMENTS FOR STUDENTS WITH DISABILITIES IN HIGHER EDUCATION

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by

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Abstract

This paper folio has relevance to the direct practice and administration of services to students with disabilities in online learning environments. In particular, the first paper will examine the types of barriers students with disabilities face when they use the World Wide Web. It will offer solutions for improving Web content accessibility to optimize readability and navigation. This paper can be used as a practical resource for faculty, staff, and administrators who are unfamiliar with this new and emerging issue in higher education. The second paper will advance the discussion from awareness building to institutional accountability through policy development. The distance learner will be profiled, since the effect of inaccessible online resources is most drastic in Web-based distance education courses. This paper will be particularly relevant for distance education practitioners and senior university administrators who are interested in the legal, ethical, and practical facets of accessing virtual learning environments. Finally, the third paper will explore the theoretical frameworks for fostering inclusive online learning environments for students with disabilities. It will highlight the importance of the relationship between campus ecology and student development. This paper will be especially pertinent for student affairs professionals and their academic colleagues. Both student affairs colleagues and faculty members would benefit from a theoretical basis in which to understand and interpret student learning in an online environment.

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Introduction

The issue of accessible Web design for students with disabilities has recently become a topic of great concern in higher education, although advocacy for barrier-free learning environments has been long standing. University "campuses are becoming increasingly 'wired' and the technology is pervading all aspects of academic life" (Bausch, 1994, as cited in Fichten, Asuncion Barile, Fossey, & de Simone, 2000, p. 181). Participants in online activities include an increasing group of students with sensory, physical, cognitive and other disabilities "for whom adaptive technologies[1] provide a gateway to information and education"(Harrison, n.d., ¶ 2). This points to the need for Web designers to increase their understanding of the principles and practices that support universal design.[2]

Ironically, the very technology that has opened the door to increased participation of persons with disabilities in higher education can also harbor the possibility for the very opposite. Just as there are enabling and disabling conditions in the physical environment, so are there conditions associated with information technology that can result in the inclusion or exclusion of certain people (Schmetzke, 2001), including those with disabilities. For instance, many professors, lured by Web-design products, often create stylish, colourful, and audible Internet sites for their courses (Foster, 2001). However, this technology and Web-design techniques may not easily translate into an accessible medium for many students. In particular, some students who are hard of hearing have

problems using Internet Web sites when video clips have no closed captioning (Fichten, Barile, Asuncion, & Fossey, 2000). Others with learning disabilities and psychiatric conditions may have difficulty processing information "when screens are unorganized, inconsistent and cluttered and when descriptions and instructions are unclear" (Burgstahler, Comden, & Fraser, 1997, p. 9). Similarly, individuals who are blind encounter problems when graphic images do not have verbal descriptive tags for text-based browsers[3] and screen readers[4] (Vanderheiden, Chisholm, & Ewers, 1996, as cited in Fichten, Barile, Asuncion, & Fossey, 2000). Likewise, an e-mail chat room that allows many students to discuss a topic simultaneously can be difficult to follow for those who are blind even with screen-reading software. Also, some students with limited manual dexterity can struggle just to send an e-mail message. As a result, many students with disabilities find that this new technology cuts them off from the learning process, which presents educational implications, particularly if a university decides to teach most of its courses online, and those courses are designed using inaccessible Web sites and authoring tools (Foster, 2001).

Disabling environments, as noted above, need not exist. "In the past, technologies have worked in the service of people with disabilities by reducing or eliminating barriers and by improving a variety of aspects of quality of life" (Day & Jutai, 1996, as cited in Fichten, Barile, Asuncion, & Fossey, 2000, Use of Computer, Information and Adaptive Technologies by People with Disabilities section, ¶ 2). This points to the need for Web

designers in higher education to implement universal design principles and consider all possible users when creating their sites (Burgstahler, Comden, & Fraser, 1997). Fortunately, however, most Web-accessibility barriers can be eliminated or easily minimized (Lenn, 1996). As Lenn (1996) further notes, some solutions may come easily while others may take time; some will take little effort and money while others may require more.

> Congruence between people and their environment [is] . . . important for effective educational experiences. Assuming that successful attraction, matriculation, and retention of students are desirable goals for all campuses, those responsible for recruitment and admissions need to pay special attention to the degree of institutional "fit" for any potential student. . . . Understanding the potentially negative consequences of incongruence is particularly important for understanding the experiences of minority students who may not share the characteristics of the dominant campus population (including international students, adult learners, and students with disabilities). The inevitable stress and "associated symptoms" (Moos, 1986, p. 413) resulting from incongruence between a student and the educational environment often place additional burdens on such students, and higher attrition rates and greater adjustment problems are to be expected (Strange, 1996, p. 262).

The implication for student affairs professionals[5] is apparent. Campus problems may originate not from students or small groups of students or from organizations but from the campus as an institution (Banning, 1980) and increasing societal expectations for leadership in such matters. Direct interventions at the institutional level are, therefore, an appropriate treatment under these situations (Banning, 1980). Colleagues in student affairs must, therefore, welcome students with disabilities to their campuses and develop programs, practices, and policies that increase their potential to achieve (Clement, 1993, as cited in Hall & Belch, 2000). In fact, of all the constituencies on university campuses, student affairs, by virtue of its historical commitment to differences and the espoused values of the profession, is ideally positioned to advocate for the creation of online learning environments that are inclusive, diverse, and affirming (Hall & Belch, 2000). To achieve success, they must strengthen their partnerships with academic colleagues and "work with students to design their campus ecology so that the behavioral outcome is more involvement, awareness, satisfaction, and completion" (Banning & Hughes, 1986, p. 20). Consequently, "they can do much to ensure that the potential of computer, information and adaptive technologies to empower students with disabilities is realized" (Fichten, Asuncion, Barile, Fossey, Robillard, & Wolforth, 2001).

Before advancing the discussion on this timely topic, it is important to differentiate the meaning of several key terms used in this paper folio. Other important terms are defined as they appear in the respective papers.

The terms "Internet,"[6] "intranet,"[7] "online,"[8] "virtual,"[9] and "World Wide Web,"[10] or simply the "Web," seem to have been used interchangeably in the research literature reviewed for these papers. Clearly, however, as evident from the definitions provided here (see Footnotes), a distinction can be made between the "Internet" and the other four terms cited above. Consequently, this author has used those four terms interchangeably to refer to a Web-based document. When the word "Internet" appears outside of this context, the works of other authors, who used that term, are cited.

To improve clarity of reading further, it is also important to make a distinction between "distance education" and "online distance education." In particular, "distance education" is a broad term used to cover a variety of learning opportunities for those who generally live at a distance from the teaching institution or education provider. The instruction is offered wholly or primarily by distance study through virtually any media including print materials, videotapes, CD or DVD ROM's, audio recordings, facsimiles, telephone communications, and the Internet through e-mail and Web-based delivery systems (Distance Education and Training Council, What is Distance Education? section, ¶ 1). Moreover, the term "online distance education," as used in this paper folio, is a descriptor for instruction offered through e-mail and Web-based delivery systems (i.e., the phrase "online distance education").

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Footnotes

[1] Adaptive technologies are products used by people with disabilities to help accomplish tasks that they cannot do otherwise or could not do easily otherwise. When used with computers, they are also referred to as adaptive software. Some adaptive technologies rely on output of other user agents, such as text browsers, graphical desktop browsers, voice browsers, multimedia players, plug-ins, etc. (World Wide Web Consortium [W3C], 2001).

[2] "Universal design" means that products and environments will be designed to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Centre for Universal Design, 1997).

[3] Text-based browsers, such as Lynx, are an alternative to graphical-user interface browsers. They can be used with screen readers for people who are blind. They are also used by many people who have low bandwidth connections and do not want to wait for images to download (W3C, 2001).

[4] Screen readers are commonly used by students who are blind to access Web pages, electronic text, and computer applications. This software allows all text to be read out from the toolbar, directory buttons, menu, or Web pages (Harrison, n.d.) by outputting that information to a speech synthesizer and/or a refreshable braille display.

[5] The term "professionals" is used in this paper as a descriptor for all types of student service administrators, deans, directors, managers, and service providers.

[6] The "Internet" is a massive network of networks, a networking infrastructure. It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet. Information that travels over the Internet does so via a variety of languages known as protocols (Webopedia, 2002a, ¶ 2).

[7] The "intranet" is an Internet that belongs to an organization, usually a corporation, accessible only by the organization's members, employees, or others [e.g., university students] with authorization (Webopedia, 2002b, Intranet header, ¶ 1).

[8] "Online" means that a user is connected to a computer service through a modem (i.e., they are actually on the line). Increasingly, the term is being spelled as one word, "online" (Webopedia, 2002c, On-line header, ¶ 2).

[9] In general, the term "virtual" is used to distinguish something that is merely conceptual from something that has physical reality (Webopedia, 2002d, Virtual header, ¶ 1).

[10] The World Wide Web, or simply the Web, is a way of accessing information over the medium of the Internet. It is an information-sharing model that is built on top of the Internet. The Web uses the HTTP protocol, only one of the languages spoken over the Internet, to transmit data. . . . The Web also utilizers browsers, such as Internet

Explorer or Netscape, to access Web documents called Web pages that are linked to each other via hyperlinks. Web documents also contain graphics, sounds, text, and video (Webopedia, 2002a, ¶ 3).

Paper 1

Web Accessibility Barriers and Solutions for University Students with Disabilities

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Web Accessibility Barriers and Solutions for University Students with Disabilities

Introduction

The increasing popularity of the World Wide Web, and other Internet-related applications, has added a new meaning to the ability of computers to be used as tools for the facilitation of learning. Today's phenomenon of "going online" places a wealth of information within easy reach of anyone who can use and has access to a personal computer (Shumila & Shumila, 1998). Within the context of higher education, many professors are teaching distance education courses over the Web. Even if a student is physically in class, some faculty members are posting information on course Web sites. Also, universities are equipping classrooms with the latest electronic technologies that allow Web access during live lectures. This trend toward increased efficiency of Internet access to information systems and search engines is also transforming library reference services (Waddell, 1998). Furthermore, since students are now able, and sometimes required, to use the campus intranet to seek admission, register for courses, check on grades, and so on ad infinitum, total access is a must (Stewart, 1998).

Although the term "access" has been defined in many ways for university students with disabilities, two definitions are particularly relevant to this discussion. According to Simon (2000, Access to Postsecondary Education section, ¶ 1) "access has many faces, from the removal of physical barriers to providing communications access in programs and activities." Borland & James (1999) simply state that the essential meaning of access

in a university must be "access to the curriculum" (p. 94).

Scadden (1994) expands the discussion on access to postsecondary education by highlighting the parallel danger of inequity for people who are economically disadvantaged. He suggests that too many people with disabilities also fall into this category, which places them in double jeopardy. He further suggests that although no one intentionally plans to leave them out, the development of technology and policy continues to move ahead without achieving universal access to the technology and networks. In fact, the inability to take advantage of these emerging technologies will have serious implications in the lives of people with disabilities, especially with respect to opportunities for future employment and lifelong learning.

> The concept of barrier-free, or universal design, has been around for at least several decades. To varying degrees, it has become codified in various building guidelines and regulations (ANSI A117.1, 1961/1980/1986; MGRAD, 1982; UFAS 194 & ADAAG, 1992). Its original focus--the removal of architectural barriers preventing wheelchair users from entering buildings and using their physical facilities--has evolved over the years into the broader notion of universal design, which extends into all design disciplines (architecture, exterior and interior design, product development, and communication) and which is powered by concern for all people (Schmetzke, 2001, General Literature section, ¶ 1).

Universal design is the design methodology most applicable for a true democracy, since it includes those of all ages, sensory abilities, physical abilities, and cognitive skills in the

design process. Even though the final product may not be usable by absolutely everyone, it is usable by as many people as possible. With this approach, abilities are emphasized, and disabilities are de-emphasized. The objective is a single solution rather than multiple solutions (Anders & Fechtner, 1992, as cited in Schmetzke, 2001) which makes good economic sense. This is especially important since the cost of providing academic accommodations, such as sign language interpreters and braille transcription, is on the rise. In particular, "the universal design concept is based on the assumption that it is more logical, and humanizing, for the structure to bend in order to accommodate" (Lathrop, 1995, p. 16) the person with a disability. Therefore, "educators committed to enhancing the experiences of students with disabilities, must encourage policies, practices, and programs that secure, include, involve, and invite all students, regardless of individual differences, into the community. This requires the design and creation of environments of ability" (Strange, 2000, Conclusion section, ¶ 1).

To ensure that students with disabilities have equal access to Web-based resources, those who design, develop, and manufacture these materials, systems, and infrastructure should be encouraged to dialogue with people who are knowledgeable about the needs and concerns of students with disabilities to find out what kinds of adaptations would be beneficial. This should include, first and foremost, students with different types of disabilities, since those living with such conditions can best articulate their own needs. In this respect, it is perhaps wise to follow Microsoft's example of hiring qualified individuals with disabilities (Williams, 2000, as cited in Fichten, Asuncion,

Barile, Fossey, & de Simone, 2000). Other concerned stakeholders include personnel responsible for providing disability-related services in universities, high-tech occupational therapists (Fichten, Asuncion, Barile, Fossey, & de Simone, 2000), and members of consumer-based disability groups, such as the Canadian Paraplegic Association, the Canadian National Institute for the Blind, and the Learning Disabilities Association of Canada. "Working collaboratively to design accessible computer and information technologies for educational use will result in more equitable instructional tools for all learners, enabling all students to utilize and to construct knowledge and to fully participate in learning" (Fichten, Asuncion, Barile, Fossey, & de Simone, 2000, p. 198) activities.

This paper will examine the types of barriers students with disabilities face when they use the World Wide Web. It will offer solutions for improving Web content accessibility to optimize readability and navigation, thus making it possible for students with disabilities to independently access Web sites. The paper will also discuss the implications for institutions of higher education. Topics covered will include the importance of providing professional development and training to faculty and staff and the roles disability service providers and students can play to move their institutions closer to Web accessibility. This paper can be used as a practical resource for faculty, staff, and administrators who are unfamiliar with this new and emerging issue in higher education.

Adaptive Technologies

To understand the principles and practices of accessible Web design, individuals must first have a basic understanding of the specific access systems that accommodate, replace, or augment sensory and motor functions of users with disabilities (Harrison, n.d.a). Some of the most common adaptive technologies used today in higher education will be discussed, such as screen readers, refreshable braille displays[1], screen magnifiers[2], voice recognition software[3], and alternative keyboards[4].

Ironically, the early years of computing offered better Internet access for persons with disabilities than the last few years. The most commonly-used operating system, DOS, was text-based and, for the most part, supported text-based software used by people with visual impairments. As the Internet changed to the graphical user interface (GUI) based Web, accessibility became a greater issue (Kautzman, 1998). Consequently, some information cannot be accessed today, even with adaptive technology, because of the complexity of many Internet resources (Flowers, Bray, & Algozzine, 1999).

"Developers of accessibility aids continue to identify and develop features that can overcome some of these barriers, but there are many things that Web developers can do, with very little effort, that would make their pages more accessible" (Flowers, Bray, & Algozzine, 1999, p. 24). With universal design, however, the need for adaptive technology can be eliminated for a lot of people. This innovative concept challenges the basic assumptions society holds toward people with disabilities--the notion that a

disability is something one must "adapt" to in order to "fit" into the established social norms (Lathrop, 1995).

Barriers to Web Accessibility

A variety of disabilities can restrict access to information on the World Wide Web. Table 1.1 summarizes the types of strategies students with sensory, cognitive, and physical disabilities use to access the Web and the types of obstacles they might encounter on the Web (W3C, 2001). The specific disabilities discussed in this paper represent a broad cross sample of the disabling conditions students commonly present with in higher educational settings.

For the purpose of this discussion, it is important to consider that disability terminology varies from country to country and between different communities in the same country. For instance, there is a trend in many disability communities to use functional terminology (i.e., stating what a person can or cannot do) instead of medical descriptions. Therefore, this paper does not attempt to comprehensively address issues of terminology. Also, abilities can vary among individuals and, over time, for different people with the same type of disability. Individuals can also have combinations of different disabilities and combinations of varying levels of severity. Consequently, the word "disability" is used very generally in this paper. In fact, some people with conditions described below would not consider themselves to have disabilities. They may, however, have limitations of physical, cognitive, sensory, or neurological functioning that can restrict access to the Web. These limitations may include aging-related or injury-related

conditions and can be either chronic or temporary. Also, the number and severity of limitations generally tend to increase as people age, and may include changes in hearing, motor functioning, or vision. Not surprisingly, aging-related conditions can be accommodated on the Web with the same accessibility solutions used for people with disabilities. Also important is the fact that occasionally different disabilities require similar accommodations. For instance, a student who is blind and a student who cannot use his or her hands both need full keyboard equivalents for mouse commands in browsers and authoring tools. This is because they both have difficulty using a mouse but can use adaptive technologies to activate commands supported by a standard keyboard interface. Similarly, a student who has Attention Deficit Disorder and a student with a psychiatric illness might need to turn off distracting visual or audio elements on the Web because they interfere with concentration (W3C, 2001).

As revealed in Table 1.1 students with visual impairments have the greatest barriers to overcome, mainly because the World Wide Web is a highly visual medium. This does not mean, however, that the access barriers encountered by students with other disabilities are any less severe. For example, students who are deaf can essentially be "locked out" of the learning environment if transcripts or captions of audio files are not included during the design process. Equally serious, some students with epilepsy can experience seizures if they cannot turn off the blinking text on a Web site.

Fortunately, however, all of the barrier examples listed in Table 1.1 are illustrative of issues that are relatively easy to address with existing accessibility solutions. Some of

these remedies can be made quite easily with very little effort, while others may require more time and financial resources (Lenn, 1996).

Table 1.1

Web Access Methods & Barriers by Type of Disability

Blindness[5]

Methods Used to Access Web

- Screen readers
- Text-based browsers
- Voice browsers[6]
- Rapid navigation strategies (e.g., tabbing through headings or links rather than reading every word on the page in order)

Barriers to Web Accessibility

- Video that is not described in audio or text
- Images that do not have alternative text (ALT text)
- Complex images, such as graphics or charts, that are not adequately described
- Authoring tools & browsers that lack keyboard support for all commands
- Authoring tools & browsers that do not use standard application programmer interfaces for the operating system they are based in
- Tables that do not make sense when read in a cell-by-cell (linearized) mode
- Forms that cannot be tabbed through in a logical order or that are poorly labelled
- Frames that do not have "NOFRAME" alternatives, or that do not have meaningful names
- Non-standard document formats (e.g., Adobe) that may be difficult for screen readers to interpret

Low Vision[7]

Methods Used to Access Web

- Extra-large monitors (e.g., 21")
- Increasing the size of images and system fonts
- Screen magnifiers/screen enhancement software
- Specific combinations of text & background colors (e.g., 24-point bright yellow font on a black background)
- Particular typefaces (e.g., 15-point Ariel)

Barriers to Web Accessibility

- Color used as a unique marker to emphasize text
- Pages, or images on pages, with poor contrast & whose contrast cannot be easily changed through user override of author-specified style sheets[8]
- Pages that are difficult to navigate when enlarged, due to loss of surrounding context
- Pages with absolute font sizes that cannot be enlarged or reduced easily
- Imaged text that cannot be re-wrapped
- Many of the barriers listed for "Blindness," above, depending on the type and extent of the vision loss

Deafness[9]

Methods Used to Access Web

- Use of captions for audio content

Barriers to Web Accessibility

- Requirements for voice input
- Lack of transcripts or captions of audio files
- Lack of content-related images in pages full of text (which can slow comprehension for people whose first language may be a sign language)

Hard of Hearing[10]

Methods Used to Access Web

- Use of captions for audio content and/or amplification of audio

Barriers to Web Accessibility

- Lack of captions or transcripts for audio files

Learning Disabilities[11]

Methods Used to Access Web

- Screen reader & synthesized speech (for reading difficulties)
- Captions (for audio-processing difficulties)

Barriers to Web Accessibility

- Lack of captions or transcripts for audio tracks
- Lack of alternative text that can be converted to audio to supplement visuals
- Lack of a clear & consistent layout

Attention Deficit Disorder[12]

Methods Used to Access Web

- Turning off animations, blinking text, or audio elements to focus on content

Barriers to Web Accessibility

- Lack of a clear & consistent layout
- Distracting visual or audio elements that cannot easily be turned off

Memory Impairments[13]

Methods Used to Access Web

- Relying on a consistent navigational structure

Barriers to Web Accessibility

- Lack of a clear & consistent layout
- No alternative input method when voice-based interaction is required

Speech Impairments[14]

Methods Used to Access Web

- Text entered via a keyboard (for parts that rely on voice recognition)

Barriers to Web Accessibility

- No alternative input method when voice-based interaction is required

Psychiatric Conditions[15]

Methods Used to Access Web

- Turning off distracting visual or audio elements
- Screen magnifiers (for difficulty with blurred vision due to side effects from medication)

Barriers to Web Accessibility

- Distracting visual or audio elements that cannot easily be turned off
- Pages with absolute font sizes that do not enlarge easily
- Lack of a clear & consistent layout

Seizure Disorders[16]

Methods Used to Access Web

- Turning off animations, blinking text, or certain frequencies of audio

Barriers to Web Accessibility

- Visual flickering, blinking text, & audio signals that cannot be turned off by the user

Motor Disabilities to Hands/Arms[17]

Methods Used to Access Web

- Alternative keyboards
- Specialized mouse
- Pointing device
- Mouth stick
- Voice-recognition software

Barriers to Web Accessibility

- Time-limited response options
- Forms that cannot be tabbed through in logical sequence
- Browsers and authoring tools that do not support keyboard alternatives for mouse commands

Note. Adapted from *How People with Disabilities Use the Web* (W3C, 2001).

Top Ten Web-Accessibility Solutions for University Students with Disabilities

"In simple terms, [W]eb accessibility refers to the creation of a [W]eb document that meets the requirements of universal design" (Wadell, 1999, as cited in Hricko, 2000, p. 394). Ironically, with so many "bells and whistles" included in authoring tools today, educators are easily tempted to include design features that may actually hinder, rather than enhance, the learning process (Harrison, n.d.a). In all probability, faculty members are genuinely unaware of these issues and will need institutional supports to create more accessible online learning environments.

The World Wide Web Consortium (W3C) was established in 1994 to promote the evolution of the World Wide Web and to oversee emerging technologies and the Web.

The Web Access Initiative (WAI), which was created by the W3C, has developed guidelines for accessibility purposes. Because the W3C has provided the standards by which Web pages are developed in Hypertext Markup Language (HTML) (Guthrie, 2000), it is an excellent resource to which faculty members, and others, can turn to for guidance.

Based on an extensive review of the research literature (Banks & Coombs, 1998; Burgstahler & Comden, 1997; California Community Colleges, Chancellor's Office, 1999; Casey, 1999; Craven, 2000; Government of Canada, 2002; Guthrie, 2000; Harrison, n.d.a; Hinn 1999; Kautzman, 1998; National Federation of the Blind, 2001; Node Learning Technologies Network, 1998; Peters-Walters, 1998; Regan, 1997; Shumila & Richards, n.d.; Young, 1998), coupled with eleven years' experience as a disability service provider in higher education, the present author has identified the top ten solutions for improving Web content accessibility for university students with disabilities:

1. Keep the design clear and simple;
2. Use structural elements to convey meaning;
3. Create tables that transform gracefully;
4. Avoid using browser-specific code;
5. Build patron manipulation into the layout;
6. Provide equivalent alternatives to auditory and visual content;

7. Ensure pages can be navigated by a keyboard only or voice commands;
8. Make link text meaningful;
9. Validate accessibility with automatic tools and human review;
10. Provide contact information for accessibility enquiries.

These remedies, with supporting rationale, are highlighted in Table 1.2. Further analysis is presented below. The list has not been sorted in order of priority, since each of these solutions are equally important if students with disabilities are to be welcomed into virtual learning environments. More detailed information and techniques for implementation are available at the WAI Web site (see Appendix).

Keep the Design Clear and Simple

> Keeping the design as simple as possible is a good starting point for building a barrier-free Web site. This does not mean that there has to be a bland, boring presentation of content. It means that all elements must be chosen deliberately to enhance the content rather than be window dressing or distract from the presentation (Casey, 1999, p. 22).

Long pages of unbroken text are particularly difficult to skim for students with visual disabilities, because it takes them longer to read a passage. They are also problematic for students with Attention Deficit Disorder since they generally find it difficult to stay focused on the task of reading (Peters-Walters, 1998). Also, "for students who are paralyzed and have to press computer keys with a mouth stick, the simpler the

page is the better" (Young, 1998, ¶ 13). Long pages of text should, therefore, be broken up with headers to help with the skimming process (Peters-Walters, 1998).

Other design elements should be included to facilitate ease of reading. For example, "to help grasp the overall layout of a page or site, an outline should be placed at the point where a screen reader would begin to read" (Shumila, 1998, as cited in Casey, 1999, p. 24). Also, since screen readers read from left to right, top to bottom, the page should also be set up in a logical design with the most important information placed near the top (Kautzman, 1998). Likewise, irrelevant information, such as decorative graphics, should be omitted (Shumila & Richards, n.d.). To further enhance navigation, the layout should be kept consistent throughout the different levels of the site. This theory of design will also help students with cognitive limitations who may prove as needy of simply-designed pages as those who must use screen readers (Kautzman, 1998). As well, Web designers should "embrace the conventional--bright blue underlined text is unmistakably a link" (Regan, 1997). They should also "use good judgement when employing elements such as marquee or blinking texts since screen readers 'often read one letter at a time as it is displayed, so it may be read backwards, a letter at a time'" (Descy, 1997, as cited in Casey, 1999, p. 24). Remember, as well, that some epileptic seizures are caused by pulsing light (Regan, 1997).

Use Structural Elements to Convey Meaning

As (Harrison. n.d.a) suggests, one of the greatest obstacles to accessibility is the inappropriate use of structural markup (i.e., a coding system used to indicate how a document should be formatted) to achieve a presentation effect, especially for viewing with older browsers. Common practices include use of tables for layout or a header to change the font size. It is important to consider whether the formatting effect is so critical as to warrant rendering the page inaccessible to some students.

A better approach is to use markup such as TABLE, UL, BLOCKQUOTE, etc., as it was intended, and use Cascading Style Sheets (CSS) to separate structure from format and content from presentation (Harrison, n.d.a). Some of the attributes that can be set with CSS are font face, text decoration, line height, and background color (Castro, 1998, as cited in Guthrie, 2000). This solution not only accommodates users of adaptive technology but also users of emerging technologies, such as mobile and portable Internet access devices (Harrison, n.d.a).

Create Tables that Transform Gracefully

The use of tables is sometimes the best organizational layout for students with cognitive disabilities, since the text has a clear and consistent layout. Tables can, however, create serious access problems (e.g., jumbled text and a confusing layout) for students with visual impairments who must use adaptive software (Hinn, 1999). Web designers should, therefore, use tables sparingly or link to a non-tables version of the information found in each table (Hinn, 1999). This solution will also benefit students

using a browser that does not support tables (Burgstahler & Comden, 1997). Guthrie (2000) further suggests that Web designers should also be sure to test their pages in a text-only browser, such as Lynx, if they use tables for layout purposes. This is particularly important in actual course situations.

Avoid Using Browser-Specific Code

Web designers often use code that does not work with text-mode browsers. For example, they might use a graphical icon for a form submission button instead of the traditional gray "submit" button. Generally, this problem will not appear until after the person completes a task (e.g., a student finishes an exam and is then unable to submit it). Another example of this problem is where a student tries to access another Web-based instructional environment, such as the course lecture notes, and the coding behind the password dialog box is browser-specific. These types of access barriers are quite serious (Hinn, 1999). They can also happen in Web-based service environments. An example is where a student tries to register for a course and pay his tuition--before the deadline when a late charge will be imposed--and the coding behind the password dialog box is browser-specific. Faculty and staff must, therefore, avoid including such design elements on their Web sites by testing each essential feature that uses browser-specific code with a variety of browsers and prepare a non-browser specific alternative (Hinn, 1999).

Build Patron Manipulation into the Layout

Web designers should provide enough contrast for text to be visible and consider those who may be colorblind. In particular, they should not use red, green, brown, gray, or purple next to or on top of red, green, brown, gray, or purple (Guthrie, 2000) or the combinations of blue/yellow and red/green for text and backgrounds unless they provide an alternative site (Peters-Walters, 1998). They should also avoid conveying important information by colour alone, e.g., "The recommended readings are highlighted in green."

Fortunately, some barriers, like the use of colour, can be removed by adjusting browser preferences but only if the Web site supports these options. In other words, patron manipulation must be built into the Web site's layout. Other elements that can be manipulated on a browser are font size and the display of graphics. Any of these alterations can have a major impact on the visual display of a page (Casey, 1999).

Provide Equivalent Alternatives to Auditory and Visual Content

A simple principle is to avoid using a single medium to deliver information other than text (Burgstahler & Comden, 1997). "Anything that is represented by an image or sound, whether it is bitmapped text, photographs, illustrations, page dividers, image maps, videos, or sound clips must have alternative text" (Casey, 1999, p. 23). A simple example is the use of the "ALT" attribute for images, providing an alternative text for learners accessing Web resources with a screen reader or those who are using devices which display "text only" due to low bandwidth (Harrison, 2001a). Within this context,

Sharpe (2000) describes support for text-only files. In a recent needs assessment of distance education student services at Memorial University of Newfoundland, he found that while regular Web pages were the preferred online resource, about two-thirds of the students surveyed also indicated a preference for text-only files. He suggests that this may relate to online access issues and the fact that graphic images often take much longer to download in many rural settings, resulting in slow and often frustrating online interactions.

Some Web designers who wish to create graphically-rich pages decide to offer the page content in a text version (i.e., a clone of the site but with no graphics) (Banks & Coombs, 1998). This remedy should be implemented very cautiously, however, since it might actually reduce rather than enhance accessibility for all users. In fact, "those who address accessibility issues do not wholeheartedly support text-only pages, saying these are not updated as frequently as the 'main' site" (Guthrie, 2000, p. 7). Furthermore, this kind of oversight can have disastrous results in an academic environment, where access to timely information is critical for student success. Similar access to information must, therefore, be provided if students with disabilities are to have the same course-taking experiences as their classmates who do not have disabilities.

Ensure Pages can be Navigated by a Keyboard Only or Voice Commands

According to Kautzman (1998), the use of HTML forms is particularly problematic for some students with disabilities, since they must be seen and filled out precisely with a mouse. This can be particularly serious if a Web form is used to complete an online quiz

(Hinn, 1999) register for courses, request a transcript, order library resources, apply for convocation, etc. Good Web design means that the page can be accessed with only a keyboard or voice commands. For instance, Web designers can use HTML 4.0 features, such as TABINDEX and ACCESSKEY, to make their pages easier to navigate with only a keyboard (Harrison, n.d.a). For ultimate accessibility, they should also make all forms available as a text file, which users can download to their hard drives and return via e-mail or postal mail (Peters-Walters, 1998).

Make Sure Link Text is Meaningful

Links that are scattered throughout a paragraph will not necessarily be differentiated by students with visual impairments who use screen readers. After reading the text, they will have to go back and find the links, hoping that the context will allow for informed decisions (Kautzman, 1998). This frustrating, time-consuming process can potentially impact a student's academic achievement in the course and ultimately influence negatively their willingness to continue at the university.

Fortunately, several solutions are available to eliminate this accessibility barrier. For example, a HTML link element can be put around more of the text to make the context self-explanatory. A better solution is to separate the links from the body of the text into a menu or link (Kautzman, 1998). To enhance readability for all users, the navigation links should be placed in the same place on every page (Guthrie, 2000). All graphical links should also have an "ALT" text link beside or beneath the graphical link, which can be especially helpful for students with visual impairments (Peters-Walters,

1998). These text links should be short but descriptive, such as "WWW and Visual Disabilities" (Paciello, 1996, as cited in Peters-Walters, 1998). Link text should also be meaningful enough to make sense when read out of context--either on its own or as part of a sequence of links. For instance, instead of saying "click here" it is more meaningful to add on the words "go to the next page" (Government of Canada, 2002).

Validate Accessibility with Automatic Tools and Human Review

Validation methods should be used at the earliest stages of development, since accessibility issues will be easier to avoid or correct (Harrison, n.d.a). Web designers should submit their pages to an automatic software tool, such as "BOBBY" (Casey, 1999), which will evaluate the pages according to the W3C guidelines, marking the possible errors and ranking them in order of priority (Kautzman, 1998). They should also test the accessibility of their site with "Lynx View," for example, which will display the page as it would appear to a text browser (i.e., indicating how a screen reader may interpret the page). In particular, "Lynx View" will identify any images for which "ALT" text has not been applied, show whether the page layout is in a clear and logical order, indicate whether links are separated clearly, and show how tidily the HTML has been applied (Craven, 2000).

A word of caution is needed at this point. Although automated validation methods are generally rapid and convenient, they cannot identify all accessibility issues. Human review is, therefore, needed to ensure clarity of language and ease of navigation

(Harrison, n.d.a). For the ultimate accessibility check, Web designers should specifically test their sites with users with different kinds of disabilities.

Provide Contact Information for Accessibility Enquiries

A contact name should be given on the Web site, so students can comment on the design of the page and bring any accessibility issues to the attention of the owner. Ideally the site should give a choice of contact methods, such as postal, telephone (Casey, 1999), or e-mail. As a last resort, instructions should be given for how the person can obtain the material in another format (Guthrie, 2000). This is particularly important in actual course settings and when students must use the campus intranet to register for courses (especially if they have a limited "window of opportunity" to do so), pay their tuition before a late fee is charged, access library data bases to do a term paper, and so on. Belbin (2000) suggests that effective assessment and evaluation tools must be built into virtual service environments, thus giving the programmer immediate pictures of the service (e.g., ease of use) and constant improvements that may be needed.

The preceding discussion explains why it is important for universities to consider the needs of students with disabilities and other special populations when designing Web resources. This does not mean, however, that designers should avoid the Internet's multimedia potential and revert to a presentation of plain text. It does mean, however, that those engaged in Web design must be aware of accessibility barriers on the Web and provide alternative formats, where possible, such as informative "ALT" attributes for images, text versions or descriptions of sound files, captioning for audio-visual formats,

etc. Equally important, software developers should be aware of these issues when developing software for the Web. In addition, adaptive technology producers must keep up to date with the advances in Web-based multimedia development. Last, but not least, educational institutions must ensure that their students have appropriate tools to access the content on the Web in its many formats (Node Learning Technologies Network, 1998).

Table 1.2

Top Ten Web-Accessibility Solutions for University Students with Disabilities

Solution	Rationale
Keep the design clear and simple	Simplicity will make it less time consuming to navigate a document or to stay focused on long pages of text
Use structural elements to convey meaning	Adaptive software users can understand the layout of the page & navigate through it effectively; not everyone uses a conventional monitor & mouse to access the Web
Create tables that transform gracefully	Not all students will have access to newer screen readers that include access to tables; raising the font size in a graphical-mode browser can return a confusing layout--text in one table cell overlaps text in another table cell
Avoid browser-specific code	Some code does not work with text-mode browsers, such as Lynx
Build patron manipulation into the layout	Font size, color, and the display of graphics can have a major impact on the visual display of a page
Provide equivalent alternatives to auditory and visual content	This will ensure the page reaches the widest possible audience
Ensure pages can be navigated by a keyboard only or voice commands	Not all learners can use of will be using a mouse to navigate through the Web site
Make sure link text is meaningful	Since screen readers verbalize text, links interspersed throughout a paragraph will not necessarily be differentiated by the user
Validate accessibility with automatic tools and human review	Errors can be detected and corrected early
Provide contact information for accessibility enquiries	Users can comment on the design of the page & raise any accessibility issues

Best Practices for Ensuring Access to Online Distance Education Courses

Distance education is expected to dominate the use of the Internet and to be an area of growth in the future, using the capacities of the information highway (National Library of Canada, 2000). Within this context, Haughey (1994, as cited in Hardy Cox, 2000) highlights expected growth in distance education participation, citing changes in the Canadian economy which will require new technological skills. However, "if distance education is to flourish in the years to come, there must be an increase in levels of support services to students" (Steward, 1995, as cited in Hardy Cox, 2000, pp. 9-10). Since the effect of inaccessible online resources is most drastic in Web-based distance education courses (Schmetzke, 2001), several overriding principles should be followed by faculty and staff who are involved in the use of this instructional method. In particular, distance education resources should be designed to (a) provide "built-in" accommodation where possible; (b) interface design/content layout so it is accessible to "industry-standard" adaptive technologies in common use by students with disabilities; (c) provide information in the alternative format preferred by the student, whenever possible; and (d) ensure that the level of communication and course-taking experience is the same for students with or without disabilities (California Community Colleges, Chancellor's Office, 1999). Further analysis is provided below.

Provide Built-in Accommodation, Where Possible

All resources should be designed to provide built-in accommodation where possible, such as closed captioning for students who are deaf or descriptive narration for

students who are blind. The adoption of access solutions that include providing sign language interpreters, readers, or other assistants to work with an individual student should only be considered as a last resort when all efforts to enhance the native accessibility of the course material has failed (California Community Colleges, Chancellor's Office, 1999). This approach supports the philosophy of fostering independence in individual learners and flexibility in institutional policies and practices to ensure academic standards.

Interface Design/Content Layout with Industry-Standard Adaptive Technologies

Web pages should transform easily so students who use various types of adaptive technology, such as text-mode screen readers, screen magnifiers, etc., have equal access to course-related and other materials. Some of the techniques already mentioned include separating structure from format, providing textual as well as visual information, creating documents that do not rely on one type of browser, and ensuring that pages can be navigated with a keyboard only or voice commands, etc.

Provide Information in the Alternative Format Preferred by the Student

Whenever possible, information should be provided in the alternative format preferred by the student (e.g., closed captioning, descriptive narration, braille, audio tape, large print, or electronic text) (California Community Colleges, Chancellor's Office1999). This approach respects the student's dignity by recognizing their right to decide what "works best" for them. Unfortunately, however, the increased cost of providing academic accommodations, especially braille transcription and sign language

interpretation, can mean that students with disabilities will be asked to "adjust" to the institution, rather than the institution "adjusting" to meet their needs. For example, it is much cheaper to provide an electronic copy of a new text book--assuming the publisher grants permission--than it is to produce it in braille--the format preferred by the student.

Ensure the Level of Communication and Course-Taking Experience is the Same for Students With and Without Disabilities

This guideline is a capstone principle, since it builds on the other three recommendations in this section. In summary, it means that online distance education courses, resources, and materials must be designed and delivered in such a way that the level of communication and course-taking experience is the same for students with or without disabilities (California Community Colleges, Chancellor's Office, 1999). Therefore, for example, if a professor designs a text-only version of a course Web site to enhance accessibility for screen reader users, he or she must ensure that its content mirrors the information on the "main" Web site. In particular, all updates made to the text-only site must occur at the same time they are being made to the main site. This will ensure that students with disabilities, and those without disabilities, will always have the same access to course-related information--an equal opportunity to achieve academic success.

Implications for Institutions of Higher Education

During the past two decades, Canadian universities have been challenged to respond to the diverse needs of students. Accommodations and service provisions for

> students with disabilities are an integral aspect of this changing environment. . . . With the increasing participation of students with disabilities in university, several questions have been brought to the fore regarding course or degree modification for students. Canadian universities have been responding to this challenge through the creation of institutional policies (Cox & Walsh, 1998, pp. 51-52).

Cox and Walsh (1998), in their comprehensive review of institutional policies for students with disabilities at 47 Canadian universities, found that over 75% of all universities in Canada reported policy development and analysis initiatives. While some institutions reported specific types of policies (e.g., policies for students with learning disabilities or policies for students who are deaf or hard of hearing), no universities reported policy initiatives around Web accessibility. In their follow-up research on disability policy issues and trends in Canadian higher education, the findings were similar. While new policies had emerged in such areas as physical accessibility, none of the institutions reported Web accessibility policies (Walsh North & Cox, 2002). This does not mean, of course, that Canadian universities are not making progress toward improving Web accessibility on their campuses and beyond. In fact, the research conducted by Walsh North & Cox (2002) focused entirely on institutional written policies. For example, the Adaptive Technology Resource Centre (n.d.) at the University of Toronto is internationally renowned for its leadership in providing research, information, support, and training that will allow individuals to make informed decisions and build the skills required to optimally employ Web accessibility techniques. An

example of their success on the world scene is the development of the A-Prompt[18] (Accessibility Prompt) software tool, in partnership with the TRACE Center at the University of Wisconsin (Adaptive Technology Resource Centre, 2002).

Sergeant et al. (1987, as cited in Hill, 1992) had earlier suggested that although universities have made considerable progress in removing architectural barriers, fewer changes have occurred around support services, i.e., policies and social barriers. These findings may be explained by the fact that architectural barriers are perhaps more easily changed than attitudinal barriers (Wilchesky, 1986, as cited in Hill, 1992). Regardless, the inaccessibility of campus Web sites cannot solely be attributed to Web designers' attitudes, but it is likely to reflect a general lack of awareness about accessible design (Schmetske, 2001). As noted earlier in this paper, "the needs of students with disabilities are simply overlooked in much of the planning until it is discovered, often much too late, that the expensive new technology is inaccessible. This is not done through malice but through lack of forethought" (Fichten, Asuncion, Barile, Fossey, Robillard, & Wolforth, 2001, p. 78). "Nonetheless, electronic environmental barriers are continually being created. It is imperative that solutions are identified and implemented while the technologies and infrastructures in postsecondary educational institutions are still in a developing stage" (Fichten, Asuncion, Barile, Fossey, & Robillard, 2001, pp. 52-53). This will likely result in fewer design and legal expenses (Falta, 1992, as cited in Fichten, Asuncion, Barile, Fossey, & Robillard, 2001). The implication of doing nothing is that "educational technologies become exclusionary technologies" (Fichten, Asuncion, Barile,

Fossey, & de Simone, 2000, pp. 196-197). Hence, students will be polarized into the "information rich" and the "information poor," which will have far-reaching implications for the societies they build in the future.

Training

Even if educators familiarize themselves with the W3C Web Accessibility Guidelines and other related resources, universities must provide the necessary training, resources, and tools to develop accessible Web materials. Training should not only consist of a simple review of the Web Accessibility Guidelines, but provide a practical application of the guidelines in the faculty members' own instructional documents. When designing such activities, remember, as well, to include Web designers who work in key service areas that impact student success (e.g., the library, registrar's office, and the distance education department). In this way, faculty and staff can actually determine if their documents meet the minimum requirements of universal design. One method of demonstrating this concept to faculty members, for instance, is to have them run a diagnostic test on their own course Web site using "BOBBY" and "Lynx View." Since there are many professors who do not teach Web-based courses, but use Web-based documents to supplement their teaching, it is important that such training be not limited to instructors only participating in the university's online distance education programs. Web-based course outlines, class assignments, reading lists, specific projects, and other course-related materials should also be reviewed with automatic evaluation tools (Hricko, 2000) and followed up with human review.

If the university cannot offer a training program, there are several organizations and programs that can provide workshops and extensive resources on Web design and authoring (Harrison, n.d.b). In particular, the California Community Colleges have developed very detailed and comprehensive guidelines for creating accessibility for Web-based instruction (Hricko, 2000). An extensive list of these and other Web-accessibility resources is included in the Appendix. They are an excellent starting point for educational institutions who are interested in ensuing a greater level of accessibility to their online environments. However, simply making information available is not enough. It is imperative that these professionals be kept updated on the latest technological advances that impact Web accessibility. The tools to accomplish the teaching of these skills can also come from current students with disabilities who have developed expertise in this area from working through such obstacles. This is important, since many current students are much more knowledgeable in this area than are faculty, staff, and administrators.

> One of the most significant long-term strategies that should be taken as educators is to lobby courseware platform developers to adapt their programs to improve accessibility. This grassroots approach, beginning with authoring tools, will mean that accessible design becomes the status quo, rather than an additional effort undertaken by designers who have awareness of the potential problems (Harrison, Richards, Treviranus, 1999, as cited in Harrison, n.d.b).

Role of the Disability Service Provider

Personnel responsible for providing disability-related services in universities are ideally positioned to move their institutions toward achieving a greater level of accessibility in the Web resources being developed. Since they work closely with students with disabilities, faculty members, and others engaged in key service functions (e.g., admissions officers, distance education practitioners, and computing specialists), they are generally the first to learn about accessibility issues on their campuses. As well, they are often the personnel most familiar with adaptive technologies and the emerging issues and trends that impact their usefulness in educational environments. Also, they are usually well connected within the disability community and among professional colleagues, through such organizations as the Canadian Association of Disability Service Providers in Post-Secondary Education and the Association on Higher Education and Disability. Consequently, they are frequently the first people on their campuses to learn about the increasing societal expectations for leadership in such matters. For these reasons, the campus disability service provider can do much to create more accessible online environments for students with disabilities. Practical examples of the kinds of things they can do to help their institutions work toward this goal are outlined in Table 1.3.

A word of caution is needed here:

> Like most efforts to assist students with disabilities, computer access in higher education should be managed by a team of professionals, rather than just a single service provider or a single computer lab employee. At the very least, computer access should be steered through cooperation between services for students with disabilities and campus computing offices (Lance, 1996, p. 285).

To increase accessibility, the broadest-based consultations should also take place within the university. Members of several key stakeholder groups should be represented in planning decisions from their inception. This includes, first and foremost, students with different kinds of disabilities, administrators, professors, librarians, academic computer staff, adaptive technology and computer specialists, audio-visual specialists, instructional designers, etc. (Fichten, Asuncion, Barile, Fossey, & Robillard, 2001).

Student Involvement

Students with disabilities can also play a vital role in helping their institutions move closer toward universal design in the Web resources being developed. For this to happen, it is essential that they are included in all planning decisions and represented on all advisory or working committees related to Web accessibility. In particular, they can share the kinds of accessibility challenges they have experienced on the Web (e.g., provide demonstrations using adaptive technologies) and recommend solutions that have worked best for them. They can also participate in policy development and help to design or redesign templates for institutional Web pages, particularly in such critical areas as

distance education, the library, and the registrar's office. Likewise, they can be called upon to evaluate authoring tools before purchase decisions are made and co-present information sessions on campus with the disability service provider. Their voice can be especially effective in lobbying the senior university administration, government officials, external agencies, private foundations, and benefactors to provide infrastructure funding to implement universal design practices throughout the institution. Likewise, they can help their institutions lobby adaptive technology and courseware producers to include accessibility features in the products and tools they manufacture. In summary, students with disabilities should be invited to serve as Web-accessibility consultants within their institutions, either as paid employees or volunteers. Engaging in such activities will not only help them move their institutions closer toward universal design, but also potentially enhance their social, intellectual, and personal development, which is a pre-eminent goal of all student affairs/development programs.

Table 1.3

Practical Things Disability Service Providers Can do to Help Move Their Institutions Closer to Universal Design

1. Make their concerns known to whoever it is that can most directly impact the situation on their campus (not necessarily the person at the top of the food chain) (Harrison, 2001b);
2. Find allies in the information technology department who have significant influence. This is where Web implementation and purchase decisions are usually made (Harrison, 2001b);
3. Identify or lobby to have someone responsible for adaptive technology within the information technology department if possible (Harrison, 2001b);
4. Educate those in positions of authority (e.g., president, chancellor, registrar, university librarian, deans, directors, department heads, etc.) about the potential barriers and solutions to Web accessibility (Harrison, 2001b);
5. Offer to sit on advisory committees related to the implementation of technology and ensure that students with different kinds of disabilities are also represented (Harrison, 2001b);
6. Offer to user test Web sites, courseware tools, etc., for accessibility barriers or find students or faculty with disabilities that are willing to participate;
7. Remind those in positions of power that retrofitting costs more than doing it right the first time and improves usability for everyone (Harrison, 2001b);

8. Get support for an accessibility specialist, if the campus does not already have one, by documenting the need, identifying and communicating with persons of significant authority, communicating with technical credibility, or finding partners who can communicate with technical credibility (Harrison, 2001b);
9. Advocate at the grassroots level with those who make purchase decisions and ask for software development companies to provide documentation on accessibility (Harrison, 2001b);
10. Promote the use of courseware tools with built-in accessibility features (e.g., WebCT and Blackboard) (Fichten, Asuncion, Barile, Fossey, & de Simone, 2000);
11. Organize awareness sessions and workshops on Web accessibility (e.g., they could be held during new faculty and staff orientations) (Harrison, 2001b);
12. Develop training packages for the campus that include Web authoring/evaluation tools, universal design techniques, etc.;
13. Educate the next generation of Web authors and Web designers--lobby to have Web accessibility topics and practical applications included in the curriculum (particularly in information technology, computer science, social work, and education programs);
14. Create a link from all institutional Web pages to the WAI Accessibility Guidelines;
15. Make public service announcements on the campus radio station and write articles for the campus newspaper about Web accessibility barriers and solutions;
16. Promote the use of automatic validation tools, such as "BOBBY" and "Lynx View," throughout the campus while reinforcing the importance of human review;

17. As time and resources permit, evaluate campus Web pages for accessibility and provide suggestions for making appropriate improvements;
18. Compile a comprehensive list of accessibility resources (e.g., see Appendix) and make this information available through the institution's main Web page and/or the Web site for the office for students with disabilities;
19. Conduct a needs assessment to examine the Web accessibility barriers that exist at the university compared to what is required to eliminate those barriers;
20. Spearhead the development of a Web accessibility policy for the campus;
21. Refer to legislation and, if all else fails, cite legal precedents (American post-secondary institutions have been required to implement universal design techniques in online learning environments in response to law suits from students) (Foster, 2001).

Conclusion

> Designing accessible Web sites can seem like a daunting task. Mere awareness of the issue often raises more questions than it answers. Misconceptions often arise that need to be corrected. The truth is that Web developers who design with accessibility in mind are often able to improve their Web site for all users, and not just for those users who have disabilities (Bohman, 2000, Universal Design section, ¶ 1).

It is here that the concept of universal design becomes important, especially when current and future technologies are taken into consideration, which stretches the limits of

conventional Web wisdom. For example, enhancing the accessibility of a Web site for people who are blind will also improve its usability for individuals who have to use the Web in environments (e.g., their car) that prevent visual Web surfing. The knowledge of how to create universally acceptable sites is available; it is simply a matter of using it (Bohman, 2000). The question to ask, however, is whether universities will need laws to bring this about, or will the good sense implicit in universal design prevail to the benefit of all users of the World Wide Web (Node Learning Technologies Network, 1998). One thing is certain, if action is not taken today in the design of the information highway, there will not be universal access to it tomorrow (Scadden, 1994).

The implication for institutions of higher education is clear. As noted in the introduction to this paper folio, campus problems, such as inaccessible Web sites, can originate from within the institution (Banning, 1980) and from increasing societal expectations for leadership in such matters. Direct interventions at the institutional level are, therefore, required in such cases (Banning, 1980). The second paper in this folio will expand on this issue by advancing the discussion from awareness building to institutional accountability through policy development.

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Footnotes

[1] A refreshable braille display connects to a personal computer and transcribes the text on the screen into instantaneous braille output. A refreshable braille display thus does not produce braille characters on paper but employs electro-mechanical dots (Lazzaro, 1993).

[2] For those with limited vision, screen magnifiers (screen magnification software), such as "ZoomText," provide access to computer-based materials by enlarging portions of the screen (Harrison, 2001a).

[3] Voice recognition software, such as "Dragon Naturally Speaking," is commonly used by some individuals with learning disabilities, physical disabilities, or temporary injuries to their hands and forearms as an input method in some voice browsers (W3C, 2001). The user speaks into a microphone to surf the Web, navigate software applications, and enter text. Commands related to macro sequences may be created to customize usage for frequent tasks or specific software applications (Harrison, 2001a).

[4] Alternative keyboards offer smaller or larger target areas for people with loss of fine- or gross-motor control. They may be converted to mouse emulation mode so that the numeric keypad or the arrow keys on the same keyboard are used for mouse movements (Harrison, 2001a). On-screen keyboards that allow users to enter text and select buttons paralleling menu functions from a display on the monitor are also available. Individuals will use a pointing device or a switch to select the buttons (Harrison, 2001a).

[5] "Blindness involves a substantial, uncorrectable loss of vision in both eyes" (W3C, 2001).

[6] "Voice browsers are systems which allow voice-driven navigation, some with both voice-input and voice-output, and some allowing telephone-based Web access" (W3C, 2001).

[7] There are many types of low vision, which is also called "partially sighted" in parts of Europe. This term includes tunnel vision (seeing only the middle of the visual field), poor acuity (vision that is not sharp), central field loss (seeing only the edges of the visual field), and clouded vision (W3C, 2001).

[8] A style sheet is a set of statements that denote the presentation of a document. Style sheets can be written by content providers, created by users, or built into user agents (W3C, 2000).

[9] Deafness involves a profound uncorrectable impairment of hearing in both ears. Some individuals' first language is a sign language, and they may or may not read or speak a language (e.g., English) fluently (W3C, 2001).

[10] An individual with a mild to moderate hearing loss may be considered hard of hearing (W3C, 2001).

[11] Individuals with learning disabilities "may have difficulty processing written language or images when read visually, or spoken language when heard, or numbers when read visually or heard" (W3C, 2001).

[12] "Individuals with Attention Deficit Disorder may have difficulty focusing on information" (W3C, 2001).

[13] "Individuals with memory impairments may have problems with short-term memory, missing long-term memory, or some loss of language" (W3C, 2001).

[14] Speech impairments "can include difficulty producing speech that is recognizable by some voice recognition software, either in terms of loudness or clarity" (W3C, 2001).

[15] "Individuals with psychiatric (mental or emotional) disabilities may have difficulty focusing on information on a Web site, or difficulty with blurred vision or hand tremors due to side effects from medications" (W3C, 2001).

[16] Some seizure disorders (e.g., epilepsy) "are triggered by visual flickering or audio signals at a certain frequency" (W3C, 2001).

[17] Motor disabilities affecting the hands and/or arms can include weakness; joint problems; limitation of muscular control, such as involuntary movements, lack of co-ordination, or paralysis; limitations of sensation; or missing limbs. Some motor

disabilities can include pain that hinders movement. These conditions can affect the hands and arms as well as other parts of the body (W3C, 2001).

[18.] A-Prompt is an automatic software tool designed to improve the usability of HTML documents by evaluating Web pages for accessibility barriers. It provides Web designers with a fast and easy way to make the necessary repairs (Adaptive Technology Resource Centre, 2002).

Appendix

World Wide Web: Accessibility Resources

General Web Accessibility

- Adaptive Technology Resource Centre (ATRC), University of Toronto
  <http://www.utoronto.ca/atrc/>

  The ATRC provides education, services, and research & development in accessibility.

- Accessibility and VRML

  <http://www.utoronto.ca/atrc/rd/vrml/main.html>

  Information regarding accessibility initiatives and VRML (Virtual Reality Modeling Language) and the 3D Web.

- Accessible Web Authoring Resources and Education Centre (AWARE)

  <http://aware.hwg.org/>

  AWARE's mission is to serve as a resource for Web authors for learning about Web accessibility.

- ADOBE Accessibility Plan for PDF and Acrobat Viewers
  <http://access.adobe.com/tools.html>

  Adobe provides a set of free tools that allow users with visual impairments to read documents in Adobe PDF format. These tools convert PDF documents into either HTML or ASCII text which can then be read by many screen reading programs.

- All Things Web: Could Helen Keller Read Your Page?
  <http://www.pantos.org/atw/35412.html>

  A collection of resources for Web spinners and authors.

- Apple Disability Site

  <http://www.apple.com/disability/welcome.html>

  Apple Macintosh related accessibility information.

- Best Viewed with any Browser--Campaign for a Non-Browser Specific WWW
  <http://www.anybrowser.org/campaign/>

  Links to sites and guidelines for creating accessible Web sites.

- Distance Education: Access Guidelines for Students with Disabilities in California Community Colleges

  <http://www.htctu.fhda.edu/dlguidelines/final%20dl%20guidelines.htm>

- Centre for Applied Special Technology

  <http://www.cast.org/>

  Founded in 1984, CAST is an educational, not-for-profit organization that uses technology to expand opportunities for all people, including those with disabilities.

- College and Research Libraries "Electronic Resources on Disabilities" Guide
  <http://www.ala.org/acrl/resfeb00.html>

  This selected list of electronic resources identifies information sources on disabilities in general, assistive technology, associations and organizations, government resources, and sites centered on specific disabilities, as well as Web page accessibility.

- CPB/WGBH National Centre for Accessible Media
  <http://ncam.wgbh.org/>
  The CPB/WGBH National Centre for Accessible Media (NCAM) is a research and development facility that works to make media accessible to undeserved populations such as persons with disabilities, minority-language users, and people with low literacy skills.

- Designing an Accessible World
  <http://trace.wisc.edu/world/web/>
  Provides resources and examples of accessible Web sites.

- Equal Access to Software and Information (EASI)
  <http://www.rit.edu/~easi/>
  Provider of online training on accessible information technology for persons with disabilities (e.g., offers an online workshop on barrier-free web design).

- European MATHS Project
  <http://www.informatik.uni-stuttgart.de/ifi/ds/MATHS-ENGL.html>
  A project enabling non-visual representations of mathematical formulae.

- Glossary of Access Technology
  <http://www.utoronto.ca/atrc/reference/tech/techgloss.html>
  The ATRC's glossary page with detailed descriptions of devices and systems used for accessibility.

- Guidelines on Universal Web-Site Accessibility (Government of Canada Internet Guide)
  <http://www.cio-dpi.gc/ig-gi/index_e.asp>
  Ensuring that sites are developed to serve the largest possible audience using the broadest range of hardware and software platforms, and that consideration is given to the needs of users with disabilities.

- IBM Special Needs Solutions
  <http://www-3.ibm.com/able/>
  IBM's online accessibility centre includes techniques as well as information for professionals.

- IBM Java Accessibility
  <http://www-105.ibm.com/developerworks/casestudies.nsf/error-page>
  Information for JAVA programmers regarding accessibility.

- Marcopolo
  <http://www.webpresence.com/sonicon/marcopolo/more.htm>
  Provides eyes-free access to the World Wide Web. It is for blind and low-vision computer users or anyone who wishes to browse the Web without having to look at a computer monitor.

- Microsoft's Accessibility Home Page
  <http://www.microsoft.com/enable/>
  Information regarding accessibility within Microsoft applications.

- NCSA Mosaic Access Project
  <http://archive.ncsa.uiuc.edu/SDG/Software/Mosaic/>
  A resource for those interested in how people with disabilities can use the Internet and the World Wide Web.

- Netskills' Workpackages
  <http://www.netskills.ac.uk/>
  Includes access issues in the Exploring Web design issues workpackages.

- Project DO-IT
  <http://www.washington.edu/doit>
  University of Washington's academic and career information for people with disabilities.

- Project HIIT: Internet for the Hearing Impaired
  <http://www.dpa.org.sg/DF/>
  A wealth of resources for people with hearing impairments.

- Science Access Project
  <http://dots.physics.orst.edu/>
  Oregon State University's group for the development of methods for making science, math, and engineering information accessible to people with print disabilities.

- SMIL: Synchronized Multimedia
  <http://www.w3.org/AudioVideo/>
  To enable simple authoring of TV-like multimedia presentations such as training courses on the Web, W3C has designed the Synchronized Multimedia Integration Language. The SMIL language is an easy-to-learn HTML-like language.

- TRACE Research and Development Centre
  <http://www/trace/wisc/edu>
  Trace is a research centre at the University of Wisconsin, which focuses on making off-the-shelf technologies and systems more accessible for everyone through accessible design.

- WAI Accessibility References
  <http://www.w3.org/WAI/References>

  Quick tips, frequent questions, guidelines, checklists, techniques, training, evaluation, alternative browsing, events, policy links, & resources.

- W3C Techniques for Web Content Accessibility Guidelines 1.0

  <http://www.w3.org/TR/WAI-WEBCONTENT-TECHS>

  A gateway to a series of related documents that provide techniques for satisfying the requirements defined in "Web Content Accessibility Guidelines 1.0".

- W3C Web Accessibility Initiative (WAI) Home Page

  <http://www.w3.org/WAI/>

  Resources, events, and activities related to accessibility of the Web for people with disabilities.

- WebAble

  <http://www.webable.com/>

  An extensive listing of accessibility-related web resources.

- WebAim: The Web Accessibility "How-To" Site

  <http://www.webaim.org/>

  Description: Information, training, resources, guidelines, and standards for Web accessibility and disability access.

- Web-Savvy

  <http://www.websavvy-access.org/>

  Designers, programmers, and instructor services available to make sites as accessible as possible.

- U. S. GSA Centre on Information Technology Accommodation (CITA)

  <http://www.gsa.gov/Portal/home.jsp>

  Federal facility influencing accessible information environments, services, and management practices.

Courseware

SNOW Project: Courseware Accessibility Resources

<http://snow.utoronto.ca/access/courseware/index.html>

SNOW (Special Needs Opportunity Windows) is a project aimed at supporting educators of students with special needs. The Web site serves as a clearinghouse of practical resources and curriculum materials.

Validation

A-Prompt Toolkit

<http://aprompt.snow.utoronto.ca>

The A-Prompt (Accessibility Prompt) project is designed to make the Internet more accessible by prompting HTML authors to write better documents. It is a joint collaboration between the Adaptive Technology Resource Centre at the University of Toronto and the Trace Center at the University of Wisconsin.

- BOBBY Online Validation (CAST)

  <http://bobby.cast.org/html/en/index.jsp>

  Free Web-based service that will help make Web pages accessible to people with disabilities. It will also find HTML compatibility problems that prevent pages from displaying correctly on different Web browsers.

- HTML 4 Validator from W3C

  <http://validator.w3.org/>

  A free service that checks documents like HTML and XHTML for conformance to W3C Recommendations and other standards.

- Lynx View Site

  <http://www.delorie.com/web/lynxview.html>

  This service allows Web authors to see what their pages will look like (sort of) when viewed with Lynx, a text-mode Web browser.

Note. Adapted mainly from *Web Accessibility Resources* (Harrison, n.d.b) & *Ensuring Access to the Web for Students with Disabilities: Introduction to Advocacy and Implementation* (Harrison, 2001c).

Paper 2

Toward Web Accessibility Policy Development for University Students with Disabilities

Table of Contents

Appendix

Toward Web Accessibility Policy Development for University Students with Disabilities

Introduction

Denying students with disabilities access to the campus intranet by not adapting input and output modalities clearly denies them participation in any program (Stewart, 1998). Even if students are using adaptive technologies, intranet access will be impossible if Web pages are not created according to universal design principles. For example, some students who are hard of hearing will have difficulty accessing Web pages if video clips have no closed captioning (Fichten, Barile, Asuncion, & Fossey, 2000). Others with learning disabilities will have difficulty processing information "when screens are unorganized, inconsistent and cluttered and when descriptions and instructions are unclear" (Burgstahler, Comden, & Fraser, 1997, p. 9). Since the problem of inaccessible campus Web pages is created within the university, and/or is fueled by increasing societal expectations for leadership in such matters, direct intervention by the institution is required.

This paper will examine the critical factors that require Web accessibility policy development for university students with disabilities. The discussion will focus on two major trends that have led to great changes in higher education over the last 20 years. The discussion will pay particular attention to the prolific growth of online distance education and the legal, ethical, and practical facets of accessing online learning environments.

Major Trends in Higher Education

Two major trends changing higher education over the last 20 years include the increased participation of students with disabilities (Lance, 1996) and the growth in computer use on university campuses (Berliss & Vanderheiden, 1989; Brown, 1989, as cited in Lance, 1996). Lance (1996) suggests that "these two trends are both complementary and conflicting" (p. 279). Although computers hold great potential for increasing the options, productivity, and participation by people with disabilities, they also have the potential for becoming the greatest new handicap these individuals will ever face (Vanderheiden, 1985, as cited in Lance, 1996).

Increased Participation of Students with Disabilities

Over the last 20 years, a significant increase has occurred in the number of students with disabilities attending Canadian post-secondary institutions. Similar trends have been reported in Europe, Australia, and the United States. As an example of one university, in 1988-1989, McGill University was serving 78 students with identified disabilities. By May 1997, that number had increased to 245 students registered with the office for students with disabilities, a 214% increase in nine years. Likewise, in western Canada, the University of British Columbia reported an increase in students using their service from 122 students in fall 1994 to 187 in spring 1995. In Ontario, the province with the largest number of universities, significant increases were also reported as early as 1986 (Aune, 1993; Disability Resource Centre, 1995; Hartman, 1994; Tousignany,

1989; Wilchesky, 1986, as cited in Wolforth, 1998). These findings show that students with disabilities have become a significant part of the diversity that enriches university campuses. They have also begun to take their rightful place in higher education in increasing numbers (O'Connor & Hammond, 1998). Furthermore, according to Hill (1992), enrollment figures for this group "will most likely continue to increase as more individuals recognize the necessity of obtaining a postsecondary education in order to be competitive in the restrained employment market" (p. 53).

This development, which to date has been the subject of very little research (Wolforth, 1998), is likely the result of many factors. In particular, despite some change attributable to an aging population, the increase since 1990 is largely due to children and young adults with disabilities[1]. Other variables include mainstreaming in secondary schools, medical advances, civil rights laws, an understanding that higher education increases opportunities for employment and independence, efforts by post-secondary institutions to increase facility and program accessibility (Fichten, 1988; Fichten, Bourdon, Amsel, & Fox, 1987; Flick-Hruska & Blythe, 1992; Kaye, LaPlante, Carlson, & Wenger, 1996, as cited in Hall & Belch, 2000), and the emergence of adaptive technologies that accommodate, replace, or augment sensory and motor functions of users with disabilities (Harrison, n.d.). Wilchesky (1986) had earlier hypothesized that another reason behind the increase was a drop in student numbers and a consequent push by many universities to recruit non-traditional students (as cited in Wolforth, 1998). Many of these

factors have also likely contributed to the growing number of individuals with disabilities seeking admission to graduate programs (Davis & Lifchez, 1987; Henderson, 1992; Wiseman, Emry, & Morgan, 1988, as cited in Belch, 1995).

Growth in Computer Use

Strange & Banning (2001) report that 40% of current Internet users are between the ages of 18 to 26, with over one-third of the 30 million users online worldwide logging in from computers with the domain name "edu" (educational institution). Green (1996) had earlier reported through a campus computing survey that more than seven million college students and professors had used the Internet and the World Wide Web to complete their daily or weekly activities (as cited in Belbin, 2000). These numbers suggest that computer-mediated communication (CMC) is rapidly becoming an integral part of the university campus among students and faculty alike.

Computer-mediated communication. The prolific growth of CMC on university campuses has supported a variety of activities, particularly in the service of teaching and learning (Berge & Collins, 1995, as cited in Strange & Banning, 2001). Use of the Web for the delivery of distance learning is finding an audience in the current "just-in-time" education environment, where today's lifelong learners value customized programs and convenient professional development opportunities. Students attending traditional on-campus classes are also asking for the convenience of access to course resources, information, and communication with their professors over the Internet (Harrison, n.d.).

Examples of computer-assisted instruction include mentoring, such as advising and guiding students; guest lecturing, which promotes interaction between students and persons in the wider community; didactic teaching, that is, supplying course content, posting assignments, or other information related to course work; retrieval of information from online information archives and commercial databases; interactive chat lines to brainstorm ideas with professors and peers; and computer-based instruction, such as tutorials, simulations, and drills (Berge & Collins, 1985, as cited in Strange & Banning, 2001). Other school-related content, such as electronic libraries, university courses (Shumila & Shumila, 1998), and the use of e-mail for discussion purposes, forwarding of research work, and general communication (Belbin, 2000) is becoming more common. Furthermore, Internet discussion groups are recommended to become the norm rather than the exception with respect to course seminars and program involvement. Also, student assignments are encouraged to be Web based or, at the very least, to have major elements that require students to use Web sites for research and servicing as a part of the course (Willis 1998, as cited in Belbin, 2000).

Online student services. Belbin (2000) highlights that the administration of student services in higher education has also undergone a variety of changes in the last few years due to many factors including budget restrictions, changing students, and impacting technological changes. The latter include the growth of e-mail communications, use of Web sites, and online services and supports, which were all

previously delivered individually to students on a face-to-face basis. For example, students can register for courses, pay tuition, and receive grade reports through campus Web systems. Barnard (1999) further reports that some universities are looking to privatize their online student services, such as library resources, counselling, advising, technical support, and financial assistance, to vendors with established track records. These trends have likely occurred in response to demands from students for 24-hour access to information and personnel and institutional requirements to achieve greater economic efficiencies in a globally competitive marketplace. Furthermore, many institutions are competing "in the physical and virtual world, and their services must reflect a dedication to a horizontal model of servicing" (Belbin, 2000, p. 72).

As universities provide more content and services through electronic networks, they may exclude entire segments of the "connected" population if they ignore the principles and practices of universal design. As previously reported, the number of students with disabilities who are participating in higher education is growing steadily as is their awareness of their legal rights in this respect. This is especially true of students who may have legitimate complaints under their provincial human rights codes, for example, if they are excluded from receiving equitable information and services compared with other members of the public. Student affairs professionals are, therefore, tasked to question the implications of these emerging technologies and administrative practices for the inclusion of students with disabilities. They are further challenged to

develop services, programs, and policies that guarantee these students the right to participate equally in higher education.

Multiple Facets of Accessing Online Environments

With students now being required to retrieve and transmit increasing amounts of information over the Internet, it follows that universities must establish well-defined policies on Web accessibility standards. This requirement is particularly important in the emerging virtual universities[2]. Support for such policies can be found by examining the legal, ethical, and practical facets of accessing online learning environments.

Legal Considerations

In Canada, human rights legislation at the provincial level protects citizens against any discriminatory practice in the provision of goods, services, facilities, or accommodations customarily available to the public (Harrison, n.d.). These human rights codes have been used successfully by students with disabilities to create change at the university level. In fact, universities are generally aware that they risk a human rights complaint if they are seen to discriminate against a student with a disability. This is contrary to the situation in the United Kingdom, for example, where educational institutions are excluded from the already rather weak Disability Discrimination Act of 1995 and where students can be refused admission to a post-secondary institution because of, for example, inaccessible facilities or the lack of appropriate support services (Parker & Myers, 1997, as cited in Wolforth, 1998). In Canada, such practices would

undoubtedly result in a successful human rights complaint against the educational institution (Wolforth, 1998).

Outside the broader framework of human rights legislation, there appear to be no laws in Canada that specifically address universal electronic access. This is contrary to the situation in Australia, where the Disability and Discrimination Act of 1992 states that Web pages created or hosted on Australian soil must be accessible to people with disabilities (Node Learning Technologies Network, 1998). It also differs from the situation in the United States, where post-secondary institutions have been found in violation of Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act (ADA) of 1990 by failing to provide Internet access to students with disabilities (Campbell & Waddell, as cited in Node Learning Technologies Network, 1998). In response, many American universities have begun to develop comprehensive policies that outline the minimum criteria necessary for the creation of Web documents (Hricko, 2000).

The Office for Civil Rights (OCR) of the United States Department of Education is responsible for ensuring that educational institutions comply with the requirements of all federal civil rights laws. In March 1996, for example, it conducted a compliance review to examine whether students with visual impairments, particularly those who are blind, were provided an equal educational opportunity by California Community Colleges or whether they were being discriminated against based on their disability. As an outcome

of this landmark case, the OCR offered suggestions for addressing areas of concern identified during the compliance review. Among the suggestions was the need for the colleges to develop system-wide access guidelines for online distance education and campus Web pages (California Community Colleges, Chancellor's Office, 1999).

The OCR has issued several opinions applying the requirements of Section 504 and the ADA to situations involving access to online distance education and/or computer-assisted instruction. For example, in responding to a complaint from a student with a disability that a university had not provided access to the Internet, the OCR noted that "the issue is not whether the student with the disability is merely provided access, but the issue is rather the extent to which the communication is actually as effective as that provided to others" (OCR Docket No. 09-95-2206, January 25, 1996, as cited in California Community Colleges, Chancellor's Office, 1999, Legal Requirements section ¶ 6). In adding further clarity to the meaning of "effective communication," the OCR has held "that the three basic components of effective communication are 'timeliness of delivery, accuracy of the translation, and provision in a manner and medium appropriate to the significance of the message and the abilities of the individual with the disability'" (OCR Docket No. 09-97-2145, January 9, 1998, as cited in California Community Colleges, Chancellor's Office, 1999, Legal Requirements section, ¶ 7). The OCR has also pointed out that the courts have held that a public entity violates its obligations under the ADA when it only responds on an ad-hoc-basis to individual requests for

accommodation. Thus, there is an affirmative duty to develop a comprehensive policy before any requests for auxiliary aids or services are received (California Community Colleges, Chancellor's Office, 1999). In considering the magnitude and responsibility of this task, the OCR has stated, for example, that when a public institution chooses software or hardware that cannot be adapted for access by persons with disabilities, the substantial subsequent expense of providing access is not usually regarded as an undue burden when considering the issue of accessibility could have significantly reduced such expenses when the initial selection was made (OCR Docket No. 09-97-2002, April 7, 1997, as cited in California Community Colleges, Chancellor's Office, 1999).

Are law suits and compliance reviews against universities "the mark of a particularly litiginous society in the United States, or a warning of things to come in Canada?" (Node Learning Technologies Network, 1999). Clearly, rather than just reacting to the latest court ruling, OCR finding, or human rights decision, universities, must implement institution-wide policies that outline the minimum requirements for Web documents. This is especially important in jurisdictions, like Canada, that do not have specific electronic access laws.

Ethical Considerations

Another factor that should motivate universities to implement Web accessibility standards in their online programming (e.g., Web-based distance education courses, libraries, student support services, registration menus, grade-reporting systems, news

lines, etc.) is the fundamental ideal that access to education is a basic human right (Harrison, u.d). As Lance (1996) points out, "computer access measures . . . should be driven not by efforts to avoid litigation but by a desire for all students to have an equal opportunity to participate and achieve their potential" (p. 287). Universities should, therefore, make their Web pages accessible to students with disabilities because it is the right thing to do, not because the law requires it. Furthermore, unless they think about doing the right thing, many universities could potentially do as little as they can legally get away with (Coombs, n.d., as cited in Node Learning Technologies Network, 1998). As noted in paper one, Scadden (1994) further advocates within this framework by highlighting the parallel danger of inequity for people who are economically disadvantaged. He warns that:

> Unless [universities] develop and promote broad distribution of the required usable technologies, and the training needed to use these educational networks, [they] will be developing improved educational opportunities only for the affluent, able-bodied population in . . . society, individuals who already have far better access to the benefits of existing education (p. 4).

Universities, therefore, have a special obligation to serve students with disabilities in online distance education programs. If course, text book, and research information is offered electronically, it can be accessed and manipulated using adaptive technology in the format that best meets the students' specific needs (e.g., students with low vision can

read the content of the screen with screen magnifiers, and students with motor impairments do not have to handle printed materials and turn pages). Also, the availability of academic materials in electronic format would eliminate the need to have the information produced in a variety of other formats, such as braille, for students with a range of learning needs (Shumila & Shumila, 1998) and disabilities. In addition, since distance learning offers flexibility in location and scheduling, and course delivery formats, it can provide many students with disabilities with what may be their best or only chance to access higher education (Paist, 1995). Furthermore, self-advocacy proponents state that "people (even those with severe disabilities) can live more functional, productive lives if they are able to make choices for themselves" (Nosek & Fuhrer, 1992, as cited in Wong, 1997, p. 28). This idea is represented in the example of a university student with a disability who can register for courses through the computer registration system; send and receive e-mail with other students, professors, or support staff; and accomplish all necessary tasks off-campus, such as library research. Before this technology existed, the student was dependent on someone else to help with these procedures because campus facilities could be difficult to access, transportation was unreliable, and/or meetings were time consuming. Self-advocacy is important because the student was able to assume ownership for her education (Wong, 1997). This example is a powerful reminder of the need to develop institutional-wide policies that outline minimum Web accessibility standards.

Like other students, students with disabilities also enroll in online distance education programs because the courses they need for degree completion or career requirements are only offered through that medium. They often only discover this fact shortly before the course is scheduled to begin. The issue of inaccessible Web sites becomes even more serious in these cases, since universities have to scramble to try to put appropriate accommodations in place very quickly. Otherwise, they could face a law suit or a human rights complaint, for example. While this is happening, the student's progress in the course will undoubtedly be negatively affected, causing him or her much frustration. This experience could also potentially affect the student's decision to continue in the course or at the university. Likewise, the student could potentially sue the university and claim financial compensation for emotional duress and the expense of having to take the course at another time. This is yet another powerful reminder why adopting institutional-wide Web accessibility standards is critical.

Practical Considerations

For students with disabilities, the inaccessibility of campus Web sites is a major disadvantage, not only from a legal and ethical standpoint, but from a practical perspective as well. For example, students with disabilities tire of requiring the assistance of others to do their research, pay their tuition, or order their graduation tickets online. They also tire of asking for help to retrieve their course outlines or lecture notes. As a result, many students with disabilities simply avoid using the Internet because they have

experienced or they fear the aggravations that inaccessible Web sites can cause (Bohman, 2000). These realities also present financial implications for universities, especially when campus Web sites are used as recruitment and retention tools. This is yet another powerful reason why universities should incorporate institutional-wide policies for Web accessibility standards.

Recruitment and promotion tools. Decreasing enrollments have sparked competition among universities to recruit and retain students (Johnson, Staton, & Jorgensen-Earp, 1995). In response, many institutions are using the Web to market themselves (Sutherland & Stewart, 1999, as cited in Guthrie, 2000). This trend is consistent with the findings of Guernsey (1998) who reported an exponential growth in the number of potential students (from 4% in 1996 to 78% in 1998) who used university Web pages to get campus information (as cited in Strange & Banning, 2001). Within this context, D'Angelo & Little (1998) warn that "the design of the page not only sends a message to the user about the university, it also affects whether or not the user goes beyond the first page" (p. 71).

According to Haughey (1994), participation in distance education is expected to grow due to changes in the Canadian economy, which will require new educational skills (as cited in Hardy Cox, 2000). According to Paist (1995), increasing numbers of students with disabilities are already coming to distance education programs for their course work. Also, as distance education programs continue to grow, competition mounts. Where

students have a choice, they will judge universities by both the quality of the advertising materials they produce and, perhaps even more, by the level of student support they offer. The provision of high quality "after-sales" service is, therefore, a necessary and cost-effective way of retaining students and an essential humanizing element of any distance education program (Simpson, 2000).

Not surprisingly, because of Section 504 and ADA requirements, American public universities have a competitive edge in attracting students with disabilities world wide. Canadian institutions cannot afford to lag behind if they are to remain competitive and welcome students with disabilities to their campuses. This is especially important in Atlantic Canada, where enrollment figures are declining because of demographic trends. Consequently, universities that actually enforce their institutional-wide policies on Web accessibility standards will be better positioned to respond to the needs of students with disabilities. Equally important, the more "reader-friendly" Web-based materials are, the less frustration all students will experience completing their learning tasks. This is particularly important since attrition within virtual learning environments is alarmingly high--up to 75% of students fail their first course (Ross, 1989, as cited in Hardy Cox, 2000). Interestingly, several studies on attrition, particularly in Web-based courses, have found that a major obstacle for distance learners is the difficulty accessing online materials (Jonassen & Grabowski, 1999, as cited in Hricko, 2000).

Financial considerations. Building universal design principles into Web-based materials is clearly more cost effective than retrofitting them after they have been published. Although the initial design and development costs will not be negligible, they will decrease as universal access methods and routines become familiar and available. In particular, the design, storage, and distribution of separate forms of curriculum to different learners, as needed, does not make sense economically, particularly when estimates of learners who need special accommodations (e.g., those with disabilities or cultural barriers) can be as high as 40% (Center for Applied Special Technology, 2002). Furthermore, universities that implement policies that specify minimum requirements for Web accessibility can potentially benefit from spin-off effects. This can include an international reputation as an accessible distance education provider coupled with a corresponding increase in student enrollments.

Increased usability for all people. Another fundamental reason why universities should implement institutional-wide policies that outline Web accessibility requirements is to increase usability for all people. This means that not only people with disabilities will be able to access campus Web pages, but also, for example, those with old browsers, slow Internet connections, and no sound cards (Node Learning Technologies Network, 1998). Campus Web pages will also be accessible to individuals who experience injuries, such as a severed arm, or aging-related conditions, such as carpal tunnel syndrome. In fact, universities that design around these needs today can avoid playing "catch up"

tomorrow (Kautzman, 1998). Bohman (2000) further emphasizes the importance of implementing universal design principles in anticipation of future needs. For instance, he states that it is just a matter of time before people without disabilities complain that they cannot access their favourite Web site from their cell phone or other alternative device.

Policy Development

Undoubtedly, the increase in lawsuits in the United States over Web accessibility, both in the public and private sectors, has motivated university officials to re-evaluate their existing policies for access (Hricko, 2000) or to develop policies for the first time. Significant OCR rulings in this area have also likely fueled activities in this area. For instance, as noted earlier, the OCR has ruled that "there is an affirmative duty to develop a comprehensive policy in advance of any request for auxiliary aids or services" (Wadell, 1999, as cited in Hricko, 2000, p. 399). Equally significant, it has ruled that it is a direct violation of law for post-secondary institutions to respond to individual requests for accommodation on an ad-hoc basis (Hricko, 2000). This conclusion is consistent with the opinion of Wolforth (1998) who advises that "a system which functions by determining accommodations on a case-by-case rather than on the basis of institutional policy can . . . prevent students from receiving the assistance . . . they require" (p. 55).

As universities extend their outreach over the World Wide Web and allocate resources to expand distance education programs, it is pertinent that they develop detailed written policies on Web accessibility (Hricko, 2000). According to Wolforth (1998),

"policies not only serve the purpose of a public commitment towards [students with disabilities], they also ensure that the institution as a whole is accountable for that commitment, not just the designated service provider" (p. 55). She further suggests that students "seem to feel both welcomed and empowered by the implementation of such policies" (p. 55). This is consistent with the earlier findings of Hill (1994), who studied the perceptions of students with disabilities at Canadian universities regarding the need for institutional written policies. She found that approximately 87% of the participants indicated that formal written policies are necessary (e.g., so professors and students are aware of their rights and responsibilities and educational institutions are accountable for enforcing and monitoring accessibility requirements).

Canadian universities are making considerable progress concerning policy development for students with disabilities. For instance, Cox & Walsh (1998) found that approximately 75% of Canadian universities have institutional disability policies, although neither of the policies spoke directly to Web accessibility issues. That finding was replicated in their follow-up research on disability policy issues and trends in Canadian higher education (Walsh North & Cox, 2002). The absence of Web access policies at this time is surprising, particularly since most of the policies reviewed for both studies include review mechanisms that are activated at regular intervals. In fact, some of the policies were reviewed and updated between the first and second studies.

Hricko (2000) further advocates for policy development in this area by warning that the accreditation of distance education programs may very well include an evaluation of the level of accessibility in a university's Web-based courses. This looming eventuality is another powerful reminder of the need to adopt a proactive stance and develop Web accessibility policies up-front rather than when confronted with a difficult situation. Furthermore, as Gadbow & Du Bois (1998) point out, students with disabilities should be included in all policy development and review activities. This process can demonstrate the university's interest in creating a positive, inclusive learning environment.

Barriers to Policy Development

Given the legal, ethical, and practical facets of accessing online learning environments, and the growing research base in this area, it should follow that universities will proactively develop comprehensive Web accessibility policies. However, as McGuire & Brinckerhoff (1996) have noted, policy generally evolves, starting with a single, isolated incident, such as a request from a student who is deaf for a transcript of an audio track on a course Web site, and develops into the need for institutional policies and procedures (as cited in Shaw, McGuire, & Madaus, 1997). Some common excuses and misconceptions that can potentially impede policy development are discussed below, along with practical suggestions for rebutting these arguments whenever they arise.

Creative/Academic Freedom

Some professors and Web designers will argue that adhering to accessibility guidelines restricts their freedom to be creative (Hricko, 2000). Other educators might more pointedly protest that such policies interfere with their academic freedom, especially their right to freedom of teaching, freedom to express freely, and freedom from institutional censorship (UNESCO, 1997, as cited in Scott, 2002). However, making a Web page "look good" matters very little if all students cannot access the information. Admittedly, it may be difficult to anticipate the accessibility needs of every potential user or difficult to create parallel text-only versions of every Web page. Regardless, educators and other campus Web designers have a responsibility to provide an accessible learning environment to students with disabilities. Therefore, at the very least, they should modify sections of their Web documents that contain critical information for end users (Hricko, 2000). This includes, for example, information about admissions and registration processes, the university's catalogue, student grade reports, and professors' lecture notes, reading lists, and online tests.

Limited Resources

It is often argued, particularly in a time of scarce resources, that the money needed to make adaptations to campus Web pages is too much to spend on just a few students. This argument should be discredited whenever it arises, since it is cheaper to design for accessibility from the start than it is to implement clumsy and expensive retrofits. Also, as

noted earlier, the computer and information technology accommodations made today for students with disabilities can benefit many other sectors of society (Ekberg, 1999; Falta, 1992; Nagler, 1993, as cited in Fichten, Asuncion, Barile, Fossey, & de Simone, 2000).

Admittedly, there are costs associated with retrofitting campus Web sites. For example, the California Community Colleges received $11 million from the state to put the federal requirements in place (Foster, 2001). However, most of this design work can be done quite easily by a person who knows how to modify a Web site and can follow guidelines developed by other entities (Black, n.d., as cited in Foster, 2001), such as the Web Access Initiative of the World Wide Web Consortium (Guthrie, 2000). Nevertheless, some universities might argue that undue hardship prevents them from making their Web pages accessible to students with disabilities. Clearly, the onus, in such cases, would shift to the university to prove that it is impossible to make these changes without taking drastic action, such as eliminating an academic program or selling a building. O'Connor & Hammond (1998) caution, however, that human rights and equal opportunity commission tribunals usually take the position that educational institutions have sufficient money in their budgets to accommodate students who need high-cost services.

University's Structure and Attitude

Advocates for people with disabilities claim that the real stumbling block to making Web accessibility more widely available is a university's structure and attitude. For example, on some campuses, departments get "bogged down" in squabbles over which

of them will cover the cost. However, if senior administrators are committed to the needs of students with disabilities, the cost can be spread out across several departments or the entire university budget (Foster, 2001). Other educators and Web designers argue that campus-wide standards cannot be enforced because Web authoring is not centralized. For instance, many academic and administrative departments not only have their own independent Web servers, but most prefer to use specific applications in creating Web documents (Hricko, 2000). Since retrofitting all Web pages to make sure they are accessible will be very time-consuming and expensive, universities should develop policies that say "Nothing will get posted unless these rules are followed" (Foster, 2001, ¶ 36).

Hall & Belch (2000) imply that student affairs professionals must assume some responsibility for the absence of policy initiatives on their campuses. They say that this trend is not surprising, since, as a profession, student affairs colleagues have historically valued "doing" over thinking and reflecting. They further suggest that a renewed commitment to time spent in thinking and reflecting may lead them to provide an improved learning environment for under-represented students, specifically those with disabilities, and more thoughtful consideration of policies, programs, and practices in light of their needs. This, in turn, will allow student affairs professionals to stay ahead of potential trends and plan and project programming to meet the needs of students with disabilities.

Implications for Institutions of Higher Education

Based upon the literature reviewed for this paper, several action areas have been identified for universities engaged in the delivery of online learning and student support services. These tasks involve professional competence, strategic planning, and a renewed commitment to time spent in thinking and reflecting. Student services professionals can be viewed as policymakers, highlighting for their institutions the legal, ethical, and practical facets of accessing online environments. Educational institutions can continue to introduce emerging technologies to improve student support and achieve greater cost-saving measures, while developing institutional-wide standards that enhance accessibility for students with disabilities and other special needs. Colleagues responsible for providing disability-related services within universities are challenged to play a lead role in moving this agenda forward.

Review and Update Access Policies

Past or current enrollment trends of students with disabilities should not influence the extent to which a university will commit itself to implementing accessibility standards on one or more of its campuses. Students should not be dissuaded from attending a university of their choice because of the lack of accessibility features and services. Consequently, all post-secondary institutions should be constantly reviewing and updating their policies to improve the level of accessibility on their campuses, in consultation with

students themselves. This is critical if universities are to attract new students and to keep current ones (Killean & Hubka, 1999).

Administrators in higher education settings are responsible for knowing about the emerging issues that directly affect policies and procedures for students with disabilities. Unfortunately, there are too many cases where knowledge of the laws came after an experience with litigation. Therefore, thorough knowledge of the laws regarding disabilities (e.g., human rights legislation, Section 504, and the ADA) as they apply to higher education is essential, as is general knowledge of the range and types of accommodations that might be needed (Gadbow & Du Bois, 1998) by these students.

Review of institutional policies adopted at other universities is an efficient and informed approach that may eliminate "reinventing the wheel" (Shaw, McGuire, & Madaus, 1997). Examples of policies adopted by American post-secondary institutions are cited in the Appendix. These Web accessibility policies are provided as a starting point for universities interested in achieving greater levels of accountability for making their online resources accessible to students with disabilities. The absence of any Canadian policies is likely due to the fact that Web accessibility standards have not been legislated in this country as they have in the United States. National-level organizations that operate within higher education settings, such as the Canadian Association of Disability Service Providers in Post-Secondary Education and the National Educational Association of Disabled Students, are challenged to collaborate to provide their members with

mechanisms for discussing the issues, exchanging relevant information (Killean & Hubka, 1999), and developing action plans to make policy development a priority on all Canadian campuses. The Adaptive Technology Resource Centre at the University of Toronto, which is world renowned for providing research, support, and training related to Web accessibility (Adaptive Technology Resource Centre, n.d.), can play an instrumental role in moving this agenda forward.

Secure Resources to Implement Policy Directives

Beyond the development of an institutional-wide Web accessibility policy is the accessing of financial resources to implement the policy. The question of funding is especially critical since many universities cannot afford the thousands of dollars it may take to make their online distance education programs and other campus Web sites accessible to students with disabilities. This is a further reminder why universities should design for accessibility from the start.

Colleagues who provide disability services can play a leadership role in helping their universities finance the tasks associated with implementing Web accessibility policies. For example, to secure greater financial support, they can adopt creative approaches, such as prevailing on their senior administrators and budget officers to lobby legislators or policymakers. Humanizing the fiscal implications, and enlightening the uninformed, by bringing these decision makers to campus and providing them access to programs and students through tours, presentations, and interviews can be an effective way

to influence funding decisions (Rund & Scharf, 2000). Similarly, disability service providers can seek funding from supporters of Web accessibility in the corporate and private sectors (McLaren, 1994, as cited in McLaren, 1995; Hill, 1994). Likewise, knowing the decision makers within the university and garnering their support can help build momentum and increase support for disability programs. Also, because transforming a campus requires broad participation, other campus leaders should be relied on to support this process. This includes senior administrators, faculty advocates, business managers, facilities managers, campus planners, student service personnel (Rund & Scharf, 2000) and students with disabilities.

Develop Sophisticated Ways to Increase Retention

There are financial implications for post-secondary institutions as governments everywhere take an increasingly instrumental view of education and begin to link funding to outcomes (Simpson, 2000). This has already occurred in Alberta, Ontario, and Quebec, where the provincial governments are tying part of universities' funding directly to their graduation or student-retention rates (Matusky, 2001). Declining birth rates coupled with dropping enrollments will force many universities to adopt new recruiting alternatives for mere survival (Banning & Bass de Martinez, 1983). Increased competition for students has prompted many institutions to launch expensive student recruitment campaigns; however, it is cheaper to hold on to current students than it is to attract new ones. This competition is being felt especially in Atlantic Canada, where many universities vie for students in a declining pool of young people who decide to stay in the area (Matusky, 2001). Previously

untapped sources for prospective students, specifically the nontraditional and culturally diverse groups within society (e.g., adult learners, persons with disabilities, and ethnic minorities), will become increasingly sought after by admissions officers. However, with this inevitable and welcome increase in the enrollment of nontraditional students, universities must develop more creative ways to include and involve them in university life (Banning & Bass de Martinez, 1983).

Using Vincent Tinto's retention theory, Peters (1992) proposes administrative strategies to fight the problem of students dropping out of distance education programs. His recommendations focus on supporting the completion goals of students, ensuring that they are integrated academically and socially into the university, and helping them feel part of the campus culture (as cited in Hardy Cox, 2000). This is especially important for "at risk" students, such as those with disabilities who generally require specialized support services. Purnell, Cuskelly, & Danaher (1996) caution, however, that since different people need different services, developing a blanket approach for servicing all distance learners would be improper (as cited in Hardy Cox, 2000). Clearly, the key to achieving increased enrollment and student retention is to provide exceptional student support services. Furthermore, with tuition fees covering an ever greater proportion of university operating budgets, no institution can afford to see many of its students leave, for whatever reason (Matusky, 2001). Student services professionals are, therefore, tasked to learn about the individual differences between students (e.g., no two students are alike, even if

they do have the same disability) and to account for these differences when implementing new technologies, programs, and support services.

Provide Inservicing to Faculty and Staff

Given the dramatically increasing use of the World Wide Web within higher education settings, universities must ensure that their information systems and computer services staff understand how adaptive technologies interact with computer systems. Moreover, those responsible for making campus-wide computing decisions must be sensitized to the need to make educated choices in the selection of software that is accessible to all students. Incorporating accessibility for students with disabilities in any campus-wide computer implementation strategy is equally important (Killean & Hubka, 1999).

Sensitivity training to the needs of students with disabilities in online environments, and a copy of the university's Web accessibility policy and implementation procedures, must be made available to all students, faculty, staff, and administrative employees. The policy implications of this approach means that universities will devote specific amounts of their operating budgets to the development and support of staff training. Personnel responsible for providing disability-related services in universities can spearhead these outreach activities.

Conduct Research on the Use of the Internet by People With Disabilities

The effects of Internet training and resources on a person's perceived independence, self-efficacy, and ability to self-advocate, should be studied. This

information could potentially help expedite the awareness of legislators and policymakers, who in turn develop laws and guidelines around Web accessibility standards. This research will benefit not only those with disabilities, but society as a whole, recognizing equal access as a way to attain greater independence for all people (Wong, 1997). Student affairs colleagues responsible for providing disability-related services can play a lead role to move this agenda forward by developing research partnerships with their academic colleagues.

Conclusion

Over the last 20 years, students with disabilities have begun to take their rightful place in higher education in increasing numbers. This development is due in part to the efforts by educational institutions to increase facility and program accessibility. In particular, many universities have established distance education programs to increase access, enabling students who could not otherwise participate in higher education (Rangecroft, Gilroy, Long, & Tricker, 1999; Thompson, 1990, as cited in Hardy Cox, 2000) to pursue lifelong learning. Another key factor contributing to this increase is the emergence of adaptive and computer technologies that can potentially increase the independent functioning of persons with disabilities.

Educational opportunities for people with disabilities and integration into society can only be promoted by making all forms of learning technologies accessible to them. Adopting and applying standards in the creation of Web-based course materials and campus-wide information systems is, therefore, an essential step toward breaking down

new barriers to communication and information. The implementation of institutional-wide Web accessibility policies not only serves the purpose of a public commitment toward students with disabilities, it also ensures that the institution as a whole is accountable for that commitment, not just the designated service provider (Wolforth, 1998).

Belbin (2000) points out, that "well-planned technological development creates service opportunities" (p. 18) for post-secondary institutions. For instance, Web accessibility improvements made for students with disabilities can increase usability for all people, including those with aging-related disabilities, slow Internet connections, and emerging technologies. This factor will be an important recruitment and retention tool for universities who are forced to compete for students in a globally competitive marketplace.

It is hoped that the information included in this paper will give distance education practitioners, student affairs colleagues, university administrators, and other officials a place to begin thinking about the legal, ethical, and practical facets of accessing virtual learning environments. While engaged in thoughtful reflection, they must consider that the attitude of the university's administration, faculty, and staff toward students; its value orientation; its policies; or other factors may produce a poor environment for student growth and development. Under these circumstances, interventions at the institutional level are an appropriate and necessary treatment (Banning, 1980). Consequently, colleagues in student affairs must both welcome students with disabilities to their campuses and initiate policies that increase their opportunities for success. In embracing equality as a value, they must be aware of the individual difference among students and

account for these differences when designing programs and services (Clement, 1993, as cited in Hall & Belch, 2000). Clearly, "the challenge for both academic and student affairs personnel is to work with students to design their campus ecology so that the behavioral outcome is more involvement, awareness, satisfaction, and completion" (Banning & Hughes, 1986, p. 20). The third paper in this folio will advance this discussion by establishing a conceptual and theoretical framework for designing the virtual campus to foster student learning and development.

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Footnotes

[1] This author assumes the increase since 1990 is largely due to the number of children and young adults who were either born with or who subsequently acquired a disability.

[2] For the purpose of this discussion, virtual universities are defined as a process by which students use technology to access educational offerings (e.g., a course or a certificate, diploma, or degree program). They provide convenient access to education without the student being required to go to a university campus.

Appendix

Sample Web Accessibility Policies in American Post-Secondary Institutions

- Boston University

  http://www.bu.edu/webcentral/redesign/specs/standards.html

- Brown University

  http://www.brown.edu/Facilities/CIS/Web/Accessibility/

- California Community Colleges

  http://www.htctu.fhda.edu/dlguidelines/final%20dl%20guidelines.htm

- Colorado State University

  http://www.colostate.edu/Depts/ATRC/Resources.htm

- Georgia Institute of Technology

  http://www.gatech.edu/accessibility/

- Harvard University

  http://webmaster.harvard.edu/accessibility/standards.html

- Massachusetts Institute of Technology

  http://web.mit.edu/ada/waccess.html

- Ohio State University

  http://ada.osu.edu/OSU%20Web%20Accessibility%20Policy.htm

- University of Arizona

  http://uaweb.arizona.edu/ua_accessible/

- University of Chicago

  http://humanities.uchicago.edu/web-guide/accessibility.html

- University of Florida

  http://www.webadmin.ufl.edu/policies/accessibility/index.html

- University of Georgia

  http://www.uga.edu/help/wai/

- University of Kansas Medical Centre

  http://www.kumc.edu/webdev/access/

- University of Minnesota

  http://process.umn.edu/groups/ppd/documents/policy/webaccesspol.cfm

- Utah State University

  http://www.usu.edu/webmaster/design_and_content_web_standards.htm

Paper 3

Using Campus Ecology to Design and Redesign the Virtual Campus with Students with Disabilities

Table of Contents

Using Campus Ecology to Design the Virtual Campus with Students with Disabilities

Introduction

Although access to higher education is increasing for students with disabilities, it does not always follow that those who select this option will find welcoming, supportive campus climates--programs and services that promote choice, independence, and social participation, or adequate supports to foster academic success. Even at universities that have developed model service delivery programs in support of students with disabilities, it is debatable whether these activities have, to any significant degree, influenced the underlying campus climate (Wilson, Getzel, & Brown, 2000). For instance, during their comprehensive external review of services for students with disabilities at Virginia Commonwealth University, Wilson, Getzel, & Brown (2000, Key Findings section, ¶ 1) found that "too much emphasis is placed on the removal of the architectural barriers without adequate consideration of the 'service-oriented' barriers, which are most critical to student success."

Perhaps no where is this historical emphasis on physical accessibility issues more evident today than on the virtual campus. In particular, many students with disabilities are being denied equal access to educational programs and support services, because campus Web pages do not follow a universal (barrier-free) design. For instance, some students with low vision, who do not have access to large-print software, cannot independently

participate in Web-based distance education courses. This situation typically arises when instructional designers do not include an option allowing patrons to manipulate the size of the font on their Web pages. Likewise, some students with limited manual dexterity cannot finish online tests when professors build time-limited response options into the site's design. Furthermore, those with slow Internet connections, non-graphical browsers, or aging-related medical conditions can also be "locked out" of virtual learning environments when a barrier-free design is not used.

Universities must be as committed and creative in helping students participate in campus life as they are in getting them to the institution in the first place (Johnson, Staton, & Jorgensen-Earp, 1995). Academic and student affairs personnel must, therefore, work with students with disabilities "to design [or redesign] their campus ecology so that the behavioral outcome is more involvement, awareness, satisfaction, and completion" (Banning & Hughes, 1986, p. 20).

As articulated in the introduction to this paper folio, student affairs, by virtue of its historical commitment to differences and the espoused values of the profession (e.g., human dignity and equality), can assume leadership for creating campus learning environments that are inclusive, diverse, and affirming (Hall & Belch, 2000). Its role in this respect can, however, be challenging since the lack of a well-defined identity has historically left student affairs in an ancillary position to academic affairs. This situation can be attributed to the inability student affairs professionals have experienced over the

years to articulate their relationship with the academic mission of the institutions where they work (Hurst & Morrill, 1980).

While "border crossings" (Fried, 1995, p. 185) from academic education to student development education can be difficult, they are possible. First, however, student affairs professionals must believe that their work is educational and be able to explain what they do and what and how students learn. They must also be able to discuss theory, process, and research. Equally important, they must remember that they are members of the educational staff, as well as the administrative staff (Fried, 1995).

This paper will examine campus ecology[1] as a conceptual framework for designing intervention strategies for students with disabilities in virtual learning environments. Support for this perspective will be provided by (a) contrasting it with the medical model adopted by the medical helping professions, (b) the universities' failure to understand the role established services may play in maintaining the status quo, and (c) the historical response universities have made in assisting students to adjust to the campus (Banning, 1980). In particular, *in loco parentis,* as a rationale, which had student affairs professionals acting in the place of parents, will be critiqued. Reasons for why its obsolescence was inevitable will be reviewed.

This paper will also highlight the importance of the relationship between campus ecology and student development. The terms "ecology" and "environment," and variations thereof, will be used synonymously throughout the discussion. Student development

theory will be examined to provide a conceptual framework for explaining the varied ways in which students grow and change during their university experiences. Central to the development concept is the belief that students grow in their ability to make more differentiated responses to the demands in their environments (Banning & Cunard, 1985). Student development theory will also be reviewed to identify specific conditions in the virtual campus environment that either encourage or discourage growth and development. Especially important to this discussion is the fact that an ecological approach assumes environmental (institutional) change as well as individual student change (Banning & Bass de Martinez, 1983). In addition, the ecosystem design process (Banning, 1980) will be presented as a useful working model for designing intervention strategies for students with disabilities in virtual learning environments. A practical application of this model in a distance-education setting will also be included.

The Lack of Attention to Campus Environments

Historically, student affairs programs have attempted to focus on the management of the student body on campus. These efforts have been primarily directed at the student as an individual and have not generally offered a systematic way of serving students by managing the campus environment. Specifically, they have focused on the need for the individual student to adjust and have failed to acknowledge the broader need for the institution to change. This failure to manage broader change strategies is largely due to (a) the adoption of the medical model by the medical helping professions (e.g., medicine

and nursing); (b) the universities' failure to understand the role established services may play in maintaining the status quo; and (c) their perception of their role *in loco parentis* (Banning, 1980).

Medical Model

Historically, the predominant approach for the medical helping professions has been the medical model, in which individuals are described as ill. The treatment is focused on curing the person, or at least, on helping him or her to cope. The treatment is only begun if individuals present themselves for help or if they are referred to the person who administers aid. Any proactive or preventive measures aimed at conditions outside the individual are not in harmony with the passivity of this model (Banning, 1980).

Given the medical model's focus on helping, it is easy to see how the student affairs profession has been influenced to work primarily with individual students (Banning, 1980). Within this context, academic accommodations (e.g., assigning a reader to a student who is blind because the course Web site does not include verbal descriptive tags for visual images) have traditionally been provided to students with disabilities on an individual basis. First, however, students must self-identify to the appropriate service provider and supply the required documentation to support their request. As Hahn (1988) suggests, this approach "implies that it is the individual student who needs to change, rather than the conditions of a 'disabling environment'" (p. 349, as cited in Jones, 1996).

Conditions, as mentioned above, can be changed if the institution adopts a universal design in the creation of its Web resources. Instructional designers would then

be required to include verbal descriptive tags for all graphical images. Consequently, students who are blind would be able to use screen reading software to access campus Web sites. The management task associated with this intervention would involve the development of an institutional policy, and implementation procedures, for the creation of all Web resources.

Role of Established Services

The universities' failure to understand the role established services may play in maintaining the status quo (Banning, 1980) has also contributed to the lack of attention to the campus environment. For instance, for over a quarter century Canadian universities have been responding to the diverse needs of students with disabilities through the provision of accommodations and support services (Cox & Walsh, 1998). However, as previously noted, these arrangements are generally only provided when students self-identify and supply the appropriate documentation. Moreover, when universities expand into virtual learning environments, often nothing changes. Instead of proactively initiating steps to adopt a Web accessibility policy, student affairs and academic service providers often have little choice but to continue assigning readers, sign language interpreters, etc., to individual students who "qualify" for such assistance. Typically, their efforts to move beyond maintaining the status quo are motivated by the actions of senior administrators, who refuse to allocate sufficient resources to implement universal design standards. These officials often claim that the cost is simply too prohibitive for the small number of students involved.

Practice of In Loco Parentis

The influence of the practice of *in loco parentis* on the student affairs profession has also contributed to the lack of attention to the campus environment (Banning & McKinley, 1980). In fact, for many years this ideology provided the foundation for student affairs in higher education. Housing that was clean and comfortable, financial aid, counselling for personal problems, class attendance, etc., all reflected the role of student affairs professionals as onsite parents (Hurst, 1987). In particular, the *in loco parentis* concept highlighted the student and his or her adjustment to the educational process (Hurst & Morrill, 1980).

The effectiveness of this rationale began to decline following the Second World War with the infusion of veterans into the student population. Furthermore, during the 1960s, managing services and supports for the mutual benefit and development of both students and the campus environment came up against the conflict over the values and social expectations of that time. Specifically, the concept of *in loco parentis* was found to be unacceptable to many students and to many student affairs professionals because it was incapable of (a) providing a framework for understanding the tremendous changes that had taken place in university students over the years, (b) predicting what students needed, and (c) managing services for the mutual welfare and development of both students and their institutions. In hindsight, *in loco parentis* was destined to fail from its very beginnings because it lacked adequate theoretical and conceptual roots (Hurst, 1987).

Student Development

In loco parentis was eventually replaced by concepts of human development as applied to the university-age population. In particular, during the 1960s, the notion of student development emerged as the conceptual foundation of student affairs. Rather than seeing themselves as regulators and managers of students' lives in the absence of parents, student affairs professionals began to view themselves as educators with a responsibility for helping students obtain the skills, knowledge, and resources needed to take full advantage of their university experience (Hurst, 1987).

The concept of student development endeavours to embody the myriad ways in which students grow and change during their post-secondary experiences. Basic to the development concept is the belief that students grow in their ability to make more differentiated responses to the demands of their environments. Much has been written about the challenge and support dynamic that triggers the development; the ways it moves through levels, stages, and positions; and the theories and models that seek to provide a framework of understanding (Banning & Cunard, 1985). In particular, theories of integration (Tinto, 1993), involvement (Astin, 1993), and mattering (Schlossberg, Lynch, & Chickering, 1989) address the importance of the interaction between the student and the environment (as cited in Aune, 2000). Other student development theories are also useful for explaining this relationship. For example, psychosocial theory explores the personal and interpersonal aspects of university students' lives. Cognitive-structural theory examines students' intellectual development and considers how they interpret their

experiences. Typological theory further suggests that students are innately different from one another, possessing diverse sets of characteristics that affect how they process information, make decisions, and handle developmental challenges (Evans, 1996).

Equally significant to this discussion are the constructs of identity and development (Chickering, 1969; Erikson, 1980), which includes the "ability and disability" (McEwen, 1996, p. 204) dimension. Within this context, the social constructivism framework for understanding students with disabilities (Jones, 1996) will be discussed later in this paper.

Campus Ecology

Initially, the student development movement displayed a fundamental weakness by not recognizing that occasionally campus problems are caused by deficits in the environment and not the student (Hurst, 1987). Within this backdrop, Banning & Bass de Martinez (1983) contend that approaches which place the burden of change and adjustment on the nontraditional student are neither practical in terms of responding to large numbers nor ethically defensible. On a positive note, Hurst (1987) suggests that student development concepts have more recently "been enriched and given new meaning with the introduction of campus ecology as a more comprehensive foundation" (p. 6).

Theoretical and Conceptual Foundations

Campus ecology developed in higher education from the social ecological approach, which views behavior as a function of the person-environment relationship (Huebner, 1989). As noted earlier in this paper, this term is used to describe the

transactional relationship between students and the campus environment. The organism of interest is the student; the environment being examined is the campus; and the behavior can include any outcome, such as student development, satisfaction, or retention (Banning & Hughes, 1986). This analysis is based on the formula Lewin proposed for understanding the interaction between the organism and its environment--B = F(P x E). In simple terms, it describes behavior (B) as a function (F) of the person (P) interacting with the environment (E) (Lewin, 1936, as cited in Hurst, 1987). According to Hurst (1987), Lewin's (1936) formula stands as a major contribution to the conceptual base of the campus ecology movement. Hurst (1987) further notes that similar ideologies emerged between the 1930s and 1950s by psychologists such as Skinner (1938) and Tolman (1951).

During the sixties and early seventies, a number of psychologists and educational theorists developed conceptualizations that applied ecosystems theory to institutions of higher education (e.g., Barker, 1968; Beach, 1960; Lauterbach & Vielhaber, 1966; Moos, 1976; Pervin, 1967; Stern, 1970; Walsh, 1973, as cited in Hurst, 1987). However, according to Hurst (1987), the application of interactionist thought directly and exclusively to the campus, as both remediation and initial design, began in the seventies (e.g., Banning, 1972, 1973; Delworth & Piel, 1978; Huebner & Corazzini, 1978; Kaiser, 1972a, 1972b; Morrill & Hurst, 1971 as cited in Hurst, 1987). For instance, it was Banning who developed the campus ecology concept in higher education (Banning & Hughes, 1986). The interactional model stands in sharp contrast to the medical model by

recognizing that it is the interaction between an individual and the environment that determines if a characteristic becomes a disability (Aune, 2000). This model will be expanded upon later in this paper. More recent scholarship of the emergent campus ecology movement includes the work of individuals such as Aune (2000), Banning & Bryner (2001), Strange (1991, 1996, 2000a, 2000b), and Strange & Banning (2001). Meanwhile, as Hurst (1987) earlier contended:

> It is important, however, to recognize that serious attention to campus ecology, as a framework within which diagnosis and intervention can occur, is a relatively recent concept. In many ways, the profession is still on the frontier of what appears to be rather fertile theoretical soil (p. 10).

Strange (2000b) supports this view by suggesting that until recently, few conceptual reviews (e.g. Strange, 1996) have attempted to synthesize what is known about the nature and dynamics of campus environments, or how various features impact student learning and development. He argues that the need for such an overview increases in importance as higher education continues to diversity its mission and the types of students it attracts.

According to Banning & Bryner (2001), campus ecology is not a student development theory, but a method of thinking about the processes associated with student development. Huebner (1989) further notes that "it is largely pragmatic, sometimes political, and nearly always a participative activity. As such, it is generally atheoretical, although it draws on theoretical and empirical work from several intellectual traditions" (p. 165) including psychology and ecology.

Key Components of Campus Environments

The essential components of all human environments are their physical design and layout, the characteristics of the people who occupy them, the organizational structures associated with their purposes and goals, and the inhabitants' collective social constructions of their prevailing press, social milieu, and culture (Moos, 1986; Strange & Banning, 2000, as cited in Strange, 2000a). Strange (2000a) suggests that these four sets of components--physical, human aggregate, organizational, and socially constructed--can help educators and advisors of students with disabilities to understand the essential features of universities that, in turn, mold the experiences and outcomes of these students.

Some of the specific features in the campus environment include the physical premises, faculty and staff, administrative policies and procedures, academic advising, curricular offerings, the living situation, peer interaction (Hurst, 1987), and the emerging virtual campus (e.g., Web-based distance education courses, online student supports, and the campus intranet). The campus environment has also been described in abstract terms by individuals such as Blocher (1974) who suggested that opportunity subsystems, support subsystems, and reward subsystems play a role in shaping students' educational experiences (as cited in Banning & Hughes, 1986).

Campus Environments and Student Development

According to Strange & Banning (2001), the campus environment can foster student learning and development in two important ways. First, the actual features of the campus can influence complex behaviors, such as the encouragement and discouragement

of learning and development. Second, student involvement in designing or redesigning campus environments can promote the acquisition of skills required for the process of learning and developing. Rapport (1982, as cited in Banning, 1989a) suggests that the key to understanding how environmental features affect student behavior is the belief that the environment produces non-verbal communications. For instance, buildings, signs, traffic patterns (and campus Web sites) all communicate non-verbal messages to students. They not only give cues for particular behaviors, they also give clues to important social and attitudinal factors. In fact, Mehrabian (1971) found that the non-verbal messages may be more powerful than the spoken word, since they can influence students' sense of well-being, their feelings of belonging, their identity, and their sense of being valued by the institution (as cited in Banning, 1989a). Therefore, as Paul (1980) points out, "in order to maximally understand or influence educational outcomes, educators and student personnel professionals should attempt to take both person and environment factors into consideration" (p. 63).

Person-environment congruence. Strange (1991) contends that the "press toward conformity" (p. 167)--similarity of interests and opportunities--affects the degree to which an individual will likely be attracted to and remain stable in an environment. Strange (2000a) further suggests that the quality of anyone's experience depends on his or her congruence, or degree of fit, with the dominant group. In particular, an individual who is placed in an incompatible (e.g., inaccessible) environment will be more likely to leave that setting. One can imagine, for instance, how a student who is deaf might feel in a

Web-based course that does not provide transcripts or captions of audio files. According to Strange (2000a), he or she will either struggle to adapt to the preferences, values, attitudes, and expectations of the majority or leave the disabling environment. Consequently, experiencing a psychological sense of belonging on campus is necessary for the pursuit of opportunities leading to learning, growth, and development (Strange & Banning 2000, as cited in Strange, 2000a).

Holland (1973) earlier contended that person-environment congruence is the best indication of individual satisfaction and stability in an environment (as cited in Strange, 1991). He suggests that individuals respond to situations of person-environment incongruence by either (a) leaving the environment and seeking a new, more congruent setting, (b) trying to change the present environment to make it more suitable, or (c) adjusting to the current environment (as cited in Strange, 1991). According to Strange (1991), which option is selected is generally "a function of the degree of differentiation and consistency of the individual's interests and the degree of differentiation and consistency of the environment" (p. 169). Therefore, assuming that successful attraction, matriculation, and retention of students are desirable goals for all universities, those in charge of recruitment and admissions must pay particular attention to the degree of institutional fit for any prospective student. Stress and related symptoms caused by person-environment incongruence are additional burdens that students who do not share the dominant characteristics of the campus population must shoulder as they make their

transition into the university environment. Therefore, higher attrition rates and incidences of adjustment problems should not be surprising under these conditions (Strange, 1991).

The process of becoming a successful student can unintentionally reinforce disabilities. Unlike their peers who do not have disabilities, students with disabilities cannot focus completely on their academic careers since they cannot suspend their disabilities. Therefore, a list of practical tasks is likely to stem from their efforts to manage their disabilities in an inaccessible environment (Borland & James, 1999). For example, a student with a visual-processing learning disability might have to find a volunteer to read aloud the lecture notes on the course Web page, if an audio track is not built into the original design (and the student does not have access to a screen reader). Borland & James (1999) contend that while this is happening, assignment deadlines are missed or requests are made for extensions or special circumstances to be taken into account. They also suggest that there is a danger that the student and his or her professors will see the need for special treatment as a sign of academic failure. Hence, a spurious association between disabilities, poor performance, and special treatment may be created. This situation could become even more difficult if the student's classmates see the need for special treatment as an unfair advantage, especially in graduate programs where competition for grades can be fierce.

The situation outlined in the previous example can negatively affect a student's self-esteem and his or her intellectual and personal development. Bandura (1989) suggests that "persons feel in control when they believe they have value and the ability to

deal effectively with their environment" (as cited in Nosek & Fuhrer, 1992, p. 10). Moreover, Nosek & Fuhrer (1992) assert that on a daily basis, individuals are generally much better able to have strong feelings of self-worth, communicate assertively, and make sound judgements when their well-being and basic survival are not being threatened. They further state that this is sufficient reason for placing a major emphasis on environmental factors. McMillan & Forsyth (1991) further support this position by suggesting that "students are more likely to be motivated if their needs are being met, if they see value in what they are learning, and if they believe that they are able to succeed with reasonable effort" (as cited in King, 1996, p. 236).

When students are unable to succeed because the educational institution has not adapted itself to the underlying campus structure, (i.e., the needs of the diverse groups that comprise the student body), direct intervention is necessary. In such cases, an ecological perspective can serve as a useful framework from which to redesign the campus to adapt to the educational needs of students, such as those with disabilities. By adopting this approach, student affairs professionals can respond to the ecological relationship between students and the campus environment. They will no longer be restricted to maintaining the status quo by changing or serving individual students. Especially important is the fact that an ecological perspective can provide a theoretical backdrop and an organizational framework for implementing intervention strategies (Banning, 1980).

Sullivan (1987) contends that whether a student can function successfully in his or her immediate setting will depend on the role demands, supports, and pressures in that setting, and on the supports available from other settings. In fact, Bronfenbrenner (1979) earlier suggested that the developmental potential of a setting will be increased by the number of supportive links that are created between settings (as cited in Sullivan, 1987). For instance, is there a formal mechanism within the institution for distance education, campus computing, and student affairs to collaborate in the design of campus Web sites? An ecological analysis can actually pinpoint the frequency of such supports and the need for public policies to create additional settings and societal roles that support human development. Furthermore, effective educational planning requires policy commitments to values and goals and use of resources. A sound base of social policy is also necessary in developmental research and practice; because knowledge about values and goals alerts the administrator, counsellor, researcher, academic, etc., to environmental factors that are essential for cognitive, emotional, and social development (Sullivan, 1987).

Ecosystem design process. Campus design, the engineering arm of campus ecology, is concerned with the intentional creation of campus environments that foster student development (Kaiser, 1975). As noted previously, the concept of campus ecology suggests the elements for an ecological analysis (i.e., behavior, students, and campus environments) and provides a systematic way of designing and redesigning campus environments using the ecosystem design process (Banning, 1980; Banning & Kaiser, 1974; Huebner, 1979, as cited in Banning & Hughes, 1986). From an analysis standpoint,

the following questions can be raised within the context of this paper: How do students with disabilities perform? What are the characteristics of students with disabilities? What is the virtual campus environment like for students with different kinds of disabilities? Once this analysis is completed, the design question can be addressed: Given the characteristics of students with disabilities and the selection of the valued behaviours (i.e., student satisfaction and retention), how can the virtual campus be redesigned to promote the valued behavioural outcomes?

The ecosystem design process is built on the following assumptions:

1. The campus environment consists of all the stimuli that impinge upon the students' sensory modalities and includes physical, chemical, biological, and social stimuli.
2. A transactional relationship exists between . . . students and their campus environment, i.e., the students shape the environment and are shaped by it.
3. For purposes of environmental design, the shaping properties of the campus environment are focused upon; however, the students are still viewed as active, choice-making agents who may resist, transform, or nullify environmental influences.
4. Every student possesses the capacity for a wide spectrum of possible behaviors. A given campus environment may facilitate or inhibit any one or more of these behaviors. The campus should be intentionally designed to offer opportunities, incentives, and reinforcements for growth and development.

5. Students will attempt to cope with any educational environment in which they are placed. If the environment is not compatible with the students, they may react negatively or fail to develop desirable qualities.
6. Because of the wide range of individual differences among students, fitting the campus environment to the students requires the creation of a variety of campus subenvironments. There must be an attempt to design for the wide range of individual characteristics found among students.
7. Every campus has a design, even if the administration, faculty, and students have not planned it or are not consciously aware of it. A design technology for campus environments, therefore, is useful both for the analysis of existing campus environments and the design of new ones
8. Successful campus design is dependent upon participation of all campus members including students, faculty, staff, administration, and trustees or regents (WICHE, 1973, as cited in Banning & Hughes, 1986, pp. 20-21).

For the purpose of this paper, the stimuli in the campus environment (see No. 1 above) has been broadened to include virtual settings, such as the campus intranet, online libraries, and Web-based distance education courses.

The ecosystem design process includes the following steps:

1. Designers, in conjunction with community members, select educational values.
2. Values are then translated into specific goals.
3. Environments are designed that contain mechanisms to reach the stated goals.

4. Environments are fitted to students.
5. Students' perceptions of the environment are measured.
6. Student behavior resulting from environmental perceptions is monitored.
7. Data on the environmental design's success and failure, as indicated by student perceptions and behavior, are fed back to the designers in order that they may continue to learn about student/environment fit and design better environments (WICHE, 1973, as cited in Banning & Hughes, 1986, p. 20).

The steps in this model are interdependent, so the planning can begin at any of the steps. However, if the campus is yet to be constructed, the design process would start with Step 1 (the selection of educational values) and proceed on through to the final step (feedback). This is quite rare, because most campuses have been established for a number of years; and the goals and values of the institution have been selected and possibly published in various documents (e.g., the university's strategic plan, student catalogues, etc.). Therefore, in most cases, the design process would begin at Step 5 (measuring students' perceptions of the campus) and move on to the other steps in the process to map out the current ecological relationships between the students and the environment (Banning, 1980). Design teams must remember, however, to return to Step 1 before making any attempts to redesign the campus environment. This is the most critical step in the entire process, since it includes the requirement to select educational values (Banning & Hughes, 1986).

Campus personnel may use existing instruments or develop their own, if necessary, to obtain the assessment information. The importance of this information is that it can be used to map out specific elements in the campus environment that cause students to be distressed or dissatisfied. An ecology can then be developed to promote the maximum growth and development of students. This assessment process may also lead to the conclusion that the original values and goals chosen by the institution are no longer appropriate to meet the structure of the campus (the diversity of the student body) and that selecting new values and goals becomes the management task. Or, it may be found that the original goals and values are still appropriate but that the programs and policies related to these goals need to be revised. If so, the management task then becomes the development of new programs and policies to achieve the institution's original goals. Successful management of the campus ecology depends on how well the managers carry out the other steps in the design process (Banning, 1980). For more detailed information on how to implement the ecosystem model on campus, refer to the *Training Manual for An Ecosystem Model: Assessing and Designing Campus Environments* (Aulepp & Delworth, 1976).

Use of Ecological Approach in Higher Education

The ecological approach has shown great versatility in its applications within higher education. In fact, Banning (1989b) points out that the topic receiving the most attention is the issue of congruence between student and environment and its relationship to the following areas: enrollment management (Williams, 1986); retention (Clarke,

1987; Pascarella, 1984; Banning, 1984a); and stress (Tracey & Sherry, 1984; Witt & Handal, 1984). A review of the campus ecology literature suggests that although the ecological approach has been used to study different student populations, including commuters, first-year students, and lesbians and gays (Banning, 1989; Banning & Hughes, 1986; Nicoloff, 1985, as cited in Banning, 1989b), it has not been used to design intervention strategies for students with disabilities in virtual learning environments. Consequently, this paper can potentially contribute to the campus ecology research base.

Applying the Ecosystem Design Process to the Virtual Campus

To illustrate the ecosystem design process, assume that personnel responsible for providing disability-related services on campus have been following the emerging research on Web accessibility issues in higher education, as described in the literature review for this paper folio. This includes a review of the barriers encountered by students with disabilities; the solutions for increasing Web content accessibility; and the legal, ethical, and practical facets of accessing virtual learning environments. These individuals, who are members of the university's student affairs team, have recently determined that their institution is not using a universal design approach to create its Web-based distance education courses. In particular, they are concerned that students with disabilities are being denied access to the institution's virtual learning environments. Consequently, they have decided to initiate the process to develop an institutional-wide policy on Web content accessibility. The following exercise is based loosely on Banning & Hughes' (1986) application of the ecosystem design process to commuter student programming.

Ecological Analysis

Steps 1 to 4 in the ecosystem model will be skipped in this application exercise since the challenge is to redesign an already existing campus environment. Step 5 (measuring students' perceptions) within the ecosystem design process is, therefore, the logical place to begin the analysis, since the university in question has been delivering Web-based distance education courses for several years (Banning & Hughes, 1986). A needs assessment should be performed to distinguish between situations that represent the appearance of fundamental needs and those that do not (Fawcett, Huebner, & Banning, 1975). In fact, according to Sharpe (2000), "the very nature of a needs assessment addresses the discrepancy between what is and what ought to be. The process therefore examines and compares what is currently being done in an identified area to what is considered to be required" (p. 1). For instance, do students with disabilities perceive the campus as valuing them? To what environmental referent (e.g., people, policies, procedures, curricula, etc.) are these perceptions tied? (Kaiser, 1978, as cited in Banning & Hughes, 1986).

In Step 6, the students' behaviour in the virtual campus environment is observed or monitored and compared with the perception of the virtual campus environment and the goals of the campus (Banning, 1980). For instance, What types of barriers do students with different disabilities face in Web-based distance education courses? Is the retention rate of students with disabilities significantly lower than what would be expected on comparable campuses? Do students with disabilities report distress or dis-satisfaction on

their course evaluation or exit surveys? If the design of the virtual campus is working, there should be a high correlation among behaviour, perceptions, and goals (Banning, 1980).

In Step 7, the information and data gathered from the previous steps are fed back through the design process to review the previously selected values--to identify the design's success or failure (Banning, 1980). Were the values reasonable? Were the goals reflective of the values? The purpose of this feedback step is to start a recycling process to make the corrections whereby the values and the goals for students with disabilities in virtual learning environments can be achieved (Banning & Hughes, 1986).

This model is ideally suited for redesigning online learning environments for students with disabilities, because it uses a double-loop learning process for managing feedback. In particular, rather than merely changing routines when redesigning campus Web pages, the emphasis is on changing the values and policies from which the original routines were developed (Banning & Hughes, 1986).

Redesign Process

For the purpose of this exercise, it is assumed that students with disabilities reported frustration and dis-satisfaction with the design of the university's Web-based distance education courses. Therefore, the design team must return to Step 1, which stipulates that all who will be participating in the virtual environment will play a role in setting the values for the campus. The logistics of this requirement are usually handled by some process by which representatives from key stakeholder groups are chosen to be

members of the design team (e.g., students with different kinds of disabilities, distance education practitioners, student affairs professionals/disability specialists, instructional designers, faculty members, information technology/computer specialists, librarians, senior administrators, etc.). Within this step is the requirement to select educational values. In reference to students with disabilities, two values might emerge. One value could be that students with disabilities should interact with the virtual campus environment in such a manner that the interaction produces satisfaction for them (i.e., the environment meets their accessibility requirements). A second value might be that the interaction between students with disabilities and the virtual environment not only produces satisfaction but also growth and development.

In Step 2, the selected values are translated into specific goals (Banning & Hughes, 1986). A goal for the satisfaction value might be that the retention of students with disabilities in Web-based distance education courses should be significantly above the average found at similar universities. Likewise, the value for growth and development could be translated into the goal that such growth and development would be evident in an exit interview of graduating students who completed at least one Web-based distance education course during their degree program.

In Step 3, the mechanisms to reach these goals are built into the virtual environment. Such processes could be numerous. A mechanism for the satisfaction value might be the adoption of institutional-wide standards for the creation of Web-based distance education courses, following the guidelines developed by the Web Access

Initiative of the World Wide Web Consortium (W3C) (Guthrie, 2000). Another mechanism might be the development of an educational awareness program for faculty and staff who are engaged in instructional design. This activity could focus particularly on the access barriers students with different types of disabilities encounter on the Web. Practical opportunities could also be provided for participants to incorporate universal design techniques while developing a Web page. Rather than list all the possible programming and design ideas that could relate to the goals in Step 2, readers are directed to Blocher's (1974) organization of learning environments which includes the concept of the opportunity, support, and reward subsystems. In particular, Blocher's subsystems and the elements associated with each subsystem can provide the structure for building environmental mechanisms to attain the stated goals (Banning & Hughes, 1986).

Step 4 requires that the virtual environment be fitted to students. Here, a campus policy (with implementation procedures) is developed to increase institutional accountability for Web content accessibility. This step is especially critical, since too often programs and services are designed without due consideration to the diverse needs of students with disabilities (Banning & Hughes, 1986). Hence, when such programs fail to attract or retain students with disabilities, lack of interest, apathy, demographics, or other reasons might be cited. Nevertheless, how Step 4 might work with students with disabilities is well illustrated. For example, Shumila & Shumila (1998) suggest that the availability of academic materials in electronic format would eliminate the need to have the information produced in a variety of other formats, such as braille, for students with a

range of learning needs and disabilities. Furthermore, Paist (1995) contends that since distance learning offers flexibility in location and scheduling, and course delivery formats, it can provide many students with disabilities with what may be their best or only chance to access higher education.

At Step 5, students' perceptions are measured. Do students with disabilities see the campus as valuing them? Do they recognize the mechanisms that were designed to enable them to reach their goals? To what environmental referent (e.g., people, policies, procedures, curricula, etc.) are these perceptions tied? (Banning & Hughes, 1986).

In Step 6, the students' behaviour in the virtual campus environment is observed or monitored and compared with the perception of the virtual campus environment and the goals of the campus (Banning, 1980). For instance, do students with different kinds of disabilities encounter any barriers in Web-based courses? Is the retention rate of students with disabilities significantly higher than what would be expected on comparable campuses? Do students with disabilities report satisfaction during their exit interviews upon graduation or on their course evaluation surveys? As noted earlier, if the design of the virtual campus is working, there should be a high correlation among behaviour, perceptions, and goals (Banning, 1980).

In Step 7, the information and data gathered from the previous steps are fed back through the design process in order to review the previously selected values--to identify the design's success or failure (Banning, 1980). Were the values reasonable? Were the goals reflective of the values? The purpose of this feedback step is to start a recycling

process to make any corrections whereby the values and the goals for students with disabilities in virtual learning environments can be reached (Banning & Hughes, 1986).

The design or management process associated with the ecosystem design process can be carried out at all three levels of the campus ecology: (a) the "macro-level," or the ecology of large numbers of individuals; (b) the "micro-level," or the ecology of specific campus groups; and (c) the "life-space design level," or the individual imbedded in the total campus ecology (Banning, 1980). Since campus Web pages should be designed to be accessible to all users (e.g., those with slow Internet connections, non-graphical browsers, aging-related medical conditions, and students with disabilities), the redesign process should be implemented at the macro-level. This is consistent with the concept of universal design, which promotes usability for all people. Nonetheless, as Morrill, Hurst, & Oetting (1980) contend, it is an ambitious target, since interventions at the institutional level "would include attempt to alter goals, communications, system linkages, power distribution, information flow, policies, and sanctions" (p. 89). Regardless, this decision will be a prudent one for any university that decides to extend its reach over the Internet, in what is fast becoming a highly competitive global marketplace.

Rationale for Adopting an Ecological Perspective

As evident from the above application of the ecosystem design process, an ecological approach is superior to the practice of *in loco parentis* for designing virtual

campus environments. The reasons are several:

1. It approaches the problem in a more systematic way.
2. It closely examines the interaction of the student with the environment.
3. It is more comprehensive and intentional in its diagnosis and intervention at the variable levels of the individual student, the environment, and the resulting interaction between them (Hurst, 1987).
4. It focuses on preventative measures (Sullivan, 1987).

In contrast, the concept of *in loco parentis* is post-hoc, remedial, reactive, and transactional, and is directed to linear (status quo) treatment solutions (Sullivan, 1987). Particularly important is the notion that an ecological approach assumes that universities themselves bear responsibility for the design and creation of campus environments, constructed appropriately for meeting educational goals (Strange & Banning, 2001). Hence, they must move beyond simply maintaining the status quo by offering traditional services and programs. In particular, the fit between the student with a disability and the university can be managed in a way that includes and encourages institutional change. The ecological perspective is superior to traditional approaches since it promotes the celebration of pluralism and sharing for all. As a result, students with disabilities are not forced to retreat into isolationism; but, rather, the university adjusts itself through policy and program redesign (Banning & Bass de Martinez, 1983).

Major Implications of the Ecological Perspective

Diversity. The major implication of the ecological perspective is that it provides guidance on how to respond to diversity (Banning & Hughes, 1986). For example, instead of requiring students with disabilities to wait until a Web-based distance education course is offered on campus (if that is even a possibility) or ask a friend to help them register for their courses online, the university establishes a time line for designing/redesigning all of its online distance education courses and campus Web pages to include universal design techniques. This feature is particularly important, since the number of students with disabilities who are pursuing university degrees is steadily increasing (Hill, 1992; O'Connor & Hammond, 1998; Wolforth, 1998).

Student involvement. A second implication is the role that students play in designing their campus ecology. In particular, the ecosystem design strategy allows them to create, fashion, execute, and construct (Banning & Hughes, 1986). Also, "involving students in policy development is a way to challenge their level of thinking and create opportunities for their personal involvement in meaningful decision making, which will enhance their moral" (Evans, 1996, p. 178), cognitive, and social development. Their involvement in designing the campus environment becomes more than the politically correct thing to do; it becomes an ethical necessity, since the ecological perspective and the accompanying design process promotes the right of all those who are affected by an ecology to have the opportunity to participate in its design (Kaiser, 1978, as cited in

Banning & Hughes, 1986). Involving students in this activity also provides them with valuable opportunities to develop leadership and communication skills.

Values. A third implication of the ecological perspective and the ecosystem design methodology is the emphasis placed on values, since they direct the design and redesign process (Banning & Hughes, 1986). Within this backdrop, the increasing reliance on campus Web pages to provide registration and grading information to students, is becoming a critical symbol of organizational culture. The assessment of the environment's present state (perceptions and behaviours) against the ideals of the environment's values and goals provides the incentive for redesign (Banning & Hughes, 1986). The implication of this feature of the design/redesign process is that it creates further opportunities for students to enhance their moral development.

Implications for the Absence of an Environmental Redesign Philosophy

Fawcett, Huebner & Banning (1975) suggest that the absence of an environmental redesign philosophy on university campuses could mean lack of adequate educational opportunity for students with disabilities; ineffective engagement of students with disabilities by their environment; and lack of fit between the attitudes, skills, and knowledge taught, with the demands of the educational system. They state that the lack of an environmental redesign philosophy could mean a number of structural inadequacies in the educational system, such as the lack of collaboration, information, and resource sharing within the university; growing rigidity within the institution; and the lack of educational personnel learning new roles (e.g., advocate and campus designer), new skills

(e.g., how to incorporate universal design techniques when creating campus Web pages), and new strategies (e.g., using collaborative processes to enhance accessibility in online environments) to adapt to changing circumstances. Fawcett, Huebner & Banning (1975) further note that if there is no systematic and responsible voice in the process of designing educational change, there will be no mechanisms for identifying needs or deficient environmental structures, which can result in such dire consequences as excessive attrition, ineffective and inefficient student development, and inappropriate skills for dealing with future change. They go on to state that the absence of a direct student voice in the structure of their own development could cause a new era of visible student unrest. Finally, they suggest that, at the very least, decisions affecting their own well-being that are made "for" students rather than "by" student involvement could lead to frustration or helplessness. This could potentially be carried over into the other roles students assume during their lives (e.g., employee, tenant, patient, parent, etc.).

Using Theory to Support a Universal Design for Campus Web Sites

Interactional Theory

Support for the design and creation of barrier-free campus Web sites can be grounded in interactional (social constructivist) theory. As noted earlier in this paper, the historic approach to disability has been from a medical model, i.e., something is wrong with the student, and the expert's job is to return that person to "normalcy." Normalcy in the campus environment has generally been achieved by remediating the student to fit the campus structure (Aune 2000). As Jones (1996) aptly articulates, "to think of disability as

a socially constructed phenomenon is to distinguish between the biological facet of disability and the handicapping social environment in which the person with disabilities exist" (p. 351). Clearly, therefore, the interactions between a student with a disability and the campus environment have a profound influence on retention and completion (Aune, 2000). In particular, as Schroeder & Jackson (1987) contend, low retention rates are reflections of students' inability to manipulate their campus environment in order to make it more responsive to their needs.

According to Gill (1992), the interactional model would suggest that campus settings bear as much responsibility for adjusting to students with disabilities as students with disabilities bear in adapting to their environment (as cited in Aune, 2000). By implication, academic and social integration, not normalization, is what students with disabilities need to be successful at university. Such integration requires just as much adjustment by students without disabilities, faculty, and staff as by students with disabilities. Enright, Conyers, & Szymanski (1996) expand on this point by identifying the two factors that are most critical to the integration of students with disabilities in post-secondary settings. They suggest that the ease of social interactions with peers and the receptiveness of faculty members to accommodate their needs is critical if they are to achieve success (as cited in Aune, 2000). They go on to say that this is not surprising, considering Tinto's (1993) research on the general student population, which found that students' experiences when interacting with the campus environment affect their goals of and commitments to completing their educational programs (as cited in Aune, 2000).

Furthermore, according to Astin (1993), campus involvement can positively affect students' post-secondary experiences (as cited in Aune, 2000). Unfortunately, however, as a group, students with disabilities face frequent discrimination, negation of their goals, and administrative practices that restrict accessibility, restricting their integration into the culture of the institution. As a result, they often find themselves marginalized in bureaucratic structures that are inaccessible and unable or unwilling to adjust (Aune, 2000).

According to Aune (2000, Applying the Interactional Model to Specific Advising Issues section, ¶ 1), "universal design epitomizes the interactional model because the environment is adapted to individuals rather than requiring the individual to adapt to the environment." In fact, academic and support staff can effect a universal design in their services to students in virtual learning environments in a number of ways. First, they can recognize their own assumptions about disability and how those beliefs influence their behavior toward students with disabilities (Fichten, 1988, as cited in Aune, 2000). Second, they can create an atmosphere of mutual respect and trust (Rabby & Croft, 1991; Schriner & Roessler, 1990, as cited in Aune, 2000). Third, they can challenge themselves to understand how disability and the environment interact to create barriers (Aune & Kroeger, 1997; Enright, Conyers, & Szymanski, 1996; Murphy, 1992; Silver, Strehorn, & Bourke, 1977, as cited in Aune 2000). Fourth, they can strive to achieve a balance in focus between disability issues and issues all students face (Fichten, Robillard, Tagalakis, & Amsel, 1991, as cited in Aune 2000). Equally important, they can balance support

while fostering independence (Fichten et al., 1990; Strommer, 1995, as cited in Aune, 2000). In fact, as Nosek & Fuhrer (1992) assert, educational opportunities are among the environmental elements related to developing independence. They further suggest that the perceived availability of resources within a setting is particularly crucial in considering independence.

Implications for Institutions of Higher Education

University administrators, educators, and service providers should review how their practices and policies reflect the principles highlighted in the campus ecology literature. Clearly, the effectiveness of any educational environment--real or virtual, planned or unplanned--is a reflection of its design--what it encourages and expects students to do. In particular, effective educational environments offer opportunities for congruence, encourage involvement, and provide students with opportunities to fulfill their educational goals (Strange, 1996). This section of the paper will explain how student affairs professionals can help their institutions create learning environments that are inclusive, diverse, and affirming.

Role of Student Affairs

The role of student affairs in higher education is threefold: (a) to study and understand the student, the environment, and the consequences of the student-environment interaction in order to pinpoint potential mismatches and needed interventions; (b) to foster student development by providing students with the skills, attitudes, and other resources they need to take advantage of and profit from their learning

environments; and (c) to promote environmental resource development, such as redesign interventions, to create the optimal environment in which human development can occur (Hurst & Morrill, 1980). Examples of specific tasks that can be used to achieve these goals for students with disabilities are outlined below.

Influence the nature of the student-environment transaction. If there is a discrepancy between students' demands and existing conditions in the campus environment, such as the presence of inaccessible Web sites, the student affairs professional has a unique opportunity to influence the nature of the student-environment transaction. This opportunity typically involves great pressure from students for immediate and dramatic change and from the bureaucratic establishment to maintain the status quo (Banning & McKinley, 1988). For example, as noted earlier, senior administrators and governing boards may deem that the cost is too prohibitive for the university to voluntarily redesign its Web sites to incorporate universal design principles. Instead, they opt to wait until a student formally challenges their legal or human rights to receive an accessible learning environment. Strange & Banning (2001) suggest a proactive, preventative approach in such situations by emphasizing that:

> A measure of any educational institution's environmental capacity to encourage and sustain learning is the degree to which it provides the conditions (in real and virtual form) for students' inclusion, safety, involvement, and full membership in a community. In effect, these conditions constitute an "ecology of learning," a state of dynamic balance when student characteristics are synergetic with

> institutional features (physical, aggregate, organizational, and constructed) in support of the outcomes of learning (p. 200).

Sullivan (1987) earlier supported this view by suggesting that intellectual development is affected by what occurs in the emotional, social, physical, and spiritual realms of life, and vice versa. In particular, he asserts that the quality of what is learned in higher educational settings depends on how adequately students understand and manage membership within systems and the relationship between systems.

Interface between students and the university. Paul (1980) suggests that student affairs professionals have a unique vantage point as the liaison between the student and the university. This is because they are frequently charged with a concern for some aspect or aspects of the students' university experience (e.g., accessibility requirements for students with disabilities). Often this means that student affairs professionals, either through formal assessment or less formal contact, learn about particular student characteristics, needs, or problems before anyone else on campus. As a result, they can be better prepared to facilitate the relationship between students and the environment so that the university can become more diverse and students can be engaged in the total learning process (Banning & McKinley, 1988).

Build stronger links with faculty. Student affairs professionals must build stronger links with faculty members, collaborating with them to explore ways to create powerful educational climates for all students (Reisser, 1995). This should not, however, be done in isolation of students with disabilities. In particular, "students should be viewed as

constructivists--persons capable of influencing, planning, and constructing their own environments" (Banning, 1986, as cited in Schroeder & Jackson, 1987, p. 52). Likewise, student affairs professionals must update their policies and practices so that they continue to be truly student-centered, while increasing institutional efficiency and accountability (Reisser, 1995). In fact, Strange (1991) contends that the challenge to higher education today is the creation of campus learning environments that encourage developmental processes in students. He further suggests changing or eliminating any aspects of the environment that are actively stressful or limiting and resisting.

Gain knowledge and skills about environments and students. While the methodology and technology is available to begin the process of mapping out student-environmental transactions in the university environment, which can trigger institutional change, much knowledge and skill in implementation is still required across the institution. Therefore, if student affairs professionals are going to lead their institutions to participate in a nonreactive stance, they must gain knowledge and skills about environments and students and the process of design to foster growth and development (Banning & Kaiser, 1974). As part of this process, they must also know how to adopt collaborative consultation approaches on their respective campuses.

Manage the campus environment. The management task for student affairs can be seen as involving two major components, i.e., managing the campus ecology for student development and managing the campus ecology in terms of services, events, programs, and policies that may improve the educational milieu on campus but are not directly

related to a particular student development goal (Banning, 1989b). The development of an institutional-wide Web accessibility policy, as presented in this paper. is an example of a direct administrative intervention (Morrill, Hurst, & Oetting, 1980) into the campus environment. While this management task is important to the concept of student development (e.g., students who participate in the redesign process will have opportunities to enhance their cognitive, social, and moral development), student development is not the key issue. In this case, access will take precedence over student development. The overriding reason for adopting a Web-accessibility policy is to eliminate a disabling learning environment that denies equal access to students with disabilities. Equally important, an institutional policy will make the university more accountable for creating accessible virtual learning environments.

Conclusion

With greater numbers of students with disabilities pursuing university degrees, it is becoming more apparent that many campuses are not designed to meet the unique and diverse needs of these students (Wilson, Getzel, & Brown, 2000). Clearly, universities must not wait for legal mandates to make their campus environments accessible to students with disabilities. As Strange (2000b) asserts, without experiencing a basic sense of belonging on campus (e.g., free from anxiety), attempts at other goals of learning will probably fail. Specifically, without environmental structures of involvement (Kuh et al., 1991, as cited in Strange, 2000b), "students risk disengagement from the kinds of opportunities that call for their investment and responsibility for their own learning, key

requisites for powerful educational outcomes" (Astin 1985, as cited in Strange, 2000b, p. 19).

> Students feel that they belong when members of the campus community articulate verbally, in written documents, and by their behavior, "We are glad you are here, we want to know you, and we want you to be a part of what we do on this campus." These positive and inclusive messages affect all, and for those who may feel marginalized (as if they do not fully belong), as in the case of some students with disabilities, clearly stated acceptance is especially important in order to integrate students with disabilities into the academic community (Schuck & Kroeger, 1993; Nutter & Ringgenberg, 1993, as cited in Hall & Belch, 2000).

According to Strange (2000a, Conclusion section ¶ 1), the increasing participation of students with disabilities in higher education has "generated new sensitivities to individual differences on campus and the need to create educational environments of ability" that are capable of responding to differences. He further highlights that "educators committed to enhancing the experiences of students with disabilities must encourage policies, practices, and programs that secure, include, involve, and invite all students, regardless of individual differences, into the community" (Conclusion section ¶ 1).

Campus ecology management calls for a shift in the perspectives of student affairs professionals. Their historical concern for individual students must be broadened to cover the whole campus ecology. This new attitude must consider the relationship between students and their environment in the management of both student development programs

and other management functions associated with campus student affairs. Although these activities can be implemented in several ways, a systematic framework should be created in order to analyze information required for ecological management (Banning, 1989b). For example, the ecosystem design process "provides a sound methodology to ensure responsible intervention in a campus ecosystem. Since all members of the system are involved in each phase of the change process, the focus is on collective values, goals, implementation, evaluation, and feedback that promote acceptance of the change process" (Sullivan, 1987, p. 24).

The campus ecology perspective also calls for new knowledge and skills. The student affairs profession must, therefore, become truly multidisciplinary. Moreover, student affairs colleagues must examine concepts from a wide range of disciplines, including ecology, psychology, and student development, for their usefulness in helping to understand the campus ecology. Even though the ecology management perspective calls for a major shift in their attitudes, skills, and training, the possibility it holds for the creation of campus environments that encourage optimal growth and development is monumental (Banning, 1989b).

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Footnote

[1] Campus ecology is defined as the transactional relationship between students and the campus environment (Banning & Hughes, 1986)

Summary and Implications

Summary and Implications

The explosive growth of information technology on university campuses has resulted in the creation of accessibility issues, similar to those previously dealt with around architectural environments (Lathrop, 1995). Ironically, as noted in the introduction to this paper folio, the very technology that has opened the door to the increased participation of students with disabilities in higher education also holds the possibility for the very opposite. Just as there are enabling and disabling conditions in the physical environment, so are there conditions associated with information technology that can result in the inclusion or exclusion of certain people (Schmetzke, 2001).

Summary of Research Objectives

The objectives identified for this paper folio were to (a) examine the types of problems students with disabilities face when they use the World Wide Web, (b) offer solutions for improving Web content accessibility to optimize readability and navigation, (c) advance the discussion from awareness building to institutional accountability through policy development, and (d) explore the theoretical frameworks for fostering inclusive online environments for students with disabilities. The importance of the relationship between campus ecology and student development was highlighted to provide a theoretical foundation for creating accessible campus Web sites. It was also used to support the adoption of institutional-wide Web accessibility policies. An important aspect of this research was to investigate the present and future implications for universities that

fail to adopt a universal design in the creation of campus Web pages. The distance learner was profiled, since the effect of inaccessible online resources is most drastic in Web-based distance education courses.

Dissemination of Research Findings

This paper folio has relevance to the direct practice and administration of services for students with disabilities in online environments. It can be used as a practical resource for university faculty, staff, and administrators who are interested in the legal, ethical, and practical facets of accessing virtual learning environments. This information is especially relevant for student affairs professionals who are tasked to question the implications of emerging technologies and administrative practices for the inclusion of students with disabilities. Moreover, both student affairs professionals and their academic colleagues would benefit from a theoretical basis in which to understand and interpret student learning and development. It is hoped that this information will lead to the creation of services, programs, and policies that foster the growth and development of students with disabilities.

Key Research Findings

Five key findings emerged from this research that have implications for policy and practice in higher education settings. They involve professional training and support, resource allocation, accountability, student involvement, and theoretical foundations.

These action areas require professional competency, strategic planning, and a renewed commitment to time spent in thinking and reflecting.

Professional development and training. Even if faculty and staff familiarize themselves with the principles and practices of universal design, universities must provide the necessary training and support to develop accessible Web materials. Training should not only consist of a review of Web accessibility guidelines, such as those developed by the World Wide Web Consortium. It should also include practical opportunities for faculty and staff to apply these standards in their own Web documents. Sensitivity training to the needs of students with disabilities in online environments should also be provided, along with a copy of the university's Web accessibility policy and implementation procedures. Likewise, administrators must be accountable for knowing about the emerging issues that directly affect policies and procedures for students with disabilities. This includes knowledge of the laws regarding disabilities as they apply to higher education settings and general knowledge of the range and types of accommodations that might be needed (Gadbow & DuBois, 1998) by students with disabilities. Personnel responsible for providing disability-related services for students should collaborate with their institution's centre for faculty and staff development to carry out these activities on their campuses.

Resource allocation. Beyond the development of a Web accessibility policy is the accessing of financial resources to carry out such directives. The policy implication of

this approach means that universities will devote specific amounts of their operating budgets to the development and support of employee training. Likewise, they will provide the infrastructure to hire sufficient staff to design/redesign campus Web sites so that they meet established accessibility standards. Universities will also finance the purchase of Web authoring programs and tools that interface with the adaptive technologies currently used by students with disabilities. Senior administrators, in particular, must understand that universal design is not a one-time deal or expense. It is ongoing and must be funded and staffed just as other traditional support services are funded and staffed.

Enhancing the accessibility of campus Web sites for students with disabilities will also improve usability for many other segments of society. This includes individuals with old browsers, slow Internet connections, aging-related medical conditions, and emerging technologies. Moreover, the provision of high quality after-sales service is a necessary and cost-effective way of recruiting and retaining students in what is fasting becoming a highly competitive global marketplace. Equally important it is a vital and humanizing element of any virtual learning environment (Simpson, 2000).

Accountability. Adopting and applying standards in the creation of Web-based course materials and campus-wide information systems is an essential step toward breaking down new barriers to communication and information for students with disabilities. As Wolforth (1998) suggests, the implementation of an institutional

accessibility policy not only serves the purpose of a public commitment toward students with disabilities, it also ensures that the university as a whole is accountable for that commitment, not just the designated service providers.

Student involvement. Students with disabilities can play a vital role in helping their institutions move closer to achieving Web accessibility. For example, they can be asked to share with campus personnel the kinds of barriers they encounter on the Web and to recommend solutions for enhancing usability and navigation. Equally important, they can be called upon to share their success stories. This might include a discussion around the design techniques implemented by their professors to enhance access to their course Web sites (e.g., including text transcripts for all audio tracks and ALT tags for all visual images). For this to happen, they must be included in all planning decisions and represented on all working committees regarding Web accessibility issues. Involving students in design activities, such as the development of a Web accessibility policy or template, allows for a critique of solutions to meet their needs. Consequently, campus Web sites would be designed consistently across the institution, which could result in greater cooperation between departments and shared opportunities to distribute the costs associated with maintaining accessible Web pages. Furthermore, students' voices could be especially effective in lobbying senior university administrators, government officials, and external groups to fund infrastructure costs. Each of these activities provides students

with opportunities to enhance their social, intellectual, and personal development--a preeminent goal of all student affairs programs.

Theoretical foundations. If student affairs professionals are to create "border crossings" (Fried, 1995, p. 185) from academic education to student development education. they must be able to discuss theory and use it wisely to ground their policies, programs, and services. Within the context of this paper folio, they must gain knowledge and skills about disabling environments and students with disabilities and the process of design/redesign to foster student learning and development. In particular, they must familiarize themselves with student development theories, environmental theories, campus ecology, universal design, and the ecosystem design process.

The Role of the Disability Service Provider

Student affairs colleagues who are responsible for providing disability-related services can lead their institutions to achieve a greater level of accessibility in the Web resources being developed. Through their professional training and established networks, they are ideally positioned to identify emerging issues and trends in higher education environments that affect students with disabilities. In their zest to create welcoming, supportive online environments, they must remember to collaborate with key campus stakeholders (e.g., students with disabilities, faculty members, senior administrators, librarians, distance education practitioners, and instructional designers). Moreover, this is a fundamental principle of the ecological approach. Likewise, they must consider that

campus ecology management calls for a shift in their perspectives. Their historical concern for individual students must be broadened to include the whole campus ecology. This new attitude considers the relationship between students and their environment in the management of both student development programs and other management functions associated with campus student affairs (Banning, 1989).

In closing, educational opportunities for people with disabilities and their integration into society can only be promoted by making all forms of learning technologies accessible to them (Wolforth, 1998). Adopting and applying standards in the creation of Web-based documents, supported by institutional-wide access policies, can mean that universities will be held accountable for breaking down new barriers to communication and information.

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