

**PREPARING TECHNICAL COMMUNICATION
STUDENTS TO FUNCTION AS USER ADVOCATES
IN A SELF-SERVICE SOCIETY**

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ABSTRACT

The self-service nature of today's society means that technical communicators are needed more than ever before since users may find themselves struggling to make sense of online documentation with minimal support from the institutions that provide it. Certain demographics within the user population (older adults, disabled persons, non-native speakers) may face serious challenges when trying to use self-service documentation. Technical communication educators should prepare students to function as user advocates for members of these groups. Technical communication students need a thorough understanding of the challenges that may interfere with an audience's ability to use websites and other online documentation. This article suggests ways to help students gain this understanding through course content and by structuring service-learning and virtual team projects in which students can put their newly-developed understanding into practice.

INTRODUCTION

Technological developments have led to an increasing reliance on web applications for the dissemination of information. This reliance on technology has led

to a self-service world in which users may struggle to make sense of online documentation with little support from the institutions that provide it.

While all users may have some difficulty using web applications to locate information, certain user groups (older adults, disabled persons, and non-native speakers) often face serious challenges when using web applications. Given the exponential growth in the world population of older adults, it is not surprising that the need to make websites more accessible to older users has received a great deal of attention in the past decade. Much of the research has focused on access to healthcare information [1-3]. The needs of persons with disabilities [4, 5] and of non-native speakers [6, 7] have also been examined in the literature.

While web design guidelines have been developed to make sites more accessible to these user groups [8], much work remains to be done in implementing the guidelines and in verifying that using the guidelines will lead to sites that are more accessible to all user groups.

This article focuses on technical communication instruction, specifically on the preparation of technical communication students to function as advocates for user groups who have been disenfranchised. The article begins with a review of the literature on web accessibility for at-risk user groups. Then the authors offer suggestions for integrating current research on web accessibility into course content to help students develop an understanding of the challenges faced by disenfranchised groups. The article concludes with a description of service-learning and curriculum innovations that can be structured to give students opportunities to apply their knowledge in a practical setting.

LITERATURE REVIEW

The three user groups most at risk for being left behind in the digital age are older adults, persons with disabilities, and non-native speakers. Although they may share some characteristics and face similar challenges when using web applications, they are three distinct groups. In addition to seeing these groups as distinct from one another, web designers need to recognize that there are many subdivisions within these groups who do not all face precisely the same challenges with web accessibility. For example, while accommodation is usually made for individuals with severe learning disabilities, designers need to work toward making sites more accessible to “a far larger group of people who experience a combination of mild-to-moderate impairments” [9, p. 561].

Web Accessibility for Older Adults

Over the past decade, a large body of research has focused on web usability for older adults. The Internet has great potential to serve as “a communication lifeline” [10, p. 426] for older adults providing them with access to information on

healthcare, government, and other social concerns. It can give them opportunities for socialization and self-empowerment. However, as O'Hara points out "some of the most valuable information on the Internet remains inaccessible unless designers address the needs of elderly users" [10, p. 432].

Until recently the needs of older users have not been considered for several reasons. Chisnell, Redish, and Lee point out that the websites used by older adults are "usually developed by people who are much younger" [11, p. 39]. Web designers often assume that they themselves represent typical users [12]. Further, web developers and the institutions they work for are frequently more focused on content than on users' needs and abilities [4, 13].

Often when web accessibility is addressed it is done after websites have already been created in order to meet legal requirements or conform to guidelines. Access-first design **has to do with** creating online information that focuses on users rather than on a product's functions and features [14, p. 15]. Roberts emphasizes the importance of addressing accessibility issues before information goes live in order to avoid having to redesign sites [14].

O'Hara urges web designers and technical communicators to pay attention to the age-related changes that may affect the ability of older adults to access online information [10]. Research on older users has found that some age-related changes in vision, cognition, motor skills, and literacy affect computer use [1, 3]. While these age-related changes may vary greatly in the population of older adults [15], there is an agreement among researchers that a majority of older adults do experience some difficulty accessing web applications because of these age-related changes [1-4].

Age-related changes in vision, cognition, motor skills, and literacy may interfere with the ability of older adults to access information online. Specifically, changes in visual acuity may impact an older adult's reading speed, comprehension, navigation, and searches [16]. Older adults may also experience a decreased ability to focus at close distances and an increased sensitivity to light or glare [17]. These changes may make it difficult for them to read online content and to locate and click links.

Changes in cognition may also affect web usability for older adults. For example, as adults age, their ability to perform tasks related to working memory declines. Working memory involves retaining and manipulating information while performing various cognitive tasks. A decline in the ability to perform working memory tasks means that older adults will have much more difficulty locating and focusing on information in the presence of distracting information [18]. Therefore, they will have difficulty searching for information when they encounter visual noise in the form of a cluttered website with a large number of links. Grahame, Laberge, and Scialfa found that older adults required more time and were much less successful than younger users when conducting web searches in conditions where there were a large number of links and other visual clutter [19]. Similarly, in a study of e-government sites, Becker found that

advertisements distracted older users and interfered with their navigation and ability to extract content from the pages [20, p. 103].

Motor skills also are likely to decline with age, making it more difficult to scroll down pages, to use a mouse, and to click links. Older users may not be able to position a cursor and move a mouse as easily as younger users due to a decline in fine motor skills; this difficulty becomes most acute when dealing with small links and objects [21]. Xie and Pearson conducted a study of older Americans using a Google map website to select nursing homes. They found that poor fine motor skills caused major problems for the users when trying to use the mouse and move the cursor [22].

Finally, older users may also be affected by an age-related decline in literacy skills. As working memory capacity decreases, there may be a corresponding reduction in language comprehension skills [23]. Becker notes that the need for too much vertical scrolling taxes memory recall [20]. In addition to making screen length short to avoid excessive vertical scrolling, O'Hara recommends having links change color after they have been visited as an aid to memory for older users [10].

In response to the needs of older adults, guidelines for senior-friendly web design have been developed. The Web Content Accessibility Guidelines (W3/WAI) and the U.S. Section 508 Guidelines were both developed to help designers make sites more accessible to older users [15]. The U.S. National Institute on Aging (NIA) and the U.S. National Library of Medicine (NLM) have also published guidelines for web design based on "scientific findings from research in aging, cognition, and human factors" [1, p. 389]. However, despite the existence of guidelines for senior-friendly web design, there are still many websites that present challenges for older users.

Becker used the NIA web guidelines to assess 125 websites offering information on health resources. None of the sites she examined attained high rankings for senior-friendliness. She concluded that improvements to web design are still needed to accommodate vision, cognition, and motor skills of older users [1]. Chisnell, Redish, and Lee evaluated 50 websites and found that "web sites seeking to serve a wide audience" [11, p. 55] failed to meet the needs of older adults as represented by two personas developed by the American Association of Retired Persons (AARP). They emphasize the importance of designers learning and understanding heuristics and guidelines.

Further, while guidelines can provide valuable information regarding users, some researchers have cited problems with the guidelines as the reason they are not always used or used effectively by web designers. Czaja and Lee argue that some guidelines are "vague and difficult to implement" [24, p. 346]. They go on to point out that "guidelines or standards do not guarantee a good experience for all users" [24, p. 346]. Hart, Chapparro, and Halcomb also reflect on the shortcomings of web design guidelines, stating that "[i]n addition to their lack of specificity, most guidelines are not prioritized by criticality" [15, p. 198]. They

suggest further research “to establish criteria . . . by which the guidelines can be prioritized and applied” [15, p. 198]. They also cite the need for studies that determine which guidelines improve usability.

Milne et al. state that instead of just requiring that designers follow the guidelines we must make sure that they understand the reasons behind the guidelines. They argue that “. . . designers should not approach the resources [guidelines] expecting to find a checklist that removes the need for a more considered approach to accessibility and usability. Any resources and advice provided must be studied and reflected upon, so that designers can begin to build a clearer picture of the underlying factors that will enhance the accessibility and usability of their work” [9, p. 559].

Czaja and Lee state that older people must be involved in the testing of web applications [24]. Sloan et al. conducted a study of web users with age-related capability decline. Their study was focused on user-centered design. They found it challenging to match people with appropriate accessibility solutions since not all older adults experience the same impairments [25]. When conducting tests with older users, designers are sure to gain a greater understanding of the complexity of the audience for which they are designing.

Several researchers have also argued that meeting the needs of older users will actually benefit all users. O’Hara states that “by meeting the physical, cognitive, and social needs of elderly users, we can improve both the design and the content of web communications for all” [10, p. 441]. Similarly, Grahame, Laberge, and Scialfa state that improving the salience of links by increasing their size and grouping them together will enhance usability for all users, not just older adults [19].

Web Accessibility for Disabled Persons

Disabled persons are very likely to benefit from improvements in web design and content made to accommodate older users. While they are a distinct group, disabled persons experience some of the same challenges with web usability that older adults experience. Johnson and Kent define a disabled user as “an individual with one or more impairments relating to their visual, hearing, motor, or cognitive abilities” [4, p. 210]. Like older adults, persons with disabilities are not always considered during the development of web applications.

Many websites are not usable by persons with disabilities. At the present time, the Americans with Disabilities Act does not encompass online environments [26]. Newton states that “because of its passage prior to the growth of the Internet, its provisions do not contemplate online commerce. Advances in Internet technology that could most benefit people with disabilities, such as virtual worlds, are accessible only at the whim of developers” [26].

Many online retailers are motivated to make their websites accessible for users with disabilities in order to prevent lost revenue [4]. When they do not, they

may face charges of discrimination. For example, a group of blind individuals brought a lawsuit against Target claiming that Target's retail website was discriminatory because it did not make accommodation for the screen-reading software that they use to view websites [26].

The recent passing of the historic 21st Century Communications and Video Accessibility Act bodes well for improvements in web access for persons with disabilities. However, as we have seen with existing legislation and guidelines, even when designers strive to adhere to the guidelines, problems may still exist for users. In the case of disabled persons, most guidelines are developed for those individuals with the most severe disabilities. The needs of individuals with mild to moderate disabilities are often overlooked [9]. Also, Fairweather and Trewin point out that the cognitive impairments that affect many groups are "invisible" when compared to sensorimotor impairments like low vision or spasticity [27, p. 146].

Roberts has identified barriers that should be considered when undertaking access-first design. These barriers include the lack of alternative text for images and image-map hotspots, uncaptioned audio and undescribed video, poor color contrast, and lack of testing [14, p. 15]. The need for usability tests conducted with members of the target audience is an important consideration for accessible web design. Roberts states that "content developers should . . . invite people with disabilities to test their pages so they can experience real users navigating their site" [14, p. 22].

To create effective web applications for persons with disabilities it is important for designers to do much more than attempt to meet a set of guidelines or standards. Conducting usability tests with members of the target audience is a step in the right direction. Milne et al. argue that designers should move beyond guidelines and develop user-sensitive design strategies. They call for a more holistic approach to web design that "covers content, functionality, navigation, metaphors . . . and at the same time, addresses the full range of accessibility and usability issues" [9, p. 564].

Web Accessibility for Non-Native Speakers

Like older adults and disabled persons, non-native speakers are likely to face challenges when attempting to access information online. While limited literacy or language difficulties may present a barrier to web usability for users of any age, older users are more likely to experience problems related to reading comprehension [1] and may also have other language-related problems.

Moore et al. conducted a study on web design for a Hispanic medically underserved population. The study examined a regional consumer health website created to serve an audience with low levels of computer and health literacy. The researchers found that participants were likely to abandon the website when they had difficulty locating information. The participants in the study encountered

problems with navigation, inconsistent terminology, and the nature of the images used in the site. The findings revealed the need to simplify language, include relevant graphics, and provide **culturally relevant** examples. The authors concluded by emphasizing the importance of conducting usability testing with the target audience [7].

It is not surprising that cultural issues are likely to become relevant for a population of users who are not native speakers. The users may be recent immigrants to the United States or they may be members of co-cultural groups who do not necessarily conform to the norms of the majority culture. In any case, the ability of non-native speakers to access and comprehend healthcare information may be compromised when that information is not presented in a culturally-sensitive manner.

Kralisch and Berendt conducted a study of usage logs of a large international e-health website to determine the effect of a site's language offer (the language in which the information is presented) on access and search behavior and also the interaction between language offer and domain knowledge. The participants in their study had IP addresses from 188 countries. Their findings indicate that "the languages in which the website is presented is a crucial barrier to accessing a website's information" [28, p. 241]. They also found that prior knowledge—most likely in terms of the user's level of education—was a major factor influencing a user's ability to access information not presented in his/her native language. In their conclusion, they stress the fact the educational digital divide cannot be overcome unless users are given appropriate information in their native languages. They suggest ways to adapt design to accommodate users' cognitive requirements including terminological support, synonym expansion, and appropriate search options [28, p. 244].

Cultural rather than language issues may be a concern in online education. More and more courses at colleges and universities are being delivered online. Further, many U.S. colleges are now delivering instruction to students around the world. Websites designed either for classes including international students in the United States or for students abroad who are receiving education through universities in the United States need to have a **culturally adaptive interface**. This interface should include "technological functions which support off-task, non-verbal, and relationship building communications" [29].

Developing web applications for disenfranchised user groups presents many complex challenges. O'Hara suggests that technical communicators are "uniquely well qualified to support positive trends" in web design for these user groups [10, p. 440]. Therefore, it is important that technical communication students are prepared to serve as user advocates for groups like older adults, disabled persons, and non-natives speakers. This need becomes particularly acute as the population of older adults grows larger and the primary means of disseminating critical information on healthcare and other topics is via websites and online documentation.

BUILDING SERVICE ORIENTATION INTO THE CURRICULUM

According to the World Wide Web Consortium, the web is the fastest-adopted technology in history. People who do not have access can quickly be left behind:

The Web is becoming a key, but sometimes inaccessible, resource for:

- news, information, commerce, entertainment
- classroom education, distance learning
- job searching, and workplace interaction
- civic participation—laws, voting, government information, services. [8]

Through the emergence of Web 2.0 technologies, the web has also become a hugely popular medium for social networking.

The World Wide Web has the potential to transform the lives of people with disabilities. Technologies such as Braille and screen-readers enable users who are blind or have sight impairments to do everyday tasks, such as interact with friends, contact government agencies, organize finances, read news, access education, shop, organize travel arrangements, and so on. In theory, Internet technologies are unprecedented in their potential for social inclusion. “All aspects of social, cultural, economic and political life . . . stand to be affected by the continued massive growth in electronic technologies” [30, p. 1]. However, this potential has yet to be realized. Mark Warschauer [31], for example, describes the futility of providing technology without support or training.

Web-enabled mobile phones (known as smartphones) also have the potential to transform how users with disabilities interact with websites. However, they have several accessibility issues, including small text and small keys [32].

This section of our article discusses simple but important curriculum changes that can help prepare students to act in the interests of all users. Dubinsky rejects the widely held belief that professional communication instruction, “despite its clearly practical nature, must be vocational” [33, p. 61]. He argues strongly that while preparing students for employment, it is also possible to promote civic values.

Many of the suggestions which follow involve applications of theory. Practical examples, such as case studies, scenarios, and real-world assignments, help to remove theory from the realm of the abstract, and enable students to relate guidelines to real rhetorical situations.

Real-World Exposure to Accessibility Guidelines and Tools

Despite the exponential technological developments of the past 2 decades, a digital divide persists, because many people either cannot access or cannot use the technologies available. Mark Warschauer observes that “[a]ccess

for ICT . . . cannot rest on providing devices or conduits alone” [31, p. 47]. These devices must be usable for the various user groups that need them.

Most technical and professional communication programs which include a design component discuss accessibility guidelines, such as those from the World Wide Web Consortium or Section 508 of the Americans with Disabilities Act (ADA). However, unless students see the guidelines put into practice, the requirements can seem abstract, or even irrelevant to a designer’s work.

In assignments, for example website design assignments, it is important to require application of the accessibility guidelines. Some guidelines, such as including alternative text for images, links, and so on, are relatively simple to apply. Others, such as providing “ways to help users navigate, find content, and determine where they are” (Guideline 2.4 from the W3/WAI [8]) require systematic needs, task, and design analyses. In our courses, assignments require students to consider accessibility when conducting needs and task analyses before completing design projects.

In addition, students can use automatic accessibility evaluation tools to check their work for potential access barriers. Accessibility evaluation tools are “software programs or online services that help determine if a Web site meets accessibility guidelines” [8]. Using these tools enables designers to check their work for potential accessibility problems. However, as the WAI cautions, these tools will not catch all problems. Therefore, they should be used together with other accessibility methods such as usability testing and human evaluation. The WAI maintains a list of evaluation tools, many of which are free to use, and do not incur license fees.¹ Therefore, students can easily access and use these tools to test their designs, and should be encouraged to experiment with the range of evaluation options available. These options include basic checkers which will produce a report highlighting parts of a site that may be inaccessible, color checkers which suggest accessible color combinations, with clear contrast that work for color-deficient users, and code checkers (which test the validity of CSS or HTML, for example).

Benavidez et al. describe a project to teach accessibility whereby students interact with a website “designed to fail every accessibility checkpoint” [34, p. 341]. They conclude that this exercise is “extremely beneficial” [p. 347] for students’ learning.

Another very effective method of exposing students to accessibility concerns is to have them interact first-hand with the software and hardware tools available for users with disabilities. Most higher education institutions have software and hardware devices for students with special needs. Support staff are often eager to provide demonstrations of these accessibility devices. For example, the University of Limerick maintains a computer lab which has an array of assistive

¹ See <http://www.w3.org/WAI/ER/tools/complete>

technologies. The lab houses various types of hardware, including screen readers, Braille readers, screen magnifiers, speech recognition software, and several hardware devices for users who have reduced mobility. Each year, our MA in Technical Communication and E-Learning students at the University of Limerick attend accessibility tools demonstrations. This hands-on experience enables them to see first-hand how a screen-reader or screen-magnifier works and, therefore, to envisage how users struggle with assistive technologies. This experience enables them to better understand the design requirements for users. The practical demonstration of tools concretizes the sometimes abstract nature of guidelines, and is often a transformative experience for students. In class discussions and on their reflective learning blogs, they comment on the impact this **tool's** demonstration has on their design perspectives.

Researching Accessibility and Service Orientation

Beyond fulfilling a course requirement, student research projects have several tangible benefits for the student, including enabling them to interact with users, develop theories, contribute to knowledge, and prepare for future graduate work. Mateja and Otto, in a report on successful undergraduate research, describe typical benefits of research projects for students: “in-depth knowledge in a discipline, understanding of the ethical considerations inherent in research, improvement of oral and written communication skills, learning to cope with uncertainty, and teamwork” [35, p. 269]. They also note that benefits for faculty of student research include: “livelier and more up-to-date teaching content” [35, p. 269] as well as opportunities for intellectual growth and increased scholarship.

A possible way to integrate access and service orientation issues into the curriculum is to have students conduct research to test the accessibility of systems and tools. Such assignments are important at both undergraduate and graduate levels. Several types of research studies are possible. For example, students can conduct usability tests with real users, and observe these users' interactions with poorly designed applications. Many technical communication curricula include research assignments for undergraduate as well as graduate students, using techniques such as think-aloud protocols to record real users' interactions with products and documents. Conducting usability tests with users with special needs, such as hearing or sight impairments, reinforces the real and sometimes insurmountable challenges such users face every time they try to use software, hardware, or websites.

Usability studies with users with visual impairments are a very effective and immediate method of demonstrating to students the inaccessibility of everyday services for many users. For example, one student at the University of Limerick created a scenario of a user using a travel website to book a train ticket, and find some basic information about timetables and station services. She tested this scenario on a national public transport website, with a small group of users

with visual impairments. Her study demonstrated that information and services most people take for granted are simply not available to increasingly large segments of the population. Paradoxically, her user group needed to be able to access public transport information even more than other users, since many of them were unable to drive due to their visual impairments.

It is important to note that, while any research conducted with human participants will likely require ethical clearance, research conducted with users with special needs has added ethical implications. For example, users with visual impairments are vulnerable, and, moreover, may not be able to travel to the research location. Sometimes researchers must travel to meet the participants, which can incur safety concerns both for the researcher and the participant. Students who undertake such research need to be apprised of the ethical and safety considerations, and of their ethical responsibilities to themselves, to participants, and to the institution.

At postgraduate level, many theses now focus on issues relating to user advocacy. For example, researchers examine how older users can be accommodated online, and how vision disorders can impact on their ability to use online services and applications.

Faculty research at many institutions also increasingly examines culture difference, universal design, designing for an aging population, usability, the digital divide, accommodating different cultures, and a host of related subjects that affect real users' interactions with content. Many such topics have the potential to attract funding, from corporations, state bodies, or charitable organizations, due to the importance of the findings for large sections of the population. A further benefit is that when faculty conduct studies of these topics, they can feed the results back into their teaching.

Teaching Design Ethics

Most technical communication programs cover ethics and ethical communication, to some degree. Many institutions now require faculty supervising research projects to discuss ethics and especially the ethics of conducting research, with their students. For example, research ethics committees are a feature of most higher education institutions. These committees review applications from faculty and students, and usually have strict guidelines regarding the practice of research involving human participants.

Nevertheless, fewer programs incorporate design ethics, or the more recent topic of cyberethics, into the curriculum. Yet, an understanding of these areas is central to the question of service provision and user advocacy. Students need to be aware of the pitfalls of unethical design. They also need to understand their ethical obligations to users of the new media that they design.

Mainstreaming the teaching of ethics, and integrating the subject into relevant assignments and all relevant aspects of the curriculum, enables students to see

ethical design in practice. For example, accessibility and ethics are related topics. Making content accessible and perceivable to users with disabilities constitutes ethical design. Likewise, usability and ethics are related topics. Ensuring that technologies, texts, and other types of content are usable is a complex process, and goes beyond simply following guidelines. Nielsen points out that even when a site follows the technical guidelines set out by the W3/WAI to ensure access, it can remain unusable [12].

Usable design represents ethical practice from several perspectives: it meets our obligations to both users and clients, and demonstrates a contribution to the broader profession. Concern for the end user is at the heart of the conceptualization of technical communication as a humanistic discipline.

Studying aspects of ethics in technical communication increases students' rhetorical sensitivity to difference. Emphasizing culture difference, for example, helps them to eschew in their own practice the tendency towards assuming that their culture, design sensibility, and language are dominant. Studying ethics in relation to culture difference also reminds students of the digital divide and increases their awareness of other cultures' technological or information challenges [36]. If faculty and students avail of mobility opportunities provided by programs such as study abroad in the United States and Socrates in Europe, they are, furthermore, through direct experience, more likely to be aware of the ethicality of inclusive design.

Although most Western students are now avid and sophisticated consumers of new media, they often demonstrate limited awareness of new ethical issues, and their own obligations to users in these regards. A course on design ethics should include a component dealing with cyberethics. Topics could include: communicating ethically online, privacy, information reliability, data protection, plagiarism, obscenity, and social inclusion.

Multiple resources are available which enable students to grasp the complexity of cyberethics. Popular culture provides several useful classroom activities and tools on ethics, and especially cyberethics. A recent BBC documentary, *The Virtual Revolution*, available to view on YouTube, discusses issues of privacy and data protection in one episode entitled *The Cost of Free*. Newspapers regularly report on privacy and data protection issues, especially relating to social networking and online shopping. One theme of the recent film *The Social Network*, which charts the development of Facebook, explores the importance of privacy online.

Class discussions about topics such as software piracy, illegal downloading of media, and the potential pitfalls of social networking, can generate interesting, and often very charged, debates. These discussions can encourage students "to consider what they, not their instructors or society, think is ethical" [37, p. 323].

Students frequently report that they had never considered the ethicality of their actions online, even though a large proportion of their free time is spent in

cyberspace. They also learn, often for the first time, to question and analyze the new media they use, and may help to design as part of their future careers.

Understanding and Accommodating Culture Differences

Despite the predominance of the English language in business and social communications, we in English-speaking jurisdictions need to remind our students that content may be localized for other languages or locales. Preparing to accommodate culture and linguistic differences is complex. As Hayhoe notes: “virtually all of us are completely in the dark when it comes to adapting the rhetoric and design of our own cultures for global audiences” [38, p. 10].

A focus on technical communication across cultures needs to be infused into the curriculum. It is not enough to offer one course that addresses international technical communication. Discussions of cultural issues can be included in instruction in audience analysis. Faculty members can also encourage students to undertake documentation projects that have some international/intercultural component to them. For example, in a technical writing style course, students can be required to research how communication styles differ across cultures from the succinct to the elaborate. In a document design class students can create documents for groups on campus or in the community that have an international focus (a newsletter for the Caribbean Students Association, a brochure for the Multicultural Center on campus, a website on Study Abroad opportunities). Web design assignments can require students to learn how to create online information suitable for members of diverse cultures. According to Ingram, Ou, and Owen, a culturally adaptive interface will:

- use colors carefully to avoid any that might be culturally offensive;
- use icons that can be understood by members of other cultures;
- display pictures that support the content; and
- provide more than one way to navigate through the material and avoid over-reliance on a solely linear organization of material [29].

Team projects that require students to address a global issue from a local perspective can challenge students to develop an understanding of cultural differences. This assignment could require students to research a global issue and develop some type of documentation to assist other citizens or special interest groups to take action to address the issue. For example, students might create a website with information on how citizens can take steps locally to combat world hunger or to protect the environment.

Another effective way to help students learn about culture differences is by organizing virtual team projects. Participating in virtual teams enables students to see first hand the impact of culture on work practice and on communication. In virtual teams, students work together in groups with a shared goal. Group

members rarely if ever meet face-to-face, and often come from different cultures. Student virtual team projects are one way of developing in students an “increasing awareness of the world’s complexity and interdependence” [39, p. 2]. The **hand-on** experience of working online with peers to produce content reminds students of the very real complexities of using lean communication media, communicating across **time-zones**, interacting with collaborators whose first language is not English, building trust, and using often unreliable technologies. Virtual teams require a lot of organization, and some technology facilities and expertise. Most Western universities now have videoconferencing suites, and these facilities are often under-exploited. A virtual learning environment can also support virtual collaboration. In addition, Web 2.0 technologies, such as online social networks and online telephone software, enable students to collaborate with peers from other cultures.

Hosting students and faculty from other cultures and encouraging students to spend a period of study abroad increases their understanding of other cultures. Hosting international students and faculty increases diversity in the classroom, and interaction with students on study abroad placements deepens students’ and teachers’ understanding of other cultures. A period of study abroad gives students first-hand experience, thus moving theory beyond the classroom. Some support is available to organize and fund student and faculty mobility, for example, through study abroad programs in the United States, or through the Socrates program for student and staff mobility of European Union (EU) citizens within Europe. An EU Socrates evaluation study [40] shows that the experience of studying abroad benefits students’ education and language skills.

CONCLUSIONS

In this article we have explored some of the barriers that prevent large segments of the population from accessing services and information online. As more and more content and services move online, technical communicators must be proficient not just in designing online content, but in providing access routes to that content for all users. Their understanding of access issues depends to a large degree on the awareness they cultivate as students. In addition to the ethical imperative to produce accessible designs, in many cases accessible design is also a legal requirement. In the same way that public buildings must be accessible to all, likewise, public online spaces must also be accessible and usable by all citizens.

Therefore, we contend that accessibility, service orientation, and user advocacy are fast becoming imperative components of the technical communication curriculum. Given the global movement towards offering commercial services, conducting official business, and providing public information online, it is essential that everyone, regardless of location, physical or cognitive ability, can access these online services. We do our students, and our profession, a disservice as long as this content is omitted from our curricula.

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