

CHAPTER 8.

ACCESSIBLE EPORTFOLIOS FOR VISUALLY-IMPAIRED USERS: INTERFACES, DESIGNS, AND INFRASTRUCTURES

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This chapter conceptualizes the design and pedagogy of an accessible, online ePortfolio and the content it might house from the perspective of universal design for users with visual disabilities in particular and other disabilities generally. While enrolled disabled students are demanding universities meet their special learning needs, the U.S. Department of Justice and U.S. courts are pressuring these institutions to live up to their legal and ethical obligations under the Americans with Disabilities Act, Section 504 of the Rehabilitation Act as well as the Individuals with Disabilities Education Act. Likewise, the Department of Justice, the Access Board, and Congressional reports assert that institutions of higher learning need to be ready for students with disabilities at all times, and required accommodations for student success at school, whether in face-to-face, blended, or in online environments, is both their legal and ethical responsibility.

THE DISABILITY TECHNOLOGICAL LITERACY DIVIDE

Many academic researchers have expressed reservations about how well digital technologies live up to their promise for disabled populations. Seymour and Lupton (2004), for instance, warn that digital technologies might actually increase the divide between people with and people without disabilities because of the industry's tendency to design educational environments mainly for the able-bodied. They see an intrinsic tension between designers' efforts at forging interesting and engaging, media-rich e-learning environments for average students and addressing the usually more technologically-intensive functional needs of

disabled students. An instance of such a divide is obvious in how universities employ electronic technologies in existing structures—libraries, classrooms, administrative systems—without carefully studying their impact on already underrepresented disabled members of educational communities. And the absence of research on such digitalization of campus learning spaces itself does not bode well for the disabled. Most of the research about multimodal digital spaces focuses on visual interfaces, for instance, although scattered references to sound can be found in the review of the literature. For example, abundant research has been published on concept map-based visual interfaces where other modalities are mentioned, but multimodal digital spaces for the disabled have not yet been sufficiently worked into these models (Alpert & Grueneberg, 2001; Cicognani, 2000; Kim, 2006; Kinchin, 1998; Novak, 1998).

Researchers like Stefani et al., however, claim that “e-portfolios could be an advantage for students who need to maintain a record of their learning over an interrupted programme of study, perhaps spanning several years and several institutions,” even though they concede that such benefits can only be reaped if portfolio designers and facilitators invest in principles of inclusivity and accessibility (p. 107). While enrolled disabled students are demanding universities meet their special learning needs, the U.S. Department of Justice and U.S. courts are pressuring these institutions to live up to their legal and ethical obligations under the Americans with Disabilities Act, Section 504 of the Rehabilitation Act as well as the Individuals with Disabilities Education Act. Likewise, the Department of Justice, the Access Board, and Congressional reports assert that institutions of higher learning need to be ready for students with disabilities at all times, and required accommodations for student success at school, whether in face-to-face, blended, or in online environments, is both their legal and ethical responsibility. An accessible design for electronic portfolios is within our reach because accessible user interfaces, inclusive web design guidelines for building such systems, and adequate machine and human resources for testing these systems already exist. I argue for integration of accessibility features in the design and pedagogy of electronic portfolios so that disabled instructors, students, and workers could avail of the benefits of these portfolios as well.

Before I expand on the accessibility of ePortfolios for the visually disabled users, both inside and outside the academy, a few definitions of technical terms are in order for the sake of specificity and clarity. The Americans with Disabilities Act (ADA) defines disability as “a physical or mental impairment that substantially limits one or more of the major life activities of such individual” (U.S. Department of Justice, 2008). This definition of disability can be interpreted in many ways, but for the purposes of this chapter it delineates the legal parameters within which institutions of higher education must provide accom-

modations to students and offer equal learning opportunities to all. By visual impairment, I mean the limited ability to see which nevertheless restricts one's ability to function in print or digital environments without adaptive technologies such as magnifying lenses, screen readers, or Braille displays. By blindness, I imply total or near total loss of sight where the user must depend upon alternate means for accessing print or digital information.

An ADA-based legal definition of accessibility is also important in the context of higher education because nearly all colleges receive some Federal funding directly or indirectly and are held legally responsible for implementing all U.S. disability laws. Speaking in systemic terms, ADA states that "An accessible information technology system is one that can be operated in a variety of ways and does not rely on a single sense or ability of the user. For example, a system that provides output only in visual format may not be accessible to people with visual impairments and a system that provides output only in audio format may not be accessible to people who are deaf or hard of hearing" (U.S. Department of Justice, 2009). In *Maximum Accessibility*, Slatin and Rush (2003) also offer a formal definition of accessibility which is straightforward and represents the perspective of Disability Studies closely. They write, "web sites are accessible when individuals with disabilities can access and use them as effectively as people who don't have disabilities" (p. 3). Here, we need to note that Slatin and Rush expand the concept of accessibility to include usability. They argue that in certain contexts a website can be both accessible yet unusable. Such a phenomenon has become common with many commercial websites where owners are trying to meet Section 508 or Web Content Accessibility Guidelines primarily to fulfill requirements for obtaining government contracts.

In academia, this phenomenon is on display almost with every online academic space, and a few management systems are documenting both accessibility and usability well. For example, the popular course management system, Canvas, offers the copy of a completed accessibility checklist, known as the "Canvas Voluntary Product Accessibility Template," on its website which would suggest two things to a casual reader: 1) Canvas is voluntarily doing this accessibility work, and 2) it follows all guidelines included in this list and therefore it is an accessible system for people with disabilities. In the second half of this chapter I present a firsthand report on the state of accessibility of the Canvas ePortfolio tool to demonstrate the effectiveness and how Canvas can be a useful model for other ePortfolio performance support systems.

Inside and outside the academy, ePortfolios are becoming sites of power display while enhancing each creator's virtual caché in the digital space. For instance, the president of Westminster College in Utah maintains a complete ePortfolio of his life and his life work to attract not only visitors from his own

campus but also web surfers from all over the world. As the editors of this collection state, ePortfolios are quite distinct from paper portfolios. They collect, develop, exhibit and enhance the cumulative work of the creator, but they also can easily spread their limbs to other spaces through social networking tools. A Twitter® hash tag, a link on a friend's Facebook® wall, a link in a blog or even a Word or PowerPoint document, or a casual illusion in a second life performance can move an ePortfolio from a narrowly framed space for collecting and displaying to a network of presences in multiple sites. Other chapters in these collections examine such models, in fact. And these networks go beyond expanding the reach of the creator's work because they recontextualize the original content and open it to new interpretation by transforming the meaning of what had been exhibited in the authorial frame. As Lauren F. Klein points out elsewhere in this collection, ePortfolios in association with social network sites can form additional bridges between the academic and the work world. However, the shifting nature of such networks and their very idiosyncratic choices for structuring and managing their spaces pose a virtual nightmare for those accessing the web through adaptive devices such as screen readers, magnifiers, and speech recognition systems. The free and self-regulating nature of the World Wide Web has so far rendered all attempts at enforcing any web accessibility standards across the board useless. While Web Accessibility Initiative (WAI), a voluntary organization consisting of members worldwide and one of the four domains of the World Wide Web Consortium (W3C), has released Web Content Accessibility Guidelines Version 2.0 (WCAG 2.0) just recently in fall 2012; however, a large majority of websites in the United States do not yet meet standards set by WCAG 1.0 in 1999.

Though technical communication scholars do not agree on whether specific tools and software ought to be taught to undergraduates, the application of these tools in developing ePortfolios raises other questions, particularly questions about access. Do universities have the responsibility to choose and teach only accessible tools and software? While supporters of workplace-centered curricula might object to such a suggestion because most of the digital infrastructure remains off-limits to blind workers, the idea of such a choice opens up a new space for negotiating access for people who are disabled. If our graduates have learned and achieved proficiency in tools and software for building accessible capstone projects and ePortfolios, they are more likely to advocate for the use of such accessible systems in the workplace. While their accessible projects themselves can serve as emblems of a shift toward integrated accessibility, in terms of technology transfer, these graduates can reformulate the functionality and purpose of these academic electronic portfolios to restructure and reform the circulation of ideas, information, and often closely held departmen-

tal intellectual capital in the workplace. Whereas working groups in business are utilizing bulletin boards, LISTSERVs, and social networks for exchange of ideas, these exchanges often have the qualities of transient communities. Because many of these discussion groups are formed around specific projects and problems, the end of such projects can also result in a sudden demise of these virtual communities (see Rice, 2013). Electronic portfolios can be organized around similar purposes, but if they are anchored in a particular unit of the organization and if the portfolio manager is permitted to retain a degree of autonomy and control, they can avoid the fate of a typical virtual community. Since ePortfolios are no longer static entities restricted to a solitary presence on a single E-server, they can become broader interactive spaces for construction of information, ideas, and knowledge networks.

Equipped with new tools for presenting, archiving, and transporting, ePortfolios now cultivate important technical skills, employ digital formats that allow sharing across institutions and platforms, and remain relevant technologies beyond school for graduated professionals in many fields (Gatlin & Jacob, 2002; Gibson & Barrett, 2002, 2004; Heath, 2002). Further, ePortfolios are effective means for proving certification requirements, exhibiting the pertinence of the candidate's skills for a specific job description, and demonstrating one's professional development in an existing career for advancement (Jafari & Greenberg, 2003).

The discrete skills of textual writing, graphic design and imaging, and video or audio composing are now being taught in Technical Communication courses as multimodal projects, and ePortfolios admirably lend to a holistic and seamless representation of such student work. Beyond the academy, such multimodal composing is finding a foothold in all sorts of organizations ranging from the ones who are in the business of producing digital consumer wares and are obviously a part of the emergent digital economy to the ones who were erstwhile considered manufacturers of consumer goods of the other kind but have now transformed themselves into an economy residing on the Internet and capable of transacting significant portions of its business in these digital spaces.

ePortfolio proponents are now creating bridges between the academic and workplace portfolios. This is a topic expounded on by many writers in this collection, and while educational ePortfolios are attributed to a three-phase cycle of independent learning—planning of goals, review of individual progress, and reflection for future improvement (Chau & Cheng, 2010; Mason, Pegler, & Weller, 2004; Stefani, Mason, & Pegler, 2007)—it is the additional fourth post-graduation phase where ePortfolios can best benefit the graduates with disabilities. With up to 70% unemployment rate among visually impaired working age adults (American Community Survey, 2009), a professionally pro-

duced ePortfolio can showcase a job candidate's competence better than any well-crafted résumé or a perfectly executed interview. In discussing recent trend toward lifelong and workplace portfolios, researchers in our field have not paid attention close enough to the extended benefits of electronic tools for disabled workers whose physical attributes can often act as barriers between their professional abilities and the employers (Cambridge, 2008; Willis & Wilkie, 2009).

Researchers in the United Kingdom have researched the accessibility of standardized assessment ePortfolios for disabled students (Ball, 2007; Heath & Giorgini, 2007). However, it is apparent that we need more research on workplace and lifelong ePortfolios (see Cambridge, 2010). It also needs to be stressed that we require pedagogical guidance on how to support disabled students in developing skills for managing and using ePortfolio tools and creating accessible content for themselves and others.

Workplace studies from other disciplines also indicate that employers often do not understand the nature of disabilities, are not familiar with disabled candidates' abilities, and fail to see how they can contribute to the workplace (Hendren & Sacher, 1992). For example, to counteract the deep-seated human prejudice toward blindness, a visually-impaired candidate can employ a multimodal ePortfolio to substantiate her capabilities, skills, and achievements not only at the time of hiring but also later to exhibit, clarify, and quantify her achievements to co-workers and supervisors. However, to construct such a work portfolio, the disabled college student today must fully participate in ePortfolio construction, presentation, and assessment work in their classes. They must acquire necessary technical and professional skills for accomplishing portfolio goals, learn to design spaces for presenting their work, create relevant content to attain their career goals, and develop strong presentational and design skills to showcase this content. These are all valuable rhetorical skills.

More than a decade ago, web accessibility scholar, John Slatin (2002), pointed out that "Accessibility is fundamentally a rhetorical issue, a matter of fleshing out (literally) our conception of audience to include an awareness that there are people with disabilities in that audience and developing effective skills and strategies for addressing the entire audience" (p. 37). What John Slatin wanted to stress by placing "accessibility" in the "rhetorical" category is that we can't place it in some additional or separate category; rather, it ought to be included in our original conception of audience and remain an integral fact throughout the development of the document, the project, or the website just the way disability is an essential fact of life. Slatin's discussion of accessibility is also more meaningful to the context of accessibility of ePortfolios because it applies both to the system and its content—the container and the contained.

Likewise, Sean Zdenek (2009) reminds us that “Students with disabilities are in danger of being either excluded from the new media revolution or accommodated as after-thoughts of pedagogies that fail to anticipate their needs.” At the breakneck pace new digital technologies have been adopted in higher education in this century, and if the various accessibility-related complaints against several universities during the past three years can be seen as indicative of the state of accessibility at other colleges, these dangers of being left out are certainly real (see the Pennsylvania State University Agreement with National Federation of the Blind or NFB; see also the ADA Settlement Agreement by the Arizona State University, 2010). Ellis and Kent (2011) further warn us that we must counter the “dangerous trend in digital design where socially constructed features from the analog world are migrated to the digital environment” (p. 39). Whereas visually impaired writers were largely dependent on others for putting together their paper portfolios in the past, digital tools today have the potential of endowing complete independence on them if these users could receive adequate instruction for designing accessible ePortfolios. Disabled users also have a unique opportunity to participate in electronic portfolios culture as readers, workers, and evaluators if the field of ePortfolio design follows principles of accessibility.

Universal Design for Learning (UDL) is an educational philosophy which pairs well with accessible and flexible ePortfolio construction. Developed by The Center for Applied Special Technology (2004), it has begun to gain traction in our schools and will most likely begin to receive serious consideration in higher education as we admit increasing numbers of disabled students to our programs (Burgstahler, 2008; Dolmage, 2009; Dunn & De Mers, 2002; Oswald & Hewett, 2013). Based on Principles of Universal Design in Architecture originally developed by Ronald Mace in the 1970s, the UDL framework promotes a process that works with flexible goals, adopts divergent teaching methods, and advocates for assessment tools which accommodate learner differences. Its tenets for designing curriculum and pedagogy ask for multiple means of representation, of action and expression, and for engagement. If ePortfolio infrastructure and pedagogy remain flexible and do not become what Kathleen Yancey warns as a system of “two composers, (1) a student and (2) the system, with the system’s override capability exerting greater authority” (p. 745), they are a perfect example of progressive practical theory. While commercially-grown ePortfolio systems may or may not adhere to a set of accessibility standards, probably an open-source, nonprofit system like the kind of Open Source Portfolio Initiative (OSPI) in the long run has the potential of delivering a sustainable, accessible platform for constructing UDL-driven ePortfolios.

ACCESSIBLE EPORTFOLIO DESIGN AT PRESENT

The question remains: where do we presently stand with design and infrastructure of ePortfolios as far as their accessibility to the blind in particular and visually impaired in general is concerned? I will organize this discussion around a user experience report on the electronic portfolio space offered by Instructure, the company behind the learning management system called Canvas. I have elected to give a significant room in this chapter to one practical example of accessibility problems to provide relevant, detailed examples. The accessibility of campus technology has largely been left to those who need it for survival in academia. Even when disabled students assert their legal rights to access, the conversation about the accessibility problems experienced seldom goes beyond the instructor and the Disability Services office, in my experience. Corporations behind these learning management systems are equally evasive about accessibility unless a complaint is brought against their product through a lawsuit or through an inquiry by the Justice Department. For example, the much-cited accessible course management system, Blackboard, was made accessible after several years of complaints by blind students and faculty. To the dismay of blind faculty, only the student side of Blackboard Version 9.1 was made accessible and faculty still continue to experience many accessibility problems. Likewise, relative newcomers on the ePortfolio market like Canvas have not invested in accessibility of their system from as early as the design planning stage as much as is needed. Since new companies do not have the baggage of old, inaccessible developer tools, they can integrate accessibility in their products from the early stages of choosing a platform and designing interfaces for the new products. Further on, since ePortfolios are often viewed as electronic shells or containers for displaying and storing user-generated content, in most people's views, these course management and portfolio software companies do not have the responsibility of making the content accessible. Considering the easy employability of ready-made digital tools for Web pages, content creators with little knowledge of accessibility are populating the digital spaces with inaccessible content. No reliable filters or content checkers have yet been built into the electronic portfolio systems I have researched which would alert the composer about the accessibility issues in their work.

To attain the goals of an accessible system, emerging approaches to digital design of ePortfolios can be employed offering multiple user interfaces from a single-source using differing modalities. For instance, Parallel User Interface Rendering (PUIR) is based on a "single consistent conceptual model," which can render a user interface simultaneously in multiple modalities and thus be

accessible to people with differing sensory and usability needs simultaneously (Van Hees & Engelen, 2012). These versatile interfaces and electronic performance support systems also have the potential for communicating more efficiently and efficaciously with specialized adaptive devices necessary for certain people with disabilities.

Cooper and Heath's (2009) approach to personalizing interfaces for users with disparate needs, an approach they label as "a standardized intermediate representation," works to develop interface work with popular consumer devices and educational software presently on the market. For example, they examine able-bodied users' abilities to individualize the look and feel of their cellular phones and tablets to accommodate greater accessibility needs. Just as students and instructors can subscribe or unsubscribe to services of their interest or disinterest in a course management system, disabled users should be able to add features and services which enhance their abilities to function in digital environments and remove features which distract or obstruct from effective interaction. This approach has been implemented in some Google and Microsoft and Apple products where users can turn on a built-in screen reader, magnifier, or speech recognition system without additional adaptive technology. Whereas such devices at this time only add extra modalities without paying close attention to usability, Cooper and Heath foresee a future where accessibility standards would be integrated as norm for digital usability. Thus, disabled users won't remain an after-thought for developers and designers. Instead, designers would have a vision for interfaces requiring no retrofitting—interface designs which would represent all users, would allow personalization of content, and would have the scope for individualized interfaces (Cooper & Heath, 2009; p. 1140). Some of the approaches within the Web Content Accessibility Guidelines 2.0 also aim at building such flexibility in initial digital environment design and can be implemented in ePortfolio building and pedagogy for users with a variety of sensory and learning disabilities to provide improved access to multimodal content as well as portfolio management systems themselves. An examination of one such ePortfolio system, Canvas, helps substantiate claims about accessibility and usability problems for visually impaired and blind users.

An ePortfolio can include any online multimodal document management tool with a set of specific display and management characteristics. Such systems collectively define the shared space between the creator and its imagined readers. Providing a complete survey of ePortfolio models or the tools various ePortfolios offer is beyond the scope of this discussion (see Kimball, 2006 for a fairly recent list). Rather, the primary goal here is to delineate some of the chronic accessibility issues these ePortfolio performance support systems presently suffer from in order to help illustrate how the lack of inclusivity in the

design of these tools can adversely affect visually impaired students' abilities to effectively participate in portfolio development in academia and the workplace. The availability of an accessible ePortfolio tool can have subtle, hard-to-detect yet immensely significant implications for students in their educational and workplace careers. If the portfolio tool is inaccessible or unusable in any way in school, it is very likely that the user will also lack necessary expertise to use similar technologies in the workplace. Again, the following description of Canvas Portfolio tool is not aimed to analyze or evaluate all product features.

ACCESSIBLE USER EXPERIENCE WITH THE CANVAS PORTFOLIO TOOL

Let's examine the Canvas Portfolio tool from the point of entry into the portfolio page to the place where users can add and edit sections. There are user experience accessibility problems for users with screen readers. The blind tester is an expert JAWS-for-Windows screen reader user, Version 13. A sighted university technician in charge of the management of Canvas participated as an observer. We replicated our earlier test with Canvas Portfolio six months later. Our results were almost identical. This is what we found. And note that since blind users cannot point to a mouse target, they navigate the screen with the help of the tab and arrow keys while JAWS reads the information from the cursor location. JAWS also has many sophisticated commands to permit faster navigation by expert users but nothing works unless Web pages have been coded accurately in accordance with the screen reader accessibility standards.

Once the user enters Canvas Portfolio, the first item JAWS reads is the Organize/Manage Pages area in the right navigation menu as garbage code "36,941. Reorder entries." After being serenaded by these random numbers and phrases from the underlying Web code by my favorite JAWS voice, Reed, we decided to test first things first and launched the Getting Started wizard. The wizard started okay, but once "introduction" or "portfolio sections" were selected within the wizard, a pop-up box came up with instructions and "show me" links, and JAWS did not read anything to the user to indicate that the box was displaying information. Upon being prompted by the sighted observer, the blind user was able to get the content by employing the "find" command in JAWS. The point here is that without a prompt from a sighted observer, the blind user would not even know about the existence of the text box.

At this point, the tester decided to explore this page further to understand its actual layout in comparison with the order in which JAWS was reading the

page. This is what JAWS saw and read; the sighted observer filled in the invisible items unread by JAWS:

complementary landmark
 wizard link
 panic level 2 home
 organize pages
 heading for pages for this section
 ePortfolio
 12,465 number garbage (all not visible)
 welcome
 times (all not visible)
 add another page (all not visible)
 694- reoder entery garbage (all not visible)
 edit page

At this point, we tried to create a portfolio page using the “ADD” button. When we tried to save the page, JAWS provided no response. Again, you can see how this would be impossible for a blind user to navigate without much assistance.

The next test we tried was for adding sections within the portfolio. When clicked on, the “done editing” window popped up but the “add section” button was not read. Once we clicked on it, the cursor moved in the box to enter a section name, but it was not verbalized by JAWS. After adding a section with sighted help, the last step to get the new section to show in the list of sections again did not read, and there was no way for the blind user to know that it is the last step before this added section will show in the navigation.

Further on, once a section was created, the next text box for creating another section came up but was not read. Instead JAWS read garbage after informing the user about a Twitter® link at the bottom of the page. At this stage, we decided to perform the next logical action: to edit the page with the new section. Again, using the “find” function in JAWS, the blind user located the added sections, but just by using the arrows or tab keys JAWS could not read them. Similarly, when editing a section page, the tab key did not take the user to the “add content” menu on the right, where the user needed to go. Employing the arrow keys, the user eventually reached that section, but again the tab key did not land the user on the menu.

The last test we performed was on uploading files from the user’s PC into this newly created portfolio section. Interesting enough, here we found that

when browsing for a file to upload, the “BROWSE” button on the page is voiced if the user moved the cursor backwards. But the button was not voiced when the user read forward and down the page, which is the norm. Likewise, “uploading a file” gave no verbal indication initially that the software was uploading until the user moved the arrow up.

To summarize this user experience, most of the accessibility problems recorded during this session are solvable. They would fall under four categories: the user getting lost in information organization, confusing navigation menus, invisible information, and not providing enough control to users. A separate but common accessibility/usability issue repeatedly confronted during this testing pertained to the positioning of keyboard focus when a feature was opened or closed. The system often moved the screen reader cursor back to the start of the page requiring the blind user to track back to the place where he had initiated the earlier action.

Further, an overall page design which caters to visual users, employs repetitive navigation menus with inadequate labeling, and codes various page elements poorly cannot serve disabled users. If we view questions of accessibility and usability as two interrelated phenomena, as Petrie and Kheir (2007) in their study of blind and sighted Web users have shown, many of accessibility problems confronted by blind users overlapped with usability issues experienced by the nondisabled. Addressing one group’s needs can benefit the other. Attention to Section 508 or Web Content Accessibility Guidelines could have taken care of all the technical issues in this case, although it would have been a monumental undertaking.

CONCLUSIONS

As it has been substantiated by this brief user experience report, in spite of major leaps in ePortfolio technologies, accessibility for disabled students and faculty rarely comes with these new digital tools. Campus administrators acquiring ePortfolios systems, and the instructors adopting them in their courses, must raise some difficult questions before selecting and implementing such systems for all users, both legally and ethically but also in order to adequately prepare students with functional technological literacies.

As Lawrence A. Scadden of the National Science Foundation writes, “[E]ducation professionals can be considered the gatekeepers to the future for many students with disabilities because education controls the boundaries of participation in our society. With a solid education (mediated by the essential adapted computer technology), multiple career options will be open to them, permit-

ting them to flourish independently in the twenty-first century. (VIII) the colleges can hardly ignore the needs of their disabled students and faculty today in light of the U.S. Justice Department's recent interventions in the Kindle cases in Arizona, Wisconsin, and Pennsylvania to protect the rights of this population in the higher education institutions" (Dear Colleagues Letter from DOJ, 2011). By overlooking accessibility aspects of ePortfolios we might also end up squandering precious institutional resources in providing band aid solutions in the form of able-bodied assistants to disabled students and retrofitting these ePortfolios with accessibility if the tools are home grown.

The adoption of such inaccessible ePortfolio tools happens under an range of circumstances—lack of a clear accessibility clause in the school's purchasing policies, the senior technology executives' knowledge of accessible technologies and accessibility laws, these executives' general attitudes toward disability, the admission departments' success in keeping the percentage of disabled students on campus low, and often these students' own unawareness about their educational rights. As far as cost is concerned, accessible ePortfolios should not cost a single extra penny to colleges in most cases since they are third-party commercial products. As it is apparent from the Kindle eReader cases in Arizona, Pennsylvania, and Wisconsin, any institutions of higher education receiving direct or indirect funding from the U.S. Government are obligated to purchasing accessible technologies for all users. Besides adopting accessible an ePortfolio system, we also need to ask other accessibility-related questions before ePortfolios performance support system implementation:

- What are the teaching and learning goals associated with the technological aspects of ePortfolios? Are these goals also achievable by disabled students considering the current state of ePortfolios technology? Is it possible for us to deliver our portfolios curriculum equitably to all students?
- What are the pedagogical benefits of ePortfolios to students? Will disabled students also receive comparable benefits with or without accommodations? How are these benefits assessed for students? Is the same methodology applied in the case of disabled students?
- Since various multimodal technologies integrated in ePortfolios create both opportunities and barriers for students with sensory disabilities, what content standards should be applied across the board to provide a level playing ground to all students? How do we build institutional capacity for training faculty and students in the use of technologies so that all the portfolios content generated is accessible to all as a matter of routine?
- What are the technical issues with the accessibility of ePortfolios in higher education which go beyond the question of meeting general Web

standards? Which academic or professional organization should take a leadership role for sorting out these technical problems? What commitment for integrating accessibility should be expected from the third-party vendors of ePortfolios?

RECOMMENDATIONS

These recommendations provide some suggestions for instructors to bring accessibility to their ePortfolio pedagogy so that it could be inclusive of their disabled students. While automated accessibility testing tools such as WAVE for Internet Explorer and Fangs for Firefox can highlight some key accessibility problems disabled users will experience with an ePortfolio system, a hands-on accessibility testing session can provide a visceral view of how disabled users interact with electronic pages. WCAG 2.0 lists 38 success criteria or checkpoints for achieving Web accessibility. Twelve of these checkpoints can be verified manually and can make instructors aware of the state of accessibility of a particular Web page.

Perform a manual test on all Web pages/screens of your ePortfolio tool three times and learn firsthand how your students with disabilities will interact with the system and will or will not experience accessibility problems with the various menus, links, buttons, mouse-overs, and other navigation. Conduct one test for learning about visually impaired users with a screen reader such as JAWS-for-Windows (see <http://www.freedomscientific.com>) or NonVisual Desktop Access (NVDA) (see <http://www.nvda-project.org>) for speech output and a keyboard for input but no mouse; another for speech and hearing impaired users without a speaker or microphone; and yet another without a keyboard and mouse but through a speech input software such as Dragon NaturallySpeaking (see <http://www.nuance.com/dragon>) for users unable to operate other input devices. When the ePortfolio homepage one tests fails to make links visible to the user using a screen reader, one realizes that access to this information is not really that easy. Similarly, when one's screen reader informs that the page has several links but they cannot be clicked without a mouse, a problem is clearly identified. Very suddenly the wonderful World Wide Web begins to appear not so wonderful.

Here are some disability-centered general guidelines to improve accessibility and usability performance of ePortfolios through an accessible pedagogy. Because manufacturers of ePortfolio tools primarily test their systems with nondisabled users, disabled users always face more technical problems. Consequently,

they require strong technical support on campus for troubleshooting. Another central accessibility issue relates to the need for a smooth interfacing of the electronic portfolio tools with other learning management system tools used by the instructor. Equally crucial is a functional interface with other university digital systems such as library Web pages, campus storage drives where instructors and students park materials, and any other university websites housing materials related to portfolio work.

EMPHASIS ON ACCESSIBLE CONTENT GENERATION

Besides ensuring the accessibility of the ePortfolio system, making use of only accessible tools for content development is central to disabled students' success with their portfolio projects. We often forget to check whether our own Web pages follow WCAG 2.0 guidelines. We may not remember that our videos often lack descriptive transcripts of visual elements for the blind and text transcripts of audio elements for the deaf and other users with audio processing disorders. The same rules apply to plug-ins and other third-party links. Last, information overload, or general confusion, is a major issue in multimodal presentations for users with a range of disabilities.

MULTIMODAL ASSIGNMENTS

We can develop assignments that utilize disabled students' differing capabilities and skills just the way we design assignments for able-bodied students' diverse capabilities and skills. We also cannot expect all students to accomplish the same level of competency in each area/goal of the assignment when we take into account how no two human bodies are alike. By no means do I suggest that we should not expect our disabled students to employ more than one modality or learning approaches. For example, blind students might be interested in exploring the possibilities of video whereas deaf students might be interested in soundscapes. Stefani et al. (2007) emphasize that for optimal accessibility an ePortfolio's content must be useable in more than one medium. They suggest that students create multimodal portfolios that could be experienced with "audio turned off, with screen-readable text to supplement or replace graphics, with captioning of digital video, with descriptions to accompany flash animations" (p. 114). This is a post-process pedagogy of divergency. As workplaces happen to be collaborative, and this mode of learning has become acceptable in higher education, use of collaborative assignments can permit students to apply their diverse capabilities and skills without instituting new power hierarchies.

ACTIVITIES SURROUNDING ePORTFOLIO CONTENT DEVELOPMENT

Again, when developing content for ePortfolios, at least the instructor-directed activities must draw on different abilities and skill-levels of disabled and non-disabled students. The rule of thumb for inclusive pedagogy is that we incorporate a range of activities in ePortfolio design, content development, and eventual portfolio management so that every student has an opportunity to shine in some of them rather than getting penalized for failing to perform an overwhelming number of activities beyond their bodily ability. In the same vein, involvement of disabled students in evaluating the effectiveness of assignments and activities from their vantage point as disabled designers and learners is crucial. Last, making the purpose of such activities and interactions obvious to all students is important, and presenting this information in more than one modality is even more important. In our own assessment and feedback, we must become introspective in choosing our methods for evaluating student work. We must devise methods that do not favor student work in a certain modality and penalize another. Further, experiments in providing feedback in diverse modalities can be constructive in specific student circumstances and disabilities; however, instructors ought to remember to offer more than one option for receiving this feedback because “not one size fits all” adage can be true even within a single disability category (Thompson & Lee, 2012). Last, spreading grade distribution broadly and keeping the weight of individual assignments low enough that failing one assignment does not affect final grade adversely is fair and helpful to all students.

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