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Website Accessibility Compliance at Research Institutions

Jonathan D. McGough
Central Washington University, mcgoughj@cwu.edu

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We hereby approve the thesis of

Jonathan Daniel McGough

Candidate for the degree of Master of Education

APPROVED FOR THE GRADUATE FACULTY

_____ _____

Dr. Henry Williams, Committee Chair

_____ _____

Dr. Heidi Henschel Pellett

_____ _____

Dr. Donald K. Wattam

_____ _____

Dean of Graduate Studies

ABSTRACT

Three websites from 34 research institutions were evaluated on six measures of website accessibility. All but one institution had at least one website fail the accessibility assessment, and the single institution that performed well had recently been investigated by the Department of Justice regarding the accessibility of its website. This study concludes that while disability service offices do perform better than institutional homepages and admissions websites on measures of accessibility, many websites are plagued by perennial accessibility concerns such as images that lack alternate descriptions and content inaccessible to individuals using keyboard navigation or screen reader software.

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Chapter 1

Background of Study

Introduction

The Internet has become an integral aspect of education, research, recruitment and information sharing. However, there is no law that codifies the specific responsibilities of higher education institutions to make their websites accessible to individuals with disabilities (Solovieva & Bock, 2014). Section 508 of the Rehabilitation Act of 1973 (hereafter referred to as Section 508) is a piece of legislation that codified the responsibilities of federal agencies to make their websites accessible to people with disabilities, but it does not apply to institutions of higher education, except for a limited number of states that have adopted it as a standard for their public institutions (Olalere, & Lazar, 2011). Beginning in 1996, investigations by the United States Department of Education, Office for Civil Rights (hereafter referred to as OCR), which has the responsibility of enforcing Title II of the Americans with Disabilities Act of 1990 (ADA), have continued to clarify the obligation of institutions in providing accessible digital content for individuals with disabilities (Forgione-Barkas, 2012). Still, research studies have continued to find problems with website accessibility at colleges and universities of every size and type—from community colleges to the most prestigious universities in the country (Schmetzke, 1999; Schmetzke, 2001a; Guitierrez & Long, 2001; Schmetzke, 2001b; Spindler, 2002; Hackett & Parmanto, 2005; Zaphiris & Ellis, 2001; Krach, 2007; Thompson, Burgstahler, & Moore, 2010; Erickson, Trerise, Lee, VanLooy, Knowlton, & Bruyère, 2013; Thompson, Comden, Ferguson, Burghstahler & Moore, 2013; Forgione-Barkas, 2014; Solovieva & Bock, 2014).

Inaccessible websites are an evolving area of litigation and investigation (Solovieva & Bock, 2014). Inaccessible websites can prevent otherwise qualified students from accessing course materials and members of the public from finding out more about an institution. This can potentially undermine an institution's ability to generate and maintain a diverse student body. Thus compliance is not just a risk management issue; it likely affects the very fabric of the student body.

Purpose

The purpose of this study was to clarify the legal responsibilities of institutions of higher education in making their website content accessible to individuals with disabilities, and to determine the current status of compliance at the University of Washington and its 33 peer research institutions, as demonstrated by their homepage, admissions, and disability services webpages. These webpages are of interest, in that they are a primary point of entry for many students, including those with disabilities, who are seeking information regarding a college or university. This study adds to the growing body of research seeking to define institutional responsibility in website accessibility and provide more data outlining institutional compliance in this area.

Significance of the Study

This study is of significance because no other study to date has evaluated website accessibility within this group of institutions. The relative few studies conducted in the past five years beg the question, have recent high profile investigations into website accessibility resulted in institutional prioritization of website accessibility? The timing of this study made it unique.

This study used similar accessibility criteria to Thompson et al (2010), and

provided a useful juxtaposition of current accessibility barriers, as compared to those of previous studies.

Additionally, this study compared disability services offices webpages with admissions webpages and homepages. No other study to date has evaluated accessibility among these specific webpages. Variation in website accessibility performance among webpages within the same website would demonstrate whether variations in webpage accessibility are consistent within an institution. Should disability services offices, which are likely smaller and receiving less funding than marketing or admissions offices, achieve greater accessibility performance, this would be indicative of whether website accessibility is an issue of effort, awareness, and education; not an issue of funding.

Limitations

The primary limitation to this study was that three webpages are not a sufficient sample to fully gauge the accessibility of an institution's website, online forms and course management systems. University websites are vast and contain many elements. An institution's homepage, admissions and disability pages are however, an important juxtaposition. Homepages and admission websites are well curated and likely receive much more attention from marketing and web-development professionals. Logic would follow that if this most curated page was not developed with accessibility in mind, then pages given lesser attention by staff are even less likely to be vetted for accessibility. If however, a homepage fairs well in this assessment and can be considered accessible, then it seems important to have another page tested to determine whether pages with a lower profile are given similar attention in terms of their accessibility.

Additionally, this study was not a full-compliance assessment. This study did not

conclude whether a website met all criteria for Web Content Accessibility Guidelines 2.0 (hereafter referred to as WCAG 2.0) or Section 508. Instead it focused on a limited subset of success criteria common to both standards.

Finally, this study was limited by the fact that webpages are dynamic. A webpage found to be accessible one day, could be entirely different the next. New technologies and protocols make the Internet exciting, but also create new challenges. Institutions must continually prioritize website accessibility, as web-based technologies continue to increasingly be knit into the fabric of higher education in the twenty-first century.

Legal Definition of Disability

As this paper deals primarily with issue of access for individuals with disabilities, it is critical to define the word *disability*. The Americans with Disabilities Act, Amendments Act of 2008 (hereafter referred to as the ADAAA) defined a disability as "a physical or mental impairment that substantially limits one or more major life activity…" (29 U.S.C. § 12102). While the legislation did not provide an exhaustive list of major life activities, it did specifically name activities such as reading, hearing, communicating, seeing, performing manual tasks, and learning, among others.

Barriers to Website Access for Students with Disabilities

This short list of major life functions represents the manner in which many people access the Internet using their computer. People who are blind or have low-vision use screen reader software that reads aloud text and information necessary to navigating the web. Screen reader software requires the user to navigate webpage using a keyboard, not a mouse, since the user likely is not able to see the location of a mouse cursor on a screen. In the United States, it is estimated that 2.3 percent of the United States (U.S.)

population, or 7,327,800 people, are legally blind (Erickson, Lee & von Schrader, 2015). Individuals with limited mobility and/or fine motor skills, use voice commands or keyboard shortcuts to navigate webpages and select items, instead of a mouse or track pad. Computer users with learning disabilities use similar text-to-speech software to have their computers read-aloud large bodies of text found in webpages or articles. Lastly, an estimated 11,081,300 people in the U.S. are deaf or hard-of-hearing and would benefit from captioned audio content (Erickson et al.). All told, Erickson et al. found that 12.6 percent of the United States population or 39,187,600 people have a disability according to census data. Rowland, Mariger, Siegel, and Whiting (2010) wrote, "for the 8.5 percent of the U.S. population who have at least one disability that affects computer and Internet use, inaccessible websites can inhibit or severely restrict their participation in higher education" (p. 20).

Assistive technology exists to afford individuals with disabilities access to Internet content, but only so long as webpages are appropriately formatted. With so much information shared through the Internet in modern day education, it is clear that the inability to access information on the Internet, is synonymous with the inability to access a vast body of scholarly knowledge in almost every discipline.

Definition of Accessibility

While it can be difficult to codify exactly how all the rapidly changing information on the Internet can be made "accessible", the Office of Civil Rights has worked to define the term. In 2012 they defined it as follows:

> "Accessible" means that individuals with disabilities are able to independently acquire the same information, engage in the same interactions, and enjoy the same

> services within the same timeframe as individuals without disabilities, with substantially equivalent ease of use (Resolution Agreement, among the University of Montana and the U.S. Department of Education, OCR, 2014).

In 2014, OCR modified this definition:

> "Accessible" means a person with a disability is afforded the opportunity to acquire the same information, engage in the same interactions, and enjoy the same services as a person without a disability in an equally effective and equally integrated manner, with substantially equivalent ease of use. A person with a disability must be able to obtain the information as fully, equally, and independently as a person without a disability. Although this might not result in identical ease of use compared to that of persons without disabilities, it still must ensure equal opportunity to the educational benefits and opportunities afforded by the technology and equal treatment in the use of such technology (Resolution Agreement between the University of Cincinnati and the U.S. Department of Education, OCR, 2014).

Notable in this most recent definition, is the term "an equally effective and equally integrated manner" (Resolution Agreement among the University of Cincinnati and the U.S. Department of Education, OCR, 2014). This implies that a printed or recorded accessible version of a webpage to be made available upon special request, can no longer be substituted for an accessible webpage. Instead, the individual with a disability is entitled to accessible information—integrated with other web content and accessible without assistance. There seems to be no way to accomplish this, except for a webpage to be made accessible.

Prevalence of Website Inaccessibility

While website accessibility guidelines have become increasingly clear, most studies on compliance with these standards have demonstrated vast noncompliance. Federal agencies are currently held to Section 508 standards, which is less rigorous than WCAG 2.0. Yet even with this lesser standard, Olalere and Lazar (2011) determined that only 4 out of 100 government agency homepages were Section 508 compliant. Forgione-Barkas (2012) found that all 102 colleges and Universities in North Carolina failed to meet WCAG 2.0 standards. In a 2011 study of 509 webpages, Solovieva and Bock (2014) found that just 35 percent of university webpages met the lowest WCAG 2.0 compliance standard. Solovieva and Bock wrote:

> The stricter the level of testing, the more university webpages failed. Stricter web accessibility requirements may be legally imposed [on Federal agencies] instead of Section 508 in the future. Universities will succeed in meeting an important mandate of the ADA by making institutional websites accessible to current and future students and employees with disabilities (p. 113).

This bleak compliance landscape is occurring at a time when OCR is not only honing its definition of *accessibility*, but is deciding that *accessibility* means WCAG 2.0 compliance. Since 2010, there have been seven settlement or resolution agreements OCR and the DOJ have facilitated, that have specifically referenced WCAG 2.0 standards. So while it is not codified into law, it is clearly being associated with institutional responsibilities under Section 504 of the Rehabilitation Act of 1973 (hereafter referred to as Section 504) and the ADAAA.

Conclusion

Beyond the importance of federal compliance, which is critical for institutions of higher education and alone justifies the importance of this study, institutions of higher education are working to admit, retain and graduate a diverse student body. Horn and Berktold (1999) determined that of students completing the 8th grade, 61.5 percent of students without disabilities enrolled in 4-year colleges or universities, while only 42 percent of students with disabilities enrolled in 4-year institutions. While students with disabilities face unique barriers when compared to students without disabilities, institutional non-compliance with federal laws should not be one of those barriers. Burgstahler and Moore (2009) found that website accessibility and attitudinal barriers impacted student admission decisions. Thus, by evaluating webpages critical to student experience, this study provides useful information to institutions willing to address this important aspect of accessibility, which is at the nexus of building a diverse student body and complying with rapidly evolving federal obligations.

Chapter 2

Review of Related Literature

Introduction

The purpose of this chapter was to review the literature related to website accessibility at colleges and universities in the United States. First, this chapter reviews similar studies that have assessed college and university compliance with Section 508 and WCAG 2.0 standards. Second, it reviews the context in which Section 508 and WCAG 2.0 are referenced in OCR settlements with colleges and universities. Thirdly, it elaborates on the manner in which colleges and universities that were found to be out of compliance, have been required to adopt and integrate WCAG 2.0 and Section 508 in order to fulfill their obligation to students with disabilities under the ADA and Section 504.

Section 504 of the Rehabilitation Act of 1973

In the past 40 years, legislation has changed who is considered a person with a disability and what rights they are afforded under the law. Section 504 was the first piece of legislation to support the rights of individuals with disabilities. It was passed as part of a larger wave of civil rights legislations. Section 504 still applies to all entities receiving financial assistance—this includes colleges and universities who receive federal money such as Stafford loans and Pell grant. Under this law individuals with disabilities should be afforded equal access to the services offered by recipients of federal funds. It is important to note that equal access should be afforded not just to students, but to members of the public as well. Section 504 (1973) stated:

No otherwise qualified individual with a disability in the United States…shall,

> solely by reason of her or his disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance… (29 U.S.C. § 794)

While institutions of higher education have been subject to Section 504 (1973) for over 40 years, the context in which it is applied has changed significantly—specifically because technology has changed significantly. However, it is important to note which came first. Institutions' obligations to provide access to students with disabilities, precedes the advent of the Internet and personal computers.

While schools could not have predicted, in 1973, just how the Internet would change the educational landscape, there were more blatant barriers that institutions failed to address in the years immediately following the passage of the Section 504. Architectural best practices for accessibility, such as curb cuts, elevators, braille signage and accessible bathroom stalls were still a rarity on college campuses (Davis, 1994). According to Davis, a lack of understanding, administrative priority and the anticipated costs likely all played a roll in institutions' reluctance to act on the broad intention of Section 504.

The Americans with Disabilities Act of 1990

The ADA was passed after a concerted effort of activism lead by people with disabilities (Leake & Stodden, 2014). It reversed both a pattern of judicial narrowing of the term "disability" and a trend toward minimizing the responsibilities of institutions to modify their programs for students with disabilities (Keenan, 2014). The courts had not enforced Section 504 in the manner Congress had intended (Mayerson, 1992).

The ADA not only extended the responsibilities of affording access to individuals

with disabilities to public and private organizations, but codified the responsibilities of all these entities including the slopes of wheelchair ramps, heights of bathroom grab bars, and the height of ticket windows, among many others. Specifically, Title II of the ADA (28 C.F.R. § 36) obligated public institutions, regardless of whether they received federal funding, to "make reasonable modifications in policies, practices, and procedures that deny equal access to individuals with disabilities, unless a fundamental alteration in the program would result" (Department of Justice, Civil Rights Division, 2002). Title III of the ADA (28 C.F.R. § 36) requires the same of private institutions.

Institutions and municipalities were mandated to identify high use areas, and to create detailed plans to achieve benchmarks of compliance with architectural accessibility standards over the course of fifteen years (Davis, 1994). While classrooms and residence halls still consist of the same physical components of floors, walls, desks, and windows, the role of the web-based platforms being used in the classroom and the broader digital presence of colleges and universities have changed drastically. The ADA (1990) clearly regulated minute details in the physical space, but it failed to explicitly address barriers to individuals with disabilities in the digital environment.

The Americans with Disabilities Act, Amendments Act of 2008

After nearly two decades of continued judicial erosion of Congress' intent with the ADA, the ADAAA lowered the analytical threshold required to establish whether an individual has a disability under the law (Keenan, 2014). Furthermore it broadened the definition of disability to included individuals with a history of being regarded as disabled, and included additional examples of major life functions (Keenan).

Relevant to this study, "reading" was added to the list of major life functions and

courts could no longer consider mitigating measures determining whether a person had a disability. Before the ADAAA, the *Supreme Court heard Bartlett v. New York State Board of Law Examiners* (1999). In this case Bartlett had a learning disability that impacted her ability to read. She petitioned to receive additional time to sit for the Bar Exam. This case was elevated to the Supreme Court as lower courts determined that because the plaintiff had essentially done too well in school, and therefore couldn't have been disabled. The Supreme Court concluded that the fact she had acquired subconscious mitigating measures to minimize the impact of her learning disability, did not mean that she could necessarily be disqualified as having a disability.

Despite broadening the definition, and therefore increasing the number of individuals afforded protection under the law (in particular those with reading disabilities) the Amendments Act (2008) failed to offer any clear regulatory guidance on specific responsibilities to afford students with disabilities access to web content.

Increase in the Number of College Students with Disabilities

The broadening of the term "disability" under these three pieces of legislation has led to more people finding protection under the law. This, in combination with a generation of children have been born after the ADA was passed, has in no small way led to an increase in the number of college students with disabilities (Belch, 2004). According to the National Center for Education Statistics (2015), 11.1 percent of college students have a disability.

A third reason for an increase in the number of students with disabilities is broader acceptance of the social model of disability (Laird-Metke & Moorehead, 2015). The social model states that a disability is not innate to the individual, instead it is the

societal and environmental barriers that prevent full inclusion and meaningful access. An individual may have an impairment, but they are only disabled in specific context—when barriers external to the individual prevent meaningful access. For example, an individual in a wheelchair is not pervasively disabled. Instead, they are disabled by the community when it fails to install ramps, elevators or curb cuts.

Consistent with the social model of disability, the issue facing colleges and universities seeking to accommodate students with disabilities is not, "What to do with all the disabled students?" Instead, the better question is: What to do with all of these broken websites that disable our students?

Section 508

Digital accessibility was first addressed in a legislative capacity through Section 508, which was amended in 1986, 1998, and 2001, to eventually address website accessibility (36 C.F.R. §1194.22). Section 508 Regulations mandate federal agencies providing information to the public via telecommunications and computerized formats, such as websites, to be accessible to individuals with disabilities, including employees with disabilities and members of the public.

Section 508 was last updated in 2001 and the nature of websites has changed significantly in that time (Olalere & Lazar, 2011). Section 508 (2001) requires websites to comply with sixteen checkpoints labeled A-P (see Appendix A).

According to the U.S. General Services Administration Office of Government-wide Policy, Office of Information, Integrity, & Access (n.d.), 13 states have adopted legislation mirroring Section 508 (2001) standards for their web accessibility policies. Section 508 attempted to distill 16 guidelines and 65 checkpoints created by the World

Wide Web Consortium (hereafter referred to as W3C) in 1999, and referenced the Web Content Accessibility Guidelines 1.0 (hereafter referred to as WCAG 1.0). WCAG 1.0 was a laundry list of guiding principles for web-designers to create accessible websites. The W3C developed tools to assess whether websites met the WCAG 1.0 standard, but because the checkpoints were a tedious list, these tools were used after the fact as an assessment and less as design principles (W3C, 2009). Both Section 508 and WCAG 1.0 are dated evaluation tools. Section 508 has been largely reworked, and twice opened for public comment on its revision, however there is no new regulation at this time.

WCAG 2.0

The need for guidance when websites are being designed led to the W3C's development of a new standard. WCAG 2.0 was developed around four principles, that websites must be perceivable, operable, understandable, and robust (W3C, 2008). It does not omit the growing list of checkpoints, but provides an operable framework for web-developers to build around. An important difference between a list of how to make websites accessible now, and these principles, is that they can inform developers building technologies that are currently under development. This addresses the difficulty with regulating technology, namely it is difficult to regulate what doesn't exist yet, especially given the rapidity with which new technologies are developed. As an example of how quickly computing changes, the use of smartphones is currently commonplace, but Section 508 Regulations came out six years before the first iPhone. So while even WCAG 2.0 will likely need updates in the future, its basic framework can inform web-designers and engineers building the future of the Internet.

Perceivable refers to the concept that web content can be perceived by all users,

knowing that different users will use different senses to access content. In essence, all content must be usable in multiple modalities. Visual content should be formatted in a manner that allows individuals who are blind, low-vision or have a learning disability to listen to it. Conversely, audio materials should be in a format that allows individuals who are Deaf or hard-of-hearing, to listen to it.

Operable refers to the access and navigation of web content including menus, links and controls. Content should be operable in multiple modalities. For example, individuals who have limited mobility, are blind, or have low-vision use a computer with keyboard or voice commands—and without the use of a mouse.

Understandable refers to the usability and ease of use in accessing web content. A website is understandable if both the user interface and the content rendered can be understood.

The fourth and final principal is that content must be *robust*. This means that user must be able to access it across hardware and software that is constantly changing. In other words, as web browsers are updated and using more applets and plug-ins, the content still needs to work. Individuals using accessible technologies are often required to use older operating systems or software that maintains compatibility with screen readers or other assistive technologies (Fleet, 2015).

WCAG 2.0 (W3C, 2008) identified 12 guidelines that form basic goals for web content creators to consider when making websites. Success criteria correlate to each guideline, providing testable measures that can be used in determining conformance with levels of accessibility: A, AA, AAA. Levels of conformance are grades of excellence in accessible web design. Level A conformance is the least rigorous. Levels AA and AAA

each require additional success criteria in addition to meeting the WCAG 2.0 Level A standard. Appendixes B-E correlate to each of the four principles, and explain the corresponding guidelines and success criteria necessary for each level of accessibility conformance.

Similar Studies

Since 1999, 12 major studies have sought to survey the accessibility of college and university websites in the United States by evaluating their compliance with Section 508 and/or WCAG standards (Schmetzke, 1999; Schmetzke, 2001a; Guitierrez & Long, 2001; Schmetzke, 2001b; Spindler, 2002; Hackett & Parmanto, 2005; Zaphiris & Ellis, 2001; Krach, 2007; Thompson et al., 2010; Ericksonet al., 2013; Thompson et al., 2013; Forgione-Barkas, 2014; Solovieva & Bock, 2014). All of these studies have concluded that a significant quantity of institutional webpages—regardless of size and classification of the institution—have websites that would be problematic for many users with disabilities. As litigation and investigations on the topic of web accessibility in higher education are on the rise, there seems little reason for optimism as just two of the oldest studies found a majority of institutional homepages to be accessible (Hackett & Parmanto, 2005; Krach, 2007). Studies conducted since 2013 have all concluded that the majority of institutional websites have significant barriers (Erickson, Trerise, Lee, VanLooy, Knowlton, & Bruyère, 2013; Thompson et al., 2013; Forgione-Barkas, 2014; Soloveiva & Bock, 2014).

It is difficult to directly compare these studies to one another because of three variables. First, it is difficult to compare the elements and technologies used in college and university websites in the 1990's to those of 2016. Websites have grown in terms of

quantity, complexity and profile in higher education. Second, the term *accessible* is taking on new meanings based on evolving standards, such as WCAG 2.0 (Spindler, 2002; Resolution Agreement between University of Cincinnati and U.S. Department of Education, OCR, 2014). As technologies change, so too do the standards by which they are measured. A webpage considered *accessible* in an early study such as Spindler (2002), may not be considered accessible under current standards, because earlier studies focused on a limited selection of accessibility criteria (Erickson et al., 2013). Thirdly, the instruments used in accessibility research have changed significantly. Eight of the 11 studies represented in Table 1 used the most readily available software assessment tools in lieu of manual evaluations. Bobby, an early tool designed for website developers, is no longer commercially available (Coggan, n.d.).

Assessment Instruments

The majority of studies outlined in Table 1 utilized software to evaluate accessibility and did not manually review websites for accessibility. While software can effectively identify whether image elements contain alternatives, or whether a webpage's color scheme has sufficient contrast, determining whether certain aspects of a website are equally perceivable, operable, and understandable can only be determined through a manual review of a website (Thompson et al., 2010; Thompson et al., 2013).

Assessing keyboard navigability, for example, requires a sighted computer user pressing the Tab key to determine whether a focus indicator (often a box around a selected element on a webpage) is sufficiently viewable and consistent among each button, icon, heading or menu item (Web Accessibility in Mind, 2016). Additionally, each element must be selectable and navigated in an intelligible manner. For example,

WCAG 2.0 Success Criteria 3.2.3, requires repeated navigation schemes on a given website to be consistent, while WCAG 2.0 Success Criteria 2.4.1 requires a mechanism to bypass repeated content (World Wide Web Consortium, 2008). Put another way, important and frequently needed items should be easy to access or bypass on pages within a given website, without cycling through items in a seemingly random or un-intelligible manner. So while assessment instruments are helpful in identifying some web accessibility barriers, they are not a conclusive indicator of a websites overall accessibility. Despite the changing landscape of website accessibility, themes have arisen in this body of research literature—namely that the problem of inaccessible websites does not seem to be improving greatly over time (Schmetzke, 1999; Erickson et al., 2013; Forgione-Barkas, 2014). To this end, three important longitudinal research students have been conducted.

Website Accessibility Assessments in Higher Education

Hackett and Parmanto (2005) conducted a longitudinal study using archived webpages from each of the last five years for homepages from 62 institutions. All of these institutions are members of the Association of American Universities (AAU). Hackett & Parmento found a marked decline in the accessibility of institutional homepages, finding that 64.4 percent of homepages were accessible in 1997 and only 25.6 percent of AAU websites were accessible in 2002. Hackett and Parmanto further identified that over this same period there was a marked increase in the complexity, or number of unique element types, used on these webpages. While the increased complexity may have played a role in reduced accessibility, the text descriptions of visual elements plagued accessibility scoring throughout the study. This text allows individuals

who are blind or have low-vision, and are using screen reader software, to listen to descriptions of pictures. Commonly referred to as *alt tags*, they offer additional benefit to all website users, in making images easy to query via text-based search engines such as Google or Bing. Hackett & Parmanto write:

> The issues that cause the most accessibility barriers to persons with disabilities for both government and education web sites are not supplying alternative text for images and image map hotspots. Another issue that posed issues in the education web sites, but not the government sites, was not providing titles for frames. If designers would make the minimal effort to fix these just the two issues posing most barriers (to include alternative text for each image and image map hot spot), their web site would be substantially more accessible (p. 288-9).

In a second longitudinal assessment, Krach (2007) conducted follow-up research, building on the work of Zaphiris and Ellis (2001). Both studies used comparable assessment software to report on the accessibility of 51 homepages for schools ranked highly by *US News and World Report*. Additionally, Krach evaluated departmental homepages from all but two of the institutions. Krach found an overall improvement in the accessibility of homepages, noting that 58.8 percent were accessible, as compared to Ellis' study of the same websites just five years earlier, in which 29.4 percent were accessible. This increase in accessibility is marred by the fact that not all the homepages considered accessible by Zaphiris and Ellis were still accessible in Krach's study. Departmental homepages performed poorly, as only 39.6 percent of those were accessible.

Similar to Hackett and Parmanto (2005), Krach (2007) found the most significant accessibility barrier was meaningful descriptions of image elements. Krach writes:

> In fact, all errors noted across the 51 university home pages involved just adding "alt" tags to standard images (16 institutions), adding "alt" tags to images used as buttons (three institutions), adding "alt" tags to objects (one institution), and/or adding "alt" tags to an image map, which is a divided image where each section of the picture links out to another Web site (six institutions) (p. 35).

Thirdly, Thompson et al. (2010) conducted a two-phase longitudinal study evaluating the homepages of 127 colleges and universities in the Pacific Northwest. In 2005 these websites were evaluated on 14 checkpoints. In 2009 these same webpages were again evaluated, using a subset of just three checkpoints that applied to nearly all of the webpages, so as to have meaningful data for comparison. The primary checkpoints common to both phases of the evaluation were (a) identifying alternate text for images, (b) evaluating keyboard only navigational accessibility and (c) skip navigation. Skip navigation is the feature that would allow individuals using screen reader software or using keyboard-only navigation to transition to the main content on a given webpage without cycling through each heading item. These features are important for many populations, but are critical for screen reader users to navigate the Internet effectively.

Thompson et al. (2010) concluded their study with mixed results, as there were some improvements in accessibility and some negative trend as well. Thompson et al. found that 41 percent of webpages included alternative text descriptions of images, as compared to 27 percent four years earlier. Another positive trend was that the number of webpages using skip navigation increased from 7 percent to 19 percent. Lastly, there was a significant decrease in the ability to navigate through webpages solely by using a

keyboard. Whereas 78 percent of webpages allowed for meaningful keyboard navigation in 2005, by 2009 just 65 percent of websites were keyboard navigable.

Many other studies have supported Thompson et al. (2010) finding that skip-navigation, text description of images, and effective keyboard navigation schematics remain as perennial hurdles to website accessibility. Forgione-Barkas (2014), and Erickson, et al (2013) specifically mentioned these three aspects of web accessibility. Zaphiris and Ellis (2001), Schmetzke (2001b), Spindler (2002), Krach (2007), and Thompson et al. (2013) all found a large number of errors associated with text descriptions of images. According to Kane, Shulman, Shockley and Ladner (2007), this is one of the easiest accessibility barriers to resolve.

While the trends outlined in Thompson et al. (2010) are mixed, they demonstrate a broad failure on the part of colleges and universities to meet just three checkpoints of website accessibility. The checkpoints they evaluated represented just a small fraction of the far more detailed Section 508 and WCAG 2.0 standards, but they are critical to compliance with either standard. In total, 12 major studies have evaluated website accessibility in higher education. The two most recent evaluations have concluded that as few as 65 percent or as many as 100 percent of institutional webpages are not in compliance with WCAG 2.0 (Forgione-Barkas, 2014; Solovieva & Bock, 2014). Based on the most recent studies, it seems likely that the majority of college and university websites are out of compliance with any standard (Thompson et al. 2010; Erickson et al., 2013; Forgione-Barkas, 2014; Solovieva & Bock, 2014). However, further research is necessary in this field given the increased pressure by federal enforcement agencies since 2010 and the relative few studies that have been conducted since then.

Table 1

Summary of Literature on Website Accessibility in Higher Education

Study	Sample	Standard	Instrument	Findings
Schmetzke, 1999	13 University homepages and library webpages for 13 University of Wisconsin Schools	Subset of 508 Checkpoints	Bobby by Centre for Applied Special Technology	69% of pages had significant accessibility barriers
Schmetzke, 2001a	Institutional and departmental websites for 24 Universities with library and information science programs	Subset of WCAG 1.0 and 508 Checkpoints	Bobby by Centre for Applied Special Technology	73% of institutional homepages and 96% of departmental webpages had significant accessibility barriers
Guitierrez & Long, 2001	Homepages of 392 colleges and universities accredited by The Association to Advance Collegiate Schools of Business	Subset of WCAG 1.0 and 508 Checkpoints	Bobby by Centre for Applied Special Technology	68% of pages had significant accessibility barriers
Schmetzke, 2001b	219 college and university homepages, and 3,147 pages directly linked to homepages	Subset of WCAG 1.0 and 508 Checkpoints	Bobby by Centre for Applied Special Technology	84.9% of homepages and 76.7%of pages linked to the homepage had significant accessibility barriers
Spindler, 2002	188 homepages of mid-size universities (enrollments between 5000–10,000)	Subset of WCAG 1.0 and 508 Checkpoints	Bobby by Centre for Applied Special Technology	58% of pages had significant accessibility barriers
Hackett & Parmanto, 2005	62 member universities of the Association of American Universities	WCAG 1.0 Checkpoints	Manual evaluation	This longitudinal study found 35.6% of websites in 1997 and 84.4% in 2002 had significant accessibility barriers
Zaphiris & Ellis, 2001. Krach, 2007	Krach (2007) conducted a longitudinal study building on Zaphiris & Ellis' (2001) data, evaluating 51 homepages of prestigious universities. Krach (2007) also evaluated 48 departmental homepages.	WCAG 1.0 Checkpoints	Bobby and WebXact by Centre for Applied Special Technology	Zapharis & Ellis (2001) found that 71.4% of homepages had significant accessibility barriers. Krach (2007) found that 41.2% of institutional homepages and 60.4% of departmental pages had significant accessibility barriers.
Thompson, Burgstahler, & Moore, 2010	A longitudinal study between 2004-2009 evaluating accessibility of the homepages for 127 colleges in the pacific northwest.	WCAG 1.0 Checkpoints	Manual evaluation	In 2004: 27% of homepages provided descriptions of images, 78% of homepages could be navigated using a keyboard, and 7% had skip navigation. In 2009 41% of homepages had image

				descriptions, 65% could be navigated by keyboard, and 19% had skip navigation.
Erickson, Trerise, Lee, VanLooy, Knowlton, & Bruyère, 2013	276 webpages from 30 community college websites	Section 508 Standards	Manual evaluation and AccVerify by HiSoftware	92% of pages had significant accessibility barriers according to AccVerify. A manual evaluation found 99.9% of pages had significant accessibility barriers.
Thompson, Comden, Ferguson, Burghstahler & Moore, 2013	31,701 random webpages from 3,251 U.S. colleges and universities	Subset of 7 criteria from WCAG 2.0	Google's Custom Search API	Less than half of all websites included the 7 features assessed and less than 65% of images had alternative descriptions.
Forgione-Barkas, 2014	Assessed the complete websites of 102 colleges and universities in North Carolina.	Section 508 & WCAG 2.0 AA	SortSite by PowerMapper	Used SortSite to survey all webpages within each institution's domain. No institutions were WCAG 2.0 compliant on all webpages. 2 institutions were found to be compliant with WCAG 2.0 on at least 80% of their webpages. 11 institutional websites were WCAG 2.0 compliant on at least 70% of webpages.
Solovieva & Bock, 2014	Assessed 509 webpages from a single, large public university	Section 508 & WCAG 2.0 A	Web Accessibility Evaluation Tool by WebAIM and Cynthia Says by HiSoftware	49% of webpages were found to have Section 508 accessibility barriers and 65% were found to have WCAG 2.0 A barriers.

Note. Portions of Table 1 were adapted from Bradbard, Peters, & Caneva (2010).

Legal Settlements

In 1996 a student at San Jose State University filed the first complaint with OCR regarding inaccessible website content in higher education (Krach, 2007). The University voluntarily entered into the Resolution Agreement (1996), which mandated they provide an equally flexible and responsive Internet experience for their web users with disabilities. It specifically called out the practice of relying on human readers to interpret images and assist with navigation, but failed to elaborate on the technicalities of

how the institution would ensure accessibility. Section 508 and WCAG 1.0, were still years in the future, but OCR had clearly established that websites were a university program, to which everyone should be afforded access. In a letter to the president of San Jose State University, Shelton (1996) summarized OCR's interpretation on institutions' legal responsibilities in affording individuals with disabilities access to online content:

> Section 504 at 34 C.F.R. § 104.4 (b)(1)(iii) and Title II at 28 C.F.R. § 35.130 (b)(1)(iii), state, respectively, that recipients and entities in providing any aid, benefit or service, may not afford a qualified individual with a disability an opportunity to participate that is not as effective as that provided to others. Title II recognizes the special importance of communication, which includes access information, in its implementing regulation at 28 C.F.R. § 35.106 (a). The regulation requires a public entity, such as a state university, to take appropriate steps to ensure that communications with persons with disabilities are as effective as communications with others. Thus, 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. Title II also strongly affirms the important role that computer technology is expected to play as an auxiliary aid by which communication is made effective for persons with disabilities (p. 1).

Since 1996, the law has been interpreted consistently in that students with disabilities are entitled to equal access in the digital environment (Resolution Agreement between San Jose State University and U.S. Department of Education, OCR, 1996; Resolution Agreement between the University of Cincinnati and the U.S. Department of

Education, OCR, 2014). However, no regulations have been enacted to more clearly codify the exact requirements place on institutions of higher education, in regards to Internet accessibility. All OCR and DOJ investigations into Internet accessibility to date have concluded with *voluntary* resolutions (see Table 2). While the settlements are binding, and every school has needed to make drastic changes to its accessibility policies and practices, schools have not had to make "admissions of any violations of Section 504 of the Rehabilitation Act and Title II of the Americans with Disabilities Act (Resolution Agreement, South Carolina Technical College System—U.S. Department of Education, 2013)". While the generalizability of a single settlement is limited to the parties therein, institutions of higher education should take note that these settlements are coming to nearly identical conclusions.

Currently, the federal government is working to update Section 508 Standards to incorporate the principles of WCAG 2.0 (U.S. Access Board, 2015). Until such a time as Section 508 is updated, and expressly applied to recipients of federal funds (i.e. institutions of higher education), and not just to governmental entities, colleges and universities need to inform their Internet accessibility policies and practices based on the resolution agreements that schools have entered into with OCR.

Bradbard, Peters and Caneva (2010) conducted a study reviewing website accessibility policies at 58 land-grant institutions, finding that 86 percent of institutions had policies on the topic. The fact that so many institutions failed to meet web accessibility standards was in direct contrast to the prevalence of policies on web accessibility at institutions. At the 50 colleges and universities with policies, Bradbard et al. found significant deficiencies in the policies. These deficiencies included 88 percent

of policies failing to state consequences of policy violations and 78 percent of policies failing to create a timeline for implementation. Similarly discouraging is the broad (68 percent) failure of institutions to define a specific standard. Given the shortcomings of most website accessibility policies in higher education, it should come as no surprise that OCR has conducted many investigations on website accessibility since 2010 (Bradbard et al.). Since 1996, the DOJ and OCR have clarified how institutions shall afford individuals with disabilities equal access to digital content (Resolution Agreement between San Jose State University and U.S. Department of Education, OCR, 1996; Resolution Agreement between the University of Cincinnati and the U.S. Department of Education, OCR, 2014).

Table 2

OCR and DOJ Cases Referencing Web Accessibility

Year	Institution	Intervention	Standard Adopted	Reference Number
2010	Penn State University	OCR Investigation	WCAG 2.0 AA	03-11-2020
2012	University of Montana	OCR Investigation	WCAG 2.0 AA	09-95-2206
2013	South Carolina Community and Technical College System	OCR Compliance Review	Section 508*	11-11-6002
2013	Louisiana Tech University	DOJ Investigation	WCAG 2.0 AA	204-33-116
2014	University of Cincinnati	OCR Compliance Review	WCAG 2.0 AA or Section 508	15-13-6001
2014	Youngstown University	OCR Compliance Review	WCAG 2.0 AA or Section 508	15-13-6002
2015	University of Phoenix	OCR Investigation	WCAG 2.0 AA	08-15-2040
2015	University of Colorado at Boulder	DOJ Investigation**	WCAG 2.0 AA	204-13-314

Note. * - The institution was not ordered to change its pre-existing policy that aligned with Section 508, but it agreed to fully implement its existing policy.
** - DOJ withdrew its intervention in the case after UC – Boulder drafted a policy incorporating WCAG 2.0 AA.

In the same year that Bradbard et al (2010) issued their review of institutional policies, there was a letter to all college and university presidents from the DOJ and U.S.

Department of Education (2010) stated, “It is unacceptable for universities to use emerging technology without insisting that this technology be accessible to all students” (p. 1). While the primary topic of the letter was inaccessible e-book readers used by a handful of institutions, the letter sent to all college and university presidents in the country as a clarion call to consider accessibility for all students before implementing new technologies in the learning environment.

Among the schools using inaccessible e-book readers was Penn State University. The National Federation for the Blind filed a complaint with OCR against the institution, alleging discrimination against blind and low-vision individual in using many emerging technologies including, Automated Teller Machines (ATMs), clickers, course management software, library resources and websites (Settlement Agreement between Penn State University and the National Federation for the Blind, 2011). OCR facilitated the Settlement Agreement (2011) between Penn State University and The National Federation for the Blind, through its Early Complaint Resolution process. This Settlement Agreement was the first to specifically require an institution to comply with the WCAG 2.0 AA standard. Penn State was given nine months to perform an audit of all its electronic and information technologies, create a strategy to address barriers, hire staff to oversee and implement trainings on accessibility. All webpages created during or after 2009 were to be brought into compliance by October 15, 2014 and Penn State agreed to implement a barrier reporting mechanism by which students could report any inaccessible content (Settlement Agreement between Penn State University and the National Federation for the Blind, 2011).

OCR has resolved similar complaints regarding inaccessible website content at the University of Montana and the University of Phoenix. Each institution entered into resolutions agreement with OCR in which the institution agreed to specific timelines for adopting and implementing an accessibility policy that incorporated WCAG 2.0 AA, hiring individuals responsible for overseeing compliance, and training for faculty and staff on creating accessible content. The Resolution Agreement (2014) between the University of Montana and OCR was notable for mandating a student survey to ensure student satisfaction with the new accessibility measures. In the Resolution Agreement (2015) between the University of Phoenix and OCR, the complainant was refunded for tuition in classes for which she was denied access, and permission to complete her degree without further tuition and fee charges.

In addition to receiving grievances, OCR can proactively conduct compliance reviews. To date, three such reviews have been conducted in regards to website accessibility. The South Carolina Technical College System (hereafter referred to as SCTCS) operates 16 colleges, and had already adopted a policy aligning to Section 508. SCTCS entered into a Resolution Agreement (2013) with OCR to fully implement its stated policy and report back on its full implementation. The University of Cincinnati and Youngstown State entered into nearly identical resolution agreements, implementing policies and practices compliant with WCAG 2.0 AA or Section 508 standards (see Table 2).

Lastly, in addition to OCR's enforcement efforts, the DOJ has intervened in two cases pertaining to website accessibility (see Table 2). Each institution adopted policies that required websites be WCAG 2.0 AA compliant and instituted strict timelines. The

DOJ dropped the case again University of Colorado at Boulder because of their quick adoption and implementation of WCAG 2.0 AA (Kuta, 2015). However, with Louisiana Tech, the DOJ oversaw a Settlement Agreement (2013) in which the institution agreed to compensate the complainant $23,543 in damages.

Conclusion

In conclusion, since 2010 the DOJ and OCR have repeatedly resolved complaints brought against institutions of higher education regarding inaccessible website content, by facilitating agreements wherein institutions generate policies aligning with WCAG 2.0 AA standards and become compliant with those standards quickly. While WCAG 2.0 has not been codified into law, it has repeatedly been interpreted as means to comply with the law.

Also since 2010, there have been more investigations into website accessibility compliance than there have been studies to identify the degree to which institutions are compliant. More studies are needed to determine whether institutions are taking notice of investigations and adopting accessible practices for website design.

Chapter 3

Procedures of Study

Introduction

This assessment evaluates website accessibility by evaluating a subset of criteria common to the WCAG 2.0 and Section 508 standards developed by Thompson et al. (2010). This assessment tool was administered to three webpages managed by the University of Washington and its 33 peer institutions (See Appendix F). The purpose of this assessment is to add to the existing body of knowledge regarding the accessibility of institutional website content for individuals with disabilities. There have been seven Office for Civil Rights (hereafter referred to as OCR) and Department of Justice (hereafter referred to as DOJ) investigations into website accessibility since the landmark Settlement Agreement (2010) between Penn State University and the National Federation for the Blind, but there have been just three assessments of institutional compliance with Web Content Accessibility Guidelines 2.0 standards (hereafter referred to as WCAG 2.0) during that same time period. None of these assessments looked at compliance among large research institutions. This assessment seeks to answer the question: Are research institutions making their website content accessible to students with disabilities, in the wake of high-profile investigation by OCR and the DOJ? While a complete compliance evaluation of the institutions' webpages is beyond the scope of this study, the subset of items common to both Section 508 and WCAG 2.0 standards used herein, are useful in evaluating many of the barriers identified by the current body of research. These criteria also evaluate aspects of accessibility compliance that impact the experiences of individuals with a broad range of disabilities.

Sample

This assessment was administered to three webpages for each of 34 institutions considered to be peer research institutions. The total number of websites evaluated was 102. The University of Washington Office of Budget and Planning (n.d.) maintains three lists of its peer institutions. Institutions are considered peers on the basis of enrollment, budget, and comparable medical facilities, among other factors. For the purposes of this assessment, all lists were merged, resulting in a single list of 34 institutions (see Appendix F).

The three webpages assessed from each college or university were the institutional homepage, Disability Services (or comparable unit) homepage, and the Department of Undergraduate Admissions (or comparable unit) homepage. Solovieva and Bock (2014) similarly called out these webpages because of their importance to college students with disabilities.

Assessment

An Assessment Results Form (Appendix G) was completed for each institution. Scoring was binary, in that a perfect score of "0" was recorded if no violations were found on a given criteria, and a "-1" was recorded if a webpage failed to comply with a given criteria. Because not all webpages have video content, failure to meet any of the criteria could result in a score of "-4" on webpages without video, and "-6" if a webpage contained video.

The first component of the assessment was to determine whether a webpage can be effectively navigated with keyboard commands. Keyboard navigation is necessary for individuals who have tremors or do not have the fine motors skills to use a computer

mouse effectively. Additionally, individuals who are blind or have low-vision, and use a screen reader, utilize keyboard commands to navigate and cycle through elements on a webpage.

Section 508 Checkpoint I states "Frames shall be titled with text that facilitates frame identification and navigation" (p. 80525). Similarly WCAG 2.0 A Guideline 2.1 stated, "Make all functionality available from a keyboard". WCAG 2.0 A Success Criteria 2.1.2, further specifies, "2.1.2 No Keyboard Trap: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface" (p. 13). To assess keyboard navigability Web Accessibility in Mind (2016, hereafter referred to as WebAIM) recommends using the Tab key and Shift + Tab key commands to navigate between items, arrow keys to navigate menus, and pressing Enter or Space Bar, to select an item. The first item on the Assessment Results Form indicates whether all menus, links and page elements can be selected and unselected using only the Tab key for navigation (See Appendix G).

The second component of the assessment identified whether keyboard commands allow the user to skip past repetitive navigation to access a webpage's main content. Therefore, upon first accessing a webpage in a browser, pressing the Tab key should direct a user to a skip navigation option before cycling through menu options. Section 508 Checkpoint O and WCAG 2.0 A, both require an option to bypass repeated items on a webpage, such as navigation schema. Webpages are assessed not just that they have a skip navigation option, but that it worked, as skip navigation anchors need to be updated as page content is updated.

The third item assessed was whether keyboard navigation was supported by visual focus indicators and whether those visual focus indicators are consistent. A visual focus indicator is often a box around a selected item, or other visual cue, that allows a sighted individual navigating a webpage with a keyboard to know the item they are selecting at any given time. The importance of a focus indicator is implied in Section 508 Checkpoint I, but more clearly stated in WCAG 2.0 AA Success Criteria 2.4.7, "Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible" (p. 16). While the WCAG 2.0 standard does not specifically state that focus indicators must be consistent within a website, WCAG 2.0 AA Success Criteria 3.2.4 stated, "Components that have the same functionality within a set of Web pages are identified consistently" (p. 18). This implies that consistency should broadly be considered important to accessible website design, as an aspect of the WCAG 2.0 understandable principle. Furthermore, consistent focus indicators help the keyboard user know what to look for.

The fourth aspect of this assessment was to assess whether webpages have alternative text-based descriptions of images. Descriptions allow individuals who are blind or have low-vision and use screen reading software to listen to descriptions of images. Descriptions offer benefits to sighted users as well, providing explanations of complex images, and permitting text-based search engines to query image information. Section 508 Checkpoint A, and WCAG 2.0 A Success Criteria 1.1.1 requires text descriptions of all non-text visual elements.

WebAIM (n.d) developed the Web Accessibility Evaluation (hereafter referred to as WAVE) Tool as a plug-in to Google's Chrome browser, in order to identify many

common barriers to website accessibility, including descriptions of images. The WAVE Tool allows for easy counting of all images on a page and identifies images without descriptions. For the purposes of this assessment all images are expected to include a description or have a description equal to null if an image only serves to create a border or buffer between elements on a webpage. To keep measures objective, this assessment did not evaluate sufficiency or depth of descriptions on a scale, only that they exist and contain more information that simply acknowledges that the element is an image, picture or graph.

Finally, this assessment manually reviewed each webpage for embedded video content, and identified how many of the videos contained captions and audio descriptions of visual content. Section 508 Checkpoint B and WCAG 2.0 A Success Criteria 1.2.2 both required captions for timed mixed media with audio. Captions allowed individuals who are deaf or hard of hearing to read a transcript of audio. Additionally, Section 508 Checkpoint B implies, and WCAG 2.0 AA Success Criteria 1.2.5 explicitly requires, audio descriptions of visual content in timed mixed media. Audio descriptions provide auditory information regarding visual information in a video, for an individual who is blind or has low-vision. Each embedded video will need to be viewed to determine whether it contains captions or audio descriptions.

Conclusion

WCAG 2.0 AA is the standard that the majority of institutions involved in DOJ or OCR settlements have agreed to abide by. In order for an institution to be in compliance with WCAG 2.0 AA, it would need to score positively on the Assessment Results Form for all measures pertaining to keyboard navigability and focus indication, all images

would need to include alternate descriptions, and all videos would need to include captions and audio descriptions. The Assessment Results Form concludes with a yes or no question, as to whether WCAG 2.0 AA compliance is a possibility.

Chapter 4

Results of Study

Introduction

The results of this study demonstrate the continued prevalence of inaccessible website content at universities in the sample population. Compliance with Section 508 or WCAG 2.0 AA was ruled out for all but one of the universities evaluated. The lone institution performing well on this assessment was recently investigated by the DOJ for website accessibility. Although the majority of institutions did not perform well, this study has yielded useful results in identifying frequent barriers to website accessibility. Furthermore, aggregated scores reveal that disability services webpages are more likely to be accessible, or at least score better, than homepages or admissions webpages. This implies that disability service office have an awareness of accessible web design. Completed results are delineated in Appendixes I - O.

Webpage Scoring Results

In total, 102 websites were evaluated for compliance with six aspects of accessibility criteria common to Section 508 and WCAG 2.0. Scoring for each accessibility criteria was binary. A score of zero was recorded if no violations were found, and a score of -1 was recorded for an item if a webpage did not meet a given criteria. Webpages without video content could score as low as -4. A webpage containing video could score as low as -6 if the content was not captioned and did not have a description of visual content.

As indicated in Figure 1, 87 websites failed to meet all six of the accessibility criteria scoring less than zero. Therefore the majority of webpages could not be

compliant with Section 508 or WCAG 2.0 AA. Of the 15 websites that met all criteria, nine were disability services webpages, three were admissions webpages, and three were a university homepage. This represents greater accessibility of disability services pages, when compared to the other pages evaluated in this study.

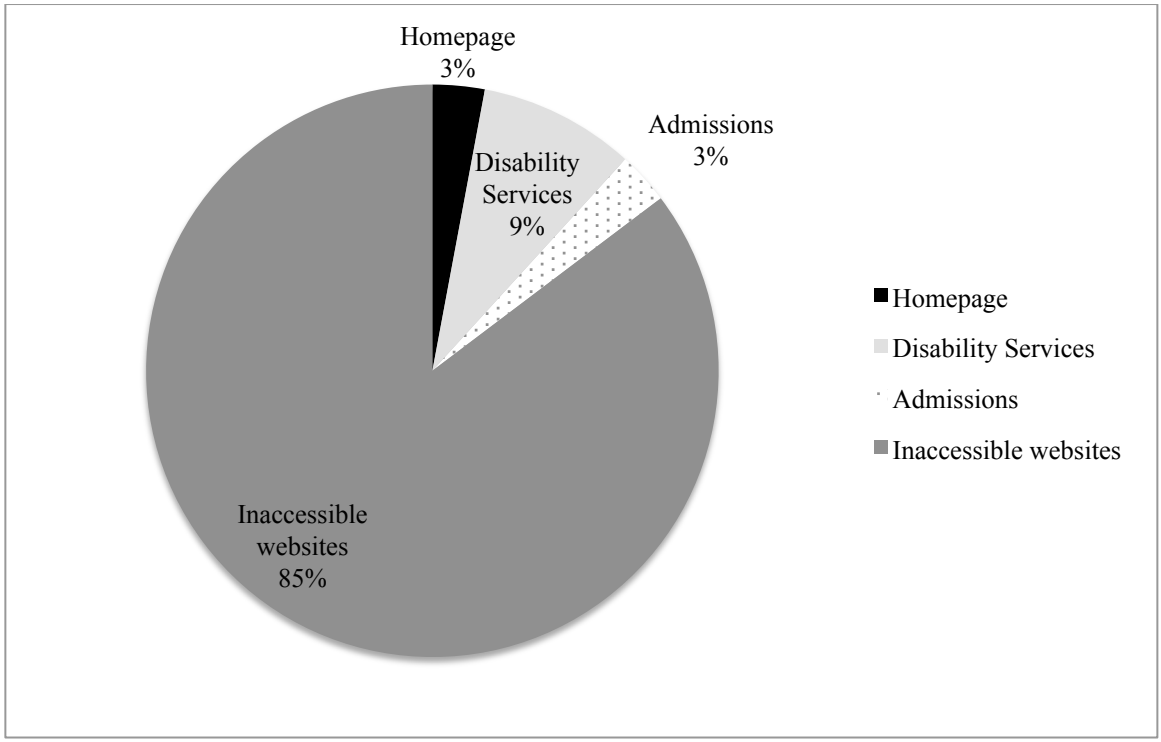

Figure 1. Percentage of Accessible Webpages by Website Type

Table 3 further substantiates the finding that disability services websites were more accessible than institutional homepages or admissions websites. The low mean and median scores for disability services webpages demonstrate greater accessibility on the criteria assessed, when compared to mean and median scores for admissions websites and institutional homepages. The median score for institutional homepages was 100 percent lower, than the median score for disability services webpages. The median score for admissions webpages was 200 percent lower than the score for disability services webpages.

Table 3

Mean and Median Scores by Website Type

Webpage	Mean Score	Median Score
Homepage	-2.06	-2
Disability Services	-1.47	-1
Admissions	-2.47	-3

Furthermore, whereas 19 disability services websites had scores greater than or equal to -1, just 16 homepages and seven admissions webpages achieved these same scores (see Figure 2). Consistently low scores further demonstrate greater accessibility in disability service webpages, when compared to other webpages evaluated in this study. Disability services pages scored better on average and more often than admissions webpages or institutional homepages.

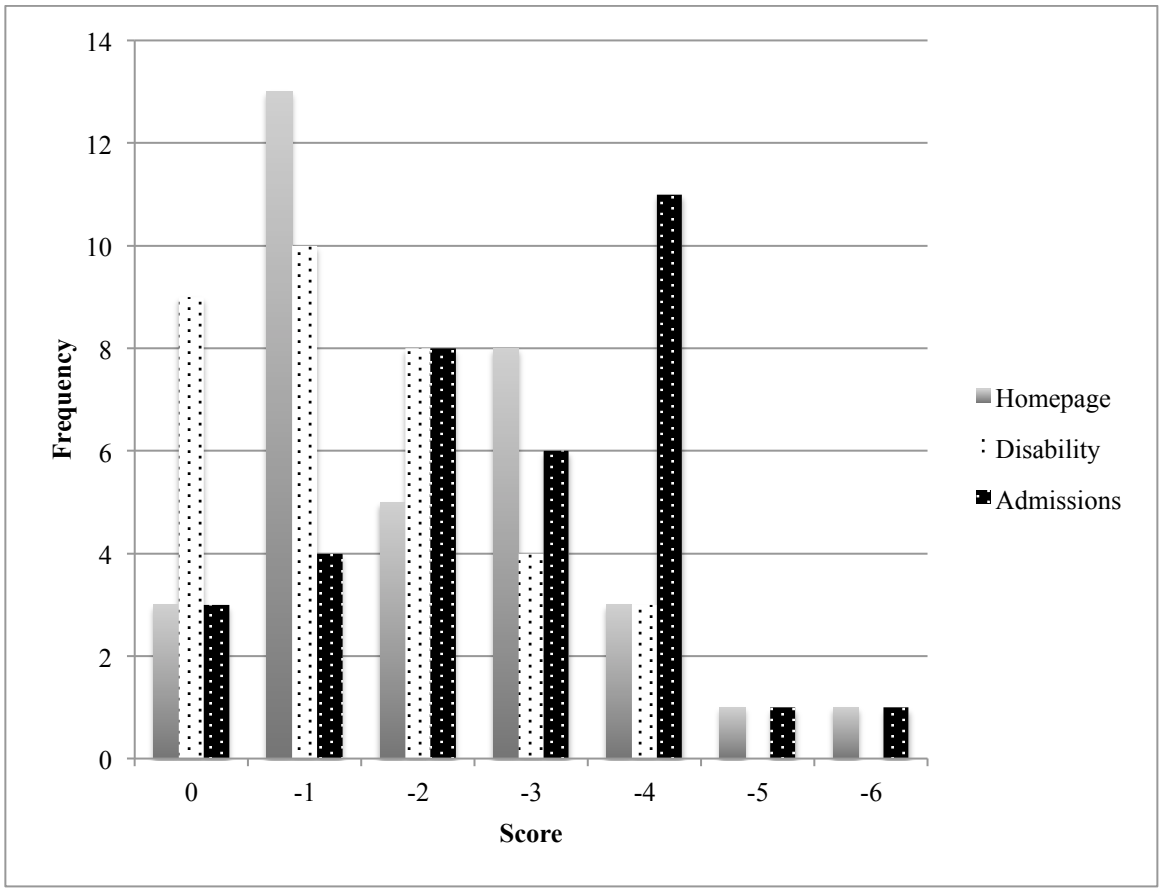

Figure 2. Score Frequency by Webpage Type

Finally, a paired, two-tailed Student's T-Test confirmed that there is a statistically significant difference between the scores of disability services webpages, when compared to institutional homepages ($p=.018$) or admissions webpages ($p<.001$). This statistically rules out that the difference in the scores is due to chance. There is however, a moderate positive correlation between scores on disability services webpages and institutional homepages ($r=.50$) and a strong correlation between disability services and admission webpages ($r=.60$). This implies that institutions seem to achieve levels of website accessibility at a fairly consistent level. So while a disability service page may be more accessible than other webpages, it is an effective indicator of whether an institution prioritizes website accessibility. This correlation cannot be construed as a causal relationship, meaning that disability services offices necessarily take the lead in promoting website accessibility. Rather, it can be said that if a disability services office does not have an accessible website, it is less likely that other webpages will be accessible.

Common Barriers to Website Accessibility

The results of this study demonstrated greater difficulty with certain accessibility errors as compared to others (see Figure 3). Failure to include alternate description of images was the most common accessibility error on admissions webpages and institutional homepages, and the second most common error for disability services webpages. Lack of focus indicators for all items on a webpage was the primary accessibility error for disability services webpages, and the second most common error for admissions webpages and institutional homepages. Also noteworthy is that the majority of admissions webpages failed the assessment for keyboard navigation and skip

navigation as well. Finally, while just 14 webpages had video content, the majority of these videos were not captioned and none of the videos incorporated audio descriptions of visual content.

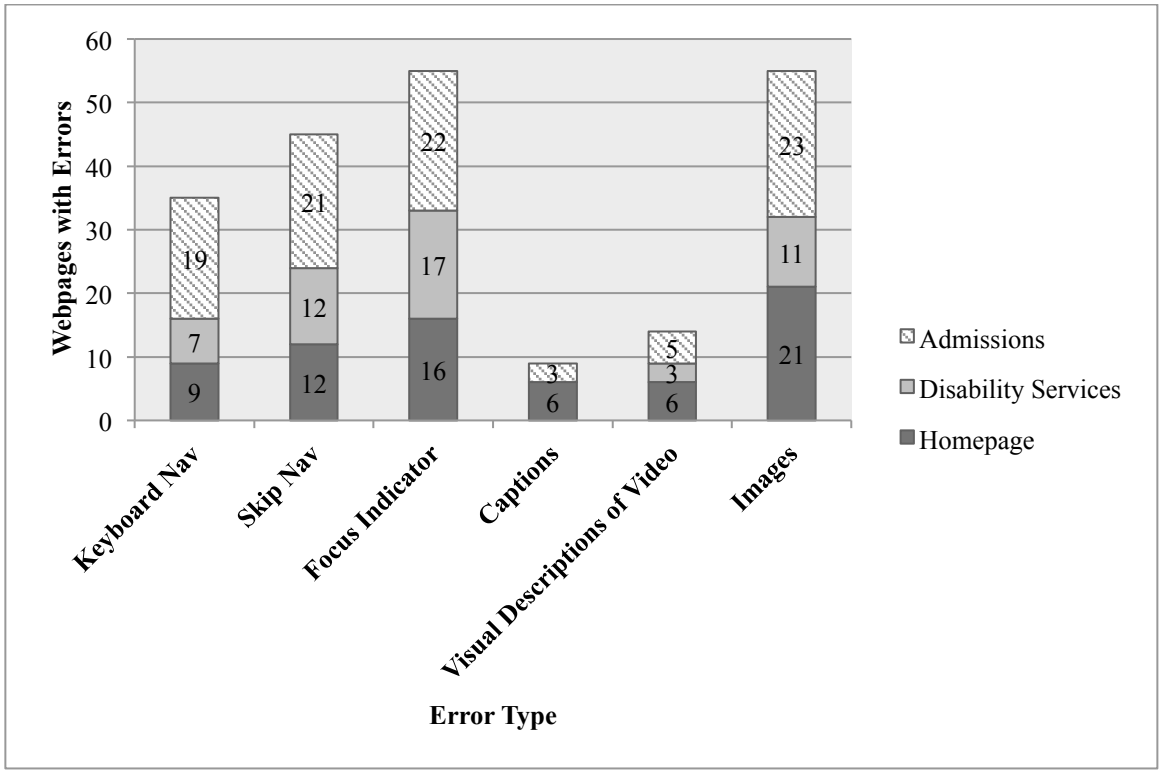

Figure 3. Frequency of Errors by Webpage Type

Failure to provide alternative descriptions of images was the most common error observed in this study. Overall disability services webpages used fewer images, and described them at a higher rate than either admissions webpages or institutional homepages (see Table 4). However, the correlation between the number of images used on each institution's website and the total percentage of images described, was very weak (r=.051). Therefore the number of images used on a webpage has no bearing on whether those images are made accessible with alternative text descriptions. The institution with the most images described all but two of its 134 images used across three webpages. Yet the institution with the fewest images managed to provide alternate descriptions on just

nine of the 14 images across its three webpages. Institutional practice varies greatly in this regard and the overall number of images on a page was not an effective predictor of whether images might be accessible or not.

Table 4

Image and Alternate Description Usage

Webpage	Mean Number of Images	Median Number of Images	% of Images w/ Descriptions
Homepage	20.71	16	88.21%
Disability Services	7.91	8	92.94%%
Admissions	18.62	13	74.99%

In addition to a lack of image descriptions, the other most common error found in this study was a lack of visual focus indicator. Whereas websites were assessed for both the presence of a visual focus indicator on every element within a page and consistency in appearance, inconsistency did not impact the score allotted for this criteria. Focus indicators are necessary for a sited computer user to effectively navigate a website without using a keyboard (Wahlbin, 2012). Keyboard navigability was assessed independently of visual focus indicators because computer users who are blind and use screen reader software require keyboard navigability, but do not need a visual focus indicator. So whereas 55 webpages lacked a visual focus indicator for all elements, the number of websites inaccessible to individuals using only a keyboard for navigation, is higher.

Conclusion

In combination, different items assessed in this thesis can be combined to identify whether a webpage might be accessible to a population of computer users. Websites are considered accessible to an individual using keyboard navigation if they obtained a score

of zero for a focus indicator present for all elements, each element could be accessed by keyboard commands, and had skip navigation. In total 26 webpages (25 percent) were determined to be accessible to a sighted individual who relies on keyboard commands to effectively navigate a webpage (see Figure 4).

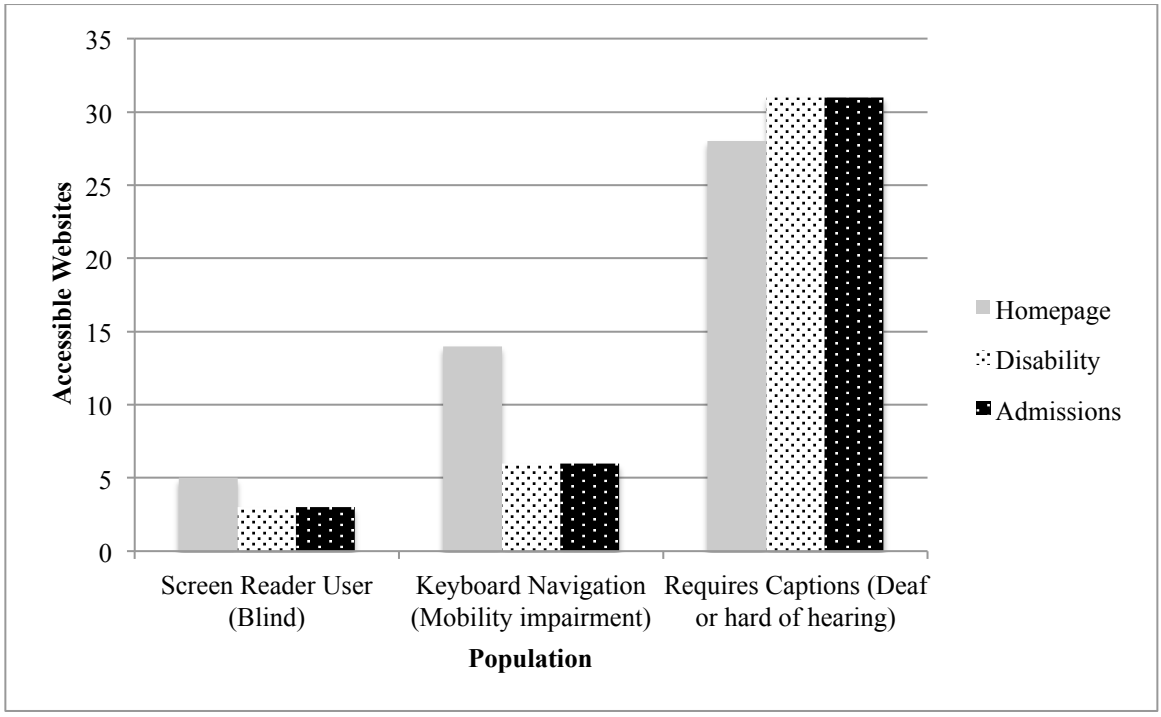

Figure 4. Number of Accessible Websites by Population and Webpage Type

As indicated in Figure 4, webpages were considered accessible to individuals who use screen reader software if they could be effectively navigated using keyboard commands, if they had skip navigation features, if images had text descriptions, and if videos included auditory descriptions of visual content. In this study not a single video included auditory descriptions, so any webpages with videos were necessarily inaccessible to screen reader users. In total, just 11 websites (11 percent) were considered accessible for screen reader users.

Lastly, 90 webpages were found to be accessible to individuals who are Deaf or hard of hearing, so long as they had captions for all auditory content. The high level of accessibility was due more to the fact that just 14 of 102 webpages used videos, and not because they were captioned with any regularity. In total, there were 27 videos embedded in webpages used in this study, of which 52 percent were captioned. All six videos on disability service webpages were captioned but just 25 percent of videos on institutional homepages and 56 percent of videos on admissions webpages were captioned.

Chapter 5

Conclusion

Persistent Barriers to Website Accessibility

Researchers have used different criteria to assess accessibility, but all have found barriers in a significant number of college and university websites (See Table 1). Many studies have concluded that alternative descriptions of images remains a perennial barrier to website accessibility (Zaphiris & Ellis, 2001; Schmetzke, 2001b; Spindler, 2002; Krach, 2007; Thompson et al., 2010; Erickson, et al., 2013; Thompson et al., 2013; Forgione-Barkas, 2014). The results of this study have concurred with the existing body of research, that this remains a barrier to accessible webpages in higher education

In total, 13 more webpages would have achieved a top score of zero scores if they had described all images. This would have nearly doubled the number of websites considered accessible in this study. However, the issue of image descriptions may be even larger than this study indicated. Image descriptions were not scored for clarity or content. So while a description may have existed and was identified by the WAVE Tool, it may not have provided sufficient explanation for a screen reader user. Furthermore, a practice repeated on 31 webpages was the use of setting image descriptions set as null. Images coded as null imply that there is no visual content worth noting in the image or the information is effectively noted elsewhere on the webpage. If an image description was coded as null, it implies that it served the purpose of providing spacing or a border to a given webpage. A more detailed analysis would be necessary to confirm whether the use of null image descriptions was in compliance with WCAG 2.0 AA or Section 508 standards. According to the organization Web Accessibility in Mind (2015), alternative

descriptions are of primary importance to any accessibly designed webpage and are also one of the most difficult to implement.

While a given webpage's accessibility can be assessed at any point in time, the fact remains that webpage content is dynamic. In order to maintain accessibility, institutions have a continued responsibility to provide descriptions of image, and pay attention to other aspects of accessibility on an ongoing basis. With skip navigation for example, of the 45 websites that did not have skip navigation seven webpages (16 percent) had missing skip navigation anchors. Skip navigation is coded into the webpage, but as content is updated, the location to which cursor should be directed, must also be updated. Commitment to web accessibility is a long-term endeavor, and one that the institutions evaluated in this study did not demonstrate.

The Current State of Website Accessibility

In this study, the only institution that passed all six measures of website accessibility on all three webpages assessed was the recent subject of an investigation by the DOJ. Therefore it seems that the eight investigations into website accessibility in higher education conducted by OCR and the DOJ since 2010 have not had a noticeable impact on website accessibility broadly, except perhaps at those schools investigated (see Table 2). Current guidance from the DOJ and OCR do not seem to be improving website accessibility en mass.

While website accessibility remains a problem at colleges and universities, this study confirms that some webpages are more likely than others to be accessible. Disability service webpages outperformed institutional homepages and admissions webpages in this study by a statistically significant measure ($p=.018$ and $p<.001$

respectively). This data rules out the probability that disability service offices are performing better due to chance. Webmasters designing and maintaining disability service offices' websites clearly understand the principles of website accessibility. Therefore, the issue is not that no one on college and university campuses is aware of principles of accessible websites design. The question remains, what can disability service website designers do to promote the accessible website design techniques they are already using and encourage others toward embracing these design principles?

Areas for Future Study

The moderate to strong correlation between scores of disability services pages and the other webpages evaluated in this study, indicated some level of consistency within an institutional culture. Further studies need to be conducted to analyze why some institutions as a whole perform better on webpage accessibility measures than others. Thompson et al. (2013) found only a weak positive correlation between website accessibility policies at institutions of higher education and webpages dedicated to accessible website design with overall website accessibility. There seems to be knowledge of accessible web design that is not translating into practice across institutions. Perhaps opportunities for professional development in accessible website design practices or administrative agenda correlate more strongly to the implementation of accessible website design practices. Surveys for website administrators may yield important information to barriers preventing implementation of accessible website design practices. Unfortunately the limited number of institutions practicing accessible website design make for a small population to study.

While websites across institutions remain predominately inaccessible, it is important to not lose sight of the impact felt by students, prospective students and the institutions that remain inaccessible to them. In particular, students who are blind seem likely to experience the most barriers to webpage accessibility (see Figure 4). Surveying students at the institutions that have been investigated by the DOJ or OCR and have accessible websites, may yield important information into the impact of accessible website design in the recruitment and retention of students with disabilities. Are students who are blind going to these schools at greater rates than in the past or at greater rates than other schools? Has the accessibility of online college applications played a role in the admissions decisions of students who are blind? Has the accessibility of their websites been an effective indicator of the level of accessibility experienced in other aspects of college life?

Through the use of focus groups, Burgstahler and Moore (2009) were able to identify that website accessibility had some impact on student admission decisions, based on student self-report. However the use of focus groups as opposed to a longitudinal study did not provide students the opportunity to share their experiences over time. While students continue to be left out of the digital space created by institutions of higher education, these same institutions are also missing out on the generation of a diverse student body. Perhaps this loss can be captured by future studies and the importance of disability as an aspect of diversity can enter into the diversity dialogues occurring at colleges and universities across the country.

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Appendix A - Section 508 Standards

Checkpoint	Criteria
A	A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).
B	Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.
C	Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
D	Documents shall be organized so they are readable without requiring an associated style sheet.
E	Redundant text links shall be provided for each active region of a server-side image map.
F	Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.
G	Row and column headers shall be identified for data tables.
H	Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
I	Frames shall be titled with text that facilitates frame identification and navigation.
J	Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
K	A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.
L	When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.
M	When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).
N	When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
O	A method shall be provided that permits users to skip repetitive navigation links.
P	When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

Source: Section 508 of the Rehabilitation Act, as amended, 36 C.F.R. §1194.22 (2001).

Appendix B: WCAG 2.0 Guidelines and Success Criteria for the Perceivable Principle

Guideline	Success Criteria
1.1 Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.	Level A 1.1.1 Non-text Content: All non-text content that is presented to the user has a text alternative that serves the equivalent purpose (with limited exceptions, see complete regulations for more information).
1.2 Time-based Media: Provide alternatives for time-based media.	Level A 1.2.1 Audio-only and Video-only (Prerecorded): For prerecorded audio-only and prerecorded video-only media, the following are true, except when the audio or video is a media alternative for text and is clearly labeled as such: Prerecorded Audio-only: An alternative for time-based media is provided that presents equivalent information for prerecorded audio-only content. Prerecorded Video-only: Either an alternative for time-based media or an audio track is provided that presents equivalent information for prerecorded video-only content. 1.2.2 Captions (Prerecorded): Captions are provided for all prerecorded audio content in synchronized media, except when the media is a media alternative for text and is clearly labeled as such. 1.2.3 Audio Description or Media Alternative (Prerecorded): An alternative for time-based media or audio description of the prerecorded video content is provided for synchronized media, except when the media is a media alternative for text and is clearly labeled as such. Level AA 1.2.4 Captions (Live): Captions are provided for all live audio content in synchronized media. 1.2.5 Audio Description (Prerecorded): Audio description is provided for all prerecorded video content in synchronized media. Level AAA 1.2.6 Sign Language (Prerecorded): Sign language interpretation is provided for all prerecorded audio content in synchronized media. 1.2.7 Extended Audio Description (Prerecorded): Where pauses in foreground audio are insufficient to allow audio descriptions to convey the sense of the video, extended audio description is provided for all prerecorded video content in synchronized media. 1.2.8 Media Alternative (Prerecorded): An alternative for time-based media is provided for all prerecorded synchronized media and for all prerecorded video-only media. 1.2.9 Audio-only (Live): An alternative for time-based media that presents equivalent information for live audio-only content is provided.
1.3 Adaptable: Create content that can be presented in different ways (for example simpler	Level A 1.3.1 Info and Relationships: Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text. 1.3.2 Meaningful Sequence: When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically

layout) without losing information or structure.	determined. 1.3.3 Sensory Characteristics: Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound.
1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.	Level A 1.4.1 Use of Color: Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. 1.4.2 Audio Control: If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. Level AA 1.4.3 Contrast (Minimum): The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following: Large Text: Large-scale text and images of large-scale text have a contrast ratio of at least 3:1; Incidental: Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement. Logotypes: Text that is part of a logo or brand name has no minimum contrast requirement. 1.4.4 Resize text: Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality. 1.4.5 Images of Text: If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text (with limited exceptions, see complete regulations for more information). Level AAA 1.4.6 Contrast (Enhanced): The visual presentation of text and images of text has a contrast ratio of at least 7: (with limited exceptions, see complete regulations for more information). 1.4.7 Low or No Background Audio: For prerecorded audio-only content that (1) contains primarily speech in the foreground, (2) is not an audio CAPTCHA or audio logo, and (3) is not vocalization intended to be primarily musical expression such as singing or rapping, at least one of the following is true: (Level AAA) No Background: The audio does not contain background sounds. Turn Off: The background sounds can be turned off. 20 dB: The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds. 1.4.8 Visual Presentation: For the visual presentation of blocks of text, a mechanism is available to achieve the following: Foreground and background colors can be selected by the user. Width is no more than 80 characters or glyphs (40 if CJK). Text is not justified (aligned to both the left and the right margins). Line spacing (leading) is at least space-and-a-half within paragraphs, and paragraph spacing is at least 1.5 times larger than the line spacing. Text can be resized without assistive technology up to 200 percent in a way that does not require the user to scroll horizontally to read a line of text on a full-screen window. 1.4.9 Images of Text (No Exception): Images of text are only used for pure decoration or where a particular presentation of text is essential to the information being conveyed.

Source: World Wide Web Consortium. (2008, December 11). *Web content accessibility guidelines 2.0*. Retrieved from http://www.w3.org/TR/WCAG20/

Appendix C: WCAG 2.0 Guidelines and Success Criteria for the Operable Principle

Guideline	Success Criteria
2.1 Keyboard Accessible: Make all functionality available from a keyboard.	Level A 2.1.1 Keyboard: All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. 2.1.2 No Keyboard Trap: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away.
2.2 Enough Time: Provide users enough time to read and use content.	Level A 2.2.1 Timing Adjustable: For each time limit that is set by the content, at least one of the following is true: The user can turn off, adjust or extend the time limit (see complete regulations for more information). Note there are exceptions during a live event, if time is essential to the task, or after 20 hours. 2.2.2 Pause, Stop, Hide: For moving, blinking, scrolling, or auto-updating information, all of the following are true: Moving, blinking, scrolling: For any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential; and Auto-updating: For any auto-updating information that (1) starts automatically and (2) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential. Level AAA 2.2.3 No Timing: Timing is not an essential part of the event or activity presented by the content, except for non-interactive synchronized media and real-time events. 2.2.4 Interruptions: Interruptions can be postponed or suppressed by the user, except interruptions involving an emergency. 2.2.5 Re-authenticating: When an authenticated session expires, the user can continue the activity without loss of data after re-authenticating.
2.3 Seizures: Do not design content in a way that is known to cause seizures.	Level A 2.3.1 Three Flashes or Below Threshold: Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds. Level AAA 2.3.2 Three Flashes: Web pages do not contain anything that flashes more than three times in any one second period.
2.4 Navigable: Provide ways to help	Level A

users navigate, find content, and determine where they are.	2.4.1 Bypass Blocks: A mechanism is available to bypass blocks of content that are repeated on multiple Web pages. 2.4.2 Page Titled: Web pages have titles that describe topic or purpose. 2.4.3 Focus Order: If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability. 2.4.4 Link Purpose (In Context): The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general. Level AA 2.4.5 Multiple Ways: More than one way is available to locate a Web page within a set of Web pages except where the Web Page is the result of, or a step in, a process. 2.4.6 Headings and Labels: Headings and labels describe topic or purpose. 2.4.7 Focus Visible: Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible. Level AAA 2.4.8 Location: Information about the user's location within a set of Web pages is available. 2.4.9 Link Purpose (Link Only): A mechanism is available to allow the purpose of each link to be identified from link text alone, except where the purpose of the link would be ambiguous to users in general. 2.4.10 Section Headings: Section headings are used to organize the content.

Source: World Wide Web Consortium. (2008, December 11). *Web content accessibility guidelines 2.0*. Retrieved from http://www.w3.org/TR/WCAG20/

Appendix D: WCAG 2.0 Guidelines and Success Criteria for the Understandable Principle

Guideline	Success Criteria
3.1 Readable: Make text content readable and understandable.	Level A 3.1.1 Language of Page: The default human language of each Web page can be programmatically determined. Level AA 3.1.2 Language of Parts: The human language of each passage or phrase in the content can be programmatically determined except for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text. Level AAA 3.1.3 Unusual Words: A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon. 3.1.4 Abbreviations: A mechanism for identifying the expanded form or meaning of abbreviations is available. 3.1.5 Reading Level: When text requires reading ability more advanced than the lower secondary education level after removal of proper names and titles, supplemental content, or a version that does not require reading ability more advanced than the lower secondary education level, is available. 3.1.6 Pronunciation: A mechanism is available for identifying specific pronunciation of words where meaning of the words, in context, is ambiguous without knowing the pronunciation.
3.2 Predictable: Make Web pages appear and operate in predictable ways.	Level A 3.2.1 On Focus: When any component receives focus, it does not initiate a change of context. 3.2.2 On Input: Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behavior before using the component. Level AA 3.2.3 Consistent Navigation: Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user. 3.2.4 Consistent Identification: Components that have the same functionality within a set of Web pages are identified consistently. Level AAA 3.2.5 Change on Request: Changes of context are initiated only by user request or a mechanism is available to turn off such changes. (Level AAA)
3.3 Input Assistance: Help users avoid and correct mistakes.	Level A 3.3.1 Error Identification: If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text.

	3.3.2 Labels or Instructions: Labels or instructions are provided when content requires user input. Level AA 3.3.3 Error Suggestion: If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content. 3.3.4 Error Prevention (Legal, Financial, Data): For Web pages that cause legal commitments or financial transactions for the user to occur, that modify or delete user-controllable data in data storage systems, or that submit user test responses, at least one of the following is true: Reversible: Submissions are reversible. Checked: Data entered by the user is checked for input errors and the user is provided an opportunity to correct them. Confirmed: A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission. Level AAA 3.3.5 Help: Context-sensitive help is available. 3.3.6 Error Prevention (All): For Web pages that require the user to submit information, at least one of the following is true: Reversible: Submissions are reversible. Checked: Data entered by the user is checked for input errors and the user is provided an opportunity to correct them. Confirmed: A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

Source: World Wide Web Consortium. (2008, December 11). *Web content accessibility guidelines 2.0*. Retrieved from http://www.w3.org/TR/WCAG20/

Appendix E: WCAG 2.0 Guidelines and Success Criteria for the Robust Principle

Guideline	Success Criteria
4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.	Level A 4.1.1 Parsing: In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features. 4.1.2 Name, Role, Value: For all user interface components (including but not limited to: form elements, links and components generated by scripts), the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.

Source: World Wide Web Consortium. (2008, December 11). *Web content accessibility guidelines 2.0*. Retrieved from http://www.w3.org/TR/WCAG20/

Appendix F: List of Institutions

School
Michigan State University
Ohio State University
Rutgers University
Texas A&M University, College Station
University of Arizona
University of California, Berkeley
University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of California, San Diego
University of Cincinnati
University of Colorado, Boulder
University of Colorado, Denver
University of Connecticut
University of Florida
University of Hawaii
University of Illinois, Chicago
University of Illinois, Urbana/Champaign
University of Iowa
University of Kentucky
University of Maryland, Baltimore
University of Maryland, College Park
University of Massachusetts, Amherst
University of Michigan, Ann Arbor
University of Minnesota, Twin Cities
University of Missouri, Columbia
University of New Mexico
University of North Carolina, Chapel Hill
University of Oregon
University of Pittsburgh
University of Utah
University of Virginia
University of Washington
University of Wisconsin, Madison

Appendix G: Assessment Results Form Template

School: Date:

Homepage url:

Test	Result	Test	Result
Keyboard Navigability:		Skip Navigation:	
Focus Indicator for all elements:		Focus Indicator Consistent	
Images with Text:		Images without Text:	
Embedded Videos With Captions:		Without captions:	
Embedded Videos with Audio Descriptions:		Embedded Videos without Audio Descriptions:	

Notes:

Disability Services url:

Test	Result	Test	Result
Keyboard Navigability:		Skip Navigation:	
Focus Indicator for all elements:		Focus Indicator Consistent	
Images with Text:		Images without Text:	
Embedded Videos With Captions:		Without captions:	
Embedded Videos with Audio Descriptions:		Embedded Videos without Audio Descriptions:	

Notes:

Admissions url:

Test	Result	Test	Result
Keyboard Navigability:		Skip Navigation:	
Focus Indicator for all elements:		Focus Indicator Consistent	
Images with Text:		Images without Text:	
Embedded Videos With Captions:		Without captions:	
Embedded Videos with Audio Descriptions:		Embedded Videos without Audio Descriptions:	

Notes:

Might this school be in compliance with WCAG 2.0 AA:

Appendix H: Homepage Aggregate Scoring Data

School	Keyboard Nav	Skip Nav	Focus Indicator	Captions	Visual Descriptions	Images	Total Score
1	-1	-1	-1	-1	-1	0	-5
2	0	0	0	-1	-1	-1	-3
3	0	0	-1	-1	-1	0	-3
4	0	0	-1	0	0	0	-1
5	0	0	0	0	0	-1	-1
6	0	0	0	0	0	0	0
7	0	0	0	0	0	-1	-1
8	0	0	0	-1	-1	-1	-3
9	-1	-1	-1	0	0	-1	-4
10	0	-1	0	0	0	0	-1
11	0	0	0	0	0	-1	-1
12	0	0	0	0	0	0	0
13	-1	-1	-1	0	0	0	-3
14	-1	0	-1	0	0	-1	-3
15	0	0	0	0	0	-1	-1
16	0	-1	0	-1	-1	-1	-4
17	0	-1	-1	0	0	0	-2
18	0	0	-1	0	0	0	-1
19	0	0	0	0	0	-1	-1
20	0	-1	0	0	0	-1	-2
21	-1	0	-1	0	0	-1	-3
22	0	-1	-1	0	0	0	-2
23	-1	0	-1	0	0	-1	-3
24	0	0	0	0	0	0	0
25	0	-1	-1	0	0	-1	-3
26	0	0	0	0	0	-1	-1
27	-1	0	-1	0	0	0	-2
28	-1	-1	-1	-1	-1	-1	-6
29	0	0	0	0	0	-1	-1
30	-1	-1	-1	0	0	-1	-4
31	0	0	0	0	0	-1	-1
32	0	0	-1	0	0	-1	-2
33	0	0	0	0	0	-1	-1
34	0	-1	0	0	0	0	-1
Sum	-9	-12	-16	-6	-6	-21	-70
Average	-0.26	-0.35	-0.47	-0.18	-0.18	-0.62	-2.06
Median	0.00	0.00	0.00	0.00	0.00	-1.00	-2.00

Appendix I: Disability Webpage Aggregate Scoring

School	Keyboard Nav	Skip Nav	Focus Indicator	Captions	Visual Descriptions	Images	Total Score
1	0	0	-1	0	-1	-1	-3
2	0	0	-1	0	0	0	-1
3	0	-1	-1	0	0	0	-2
4	0	0	0	0	0	0	0
5	0	0	-1	0	0	0	-1
6	-1	0	-1	0	0	0	-2
7	0	-1	0	0	0	0	-1
8	0	0	0	0	0	0	0
9	-1	-1	-1	0	0	-1	-4
10	0	-1	0	0	0	0	-1
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	-1	0	-1	0	0	0	-2
14	0	-1	0	0	0	0	-1
15	-1	-1	-1	0	0	-1	-4
16	0	0	0	0	0	-1	-1
17	0	0	-1	0	0	-1	-2
18	0	0	0	0	0	0	0
19	0	-1	-1	0	0	0	-2
20	0	-1	0	0	0	0	-1
21	0	0	-1	0	0	-1	-2
22	-1	-1	-1	0	0	-1	-4
23	0	0	0	0	0	-1	-1
24	0	0	0	0	0	0	0
25	-1	0	-1	0	-1	0	-3
26	0	0	0	0	0	0	0
27	0	0	-1	0	0	-1	-2
28	-1	-1	-1	0	0	0	-3
29	0	0	0	0	0	0	0
30	0	-1	-1	0	-1	0	-3
31	0	0	0	0	0	0	0
32	0	-1	0	0	0	0	-1
33	0	0	-1	0	0	-1	-2
34	0	0	0	0	0	-1	-1
Sum	-7	-12	-17	0	-3	-11	-50
Average	-0.21	-0.35	-0.50	0.00	-0.09	-0.32	-1.47
Median	0.00	0.00	-0.50	0.00	0.00	0.00	-1.00

Appendix J: Admission Webpage Aggregate Scoring

School	Keyboard Nav	Skip Nav	Focus Indicator	Captions	Visual Descriptions	Images	Total Score
1	0	-1	-1	0	0	0	-2
2	-1	-1	-1	0	0	-1	-4
3	-1	-1	-1	0	0	-1	-4
4	0	0	0	0	0	0	0
5	-1	0	-1	0	0	-1	-3
6	-1	0	-1	0	0	-1	-3
7	-1	-1	-1	0	0	0	-3
8	0	-1	-1	0	0	0	-2
9	-1	-1	-1	-1	-1	0	-5
10	0	-1	0	0	0	-1	-2
11	-1	0	-1	0	0	-1	-3
12	0	0	0	0	0	0	0
13	-1	-1	-1	0	0	-1	-4
14	0	-1	0	0	0	-1	-2
15	-1	-1	-1	0	0	-1	-4
16	0	-1	0	0	0	0	-1
17	0	-1	0	0	0	-1	-2
18	0	0	0	0	0	0	0
19	-1	0	-1	0	0	-1	-3
20	-1	-1	-1	0	0	-1	-4
21	0	0	-1	0	0	-1	-2
22	-1	-1	-1	0	0	-1	-4
23	0	0	0	0	0	-1	-1
24	-1	-1	-1	0	0	-1	-4
25	-1	-1	-1	0	0	-1	-4
26	0	-1	0	0	0	0	-1
27	-1	0	-1	0	-1	-1	-4
28	-1	-1	-1	0	0	-1	-4
29	0	0	0	0	-1	-1	-2
30	-1	-1	-1	0	0	-1	-4
31	0	0	0	-1	-1	0	-2
32	-1	0	-1	0	0	-1	-3
33	-1	-1	-1	-1	-1	-1	-6
34	0	-1	0	0	0	0	-1
Sum	-19	-21	-22	-3	-5	-23	93
Average	-0.56	-0.62	-0.65	-0.09	-0.15	-0.68	-2.74
Median	-1.00	-1.00	-1.00	0.00	0.00	-1.00	-3.00

Appendix K: Institutional Aggregate Scoring

School	Keyboard Nav	Skip Nav	Focus Indicator	Captions	Visual Descriptions	Images	Total Score
1	-1	-2	-3	-1	-2	-1	-10
2	-1	-1	-2	-1	-1	-2	-8
3	-1	-2	-3	-1	-1	-1	-9
4	0	0	-1	0	0	0	-1
5	-1	0	-2	0	0	-2	
6	-2	0	-2	0	0	-1	-5
7	-1	-2	-1	0	0	-1	-5
8	0	-1	-1	-1	-1	-1	-5
9	-3	-3	-3	-1	-1	-2	-13
10	0	-3	0	0	0	-1	-4
11	-1	0	-1	0	0	-2	-4
12	0	0	0	0	0	0	0
13	-3	-2	-3	0	0	-1	-9
14	-1	-2	-1	0	0	-2	-6
15	-2	-2	-2	0	0	-3	-9
16	0	-2	0	-1	-1	-2	-6
17	0	-2	-2	0	0	-2	-6
18	0	0	-1	0	0	0	-1
19	-1	-1	-2	0	0	-2	-6
20	-1	-3	-1	0	0	-2	-7
21	-1	0	-3	0	0	-3	-7
22	-2	-3	-3	0	0	-2	-10
23	-1	0	-1	0	0	-3	-5
24	-1	-1	-1	0	0	-1	-4
25	-2	-2	-3	0	-1	-2	-10
26	0	-1	0	0	0	-1	-2
27	-2	0	-3	0	-1	-2	-8
28	-3	-3	-3	-1	-1	-2	-13
29	0	0	0	0	-1	-2	-3
30	-2	-3	-3	0	-1	-2	-11
31	0	0	0	-1	-1	-1	-3
32	-1	-1	-2	0	0	-2	-6
33	-1	-1	-2	-1	-1	-3	-9
34	0	-2	0	0	0	-1	-3
Sum	-35	-45	-55	-9	-14	-55	-213
Average	-1.03	-1.32	-1.62	-0.26	-0.41	-1.62	-6.26
Median	-1.00	-1.00	-2.00	0.00	0.00	-2.00	-6.00

Appendix L: Homepage Image and Video Aggregate Data

School	img w/ text	img total	img text %	Videos CC	Videos total	CC %
1	40	40	100.00%	0	1	0.00%
2	24	28	85.71%	1	1	100.00%
3	18	18	100.00%	0	5	0.00%
4	22	22	100.00%	0	0	0.00%
5	1	7	14.29%	0	0	0.00%
6	14	14	100.00%	0	0	0.00%
7	29	31	93.55%	0	0	0.00%
8	2	12	16.67%	0	1	0.00%
9	16	17	94.12%	0	0	0.00%
10	11	11	100.00%	0	0	0.00%
11	20	21	95.24%	0	0	0.00%
12	11	11	100.00%	0	0	0.00%
13	14	14	100.00%	0	0	0.00%
14	29	30	96.67%	0	0	0.00%
15	8	22	36.36%	0	0	0.00%
16	13	14	92.86%	0	1	0.00%
17	7	7	100.00%	0	0	0.00%
18	20	20	100.00%	0	0	0.00%
19	22	23	95.65%	0	0	0.00%
20	5	6	83.33%	0	0	0.00%
21	31	57	54.39%	0	0	0.00%
22	73	73	100.00%	0	0	0.00%
23	51	52	98.08%	0	0	0.00%
24	22	22	100.00%	0	0	0.00%
25	10	11	90.91%	0	0	0.00%
26	6	7	85.71%	0	0	0.00%
27	17	17	100.00%	1	1	100.00%
28	9	11	81.82%	1	2	50.00%
29	8	12	66.67%	0	0	0.00%
30	32	33	96.97%	0	0	0.00%
31	3	4	75.00%	0	0	0.00%
32	11	14	78.57%	0	0	0.00%
33	7	8	87.50%	0	0	0.00%
34	15	15	100.00%	0	0	0.00%
Sum	621	704				
Average	18.26	20.71	85.88%			
Median	14.50	16.00	95.45%			

Appendix M: Disability Webpage Image and Video Aggregate Data

School	img w/ text	img total	img text %	Videos CC	Videos total	CC %
1	9	10	90.00%	1	1	100.00%
2	2	2	100.00%	0	0	0.00%
3	19	19	100.00%	0	0	0.00%
4	12	12	100.00%	0	0	0.00%
5	11	11	100.00%	0	0	0.00%
6	9	9	100.00%	0	0	0.00%
7	1	2	50.00%	0	0	0.00%
8	11	11	100.00%	0	0	0.00%
9	2	5	40.00%	0	0	0.00%
10	1	1	100.00%	0	0	0.00%
11	2	2	100.00%	0	0	0.00%
12	6	6	100.00%	0	0	0.00%
13	8	8	100.00%	0	0	0.00%
14	9	9	100.00%	0	0	0.00%
15	10	16	62.50%	0	0	0.00%
16	1	2	50.00%	0	0	0.00%
17	4	5	80.00%	0	0	0.00%
18	13	13	100.00%	0	0	0.00%
19	8	8	100.00%	0	0	0.00%
20	9	9	100.00%	0	0	0.00%
21	12	13	92.31%	0	0	0.00%
22	1	2	50.00%	0	0	0.00%
23	3	4	75.00%	0	0	0.00%
24	8	8	100.00%	0	0	0.00%
25	17	17	100.00%	3	3	100.00%
26	13	13	100.00%	0	0	0.00%
27	8	9	88.89%	0	0	0.00%
28	14	14	100.00%	0	0	0.00%
29	5	5	100.00%	0	0	0.00%
30	5	5	100.00%	1	1	100.00%
31	5	5	100.00%	0	0	0.00%
32	1	1	100.00%	0	0	0.00%
33	2	2	100.00%	1	1	100.00%
34	9	11	81.82%	0	0	0.00%
Sum	250	269				
Average	7.35	7.91	90.02%			
Median	8.00	8.00	100.00%			

Appendix N: Admissions Webpage Image and Video Aggregate Data

School	img w/ text	img total	img text %	Videos CC	Videos total	CC %
1	19	19	100.00%	0	0	0.00%
2	15	19	78.95%	0	0	0.00%
3	9	19	47.37%	0	0	0.00%
4	22	22	100.00%	0	0	0.00%
5	6	11	54.55%	0	0	0.00%
6	20	26	76.92%	0	0	0.00%
7	10	10	100.00%	0	0	0.00%
8	13	13	100.00%	0	0	0.00%
9	13	13	100.00%	0	2	0.00%
10	6	7	85.71%	0	0	0.00%
11	9	22	40.91%	0	0	0.00%
12	3	3	100.00%	0	0	0.00%
13	3	10	30.00%	0	0	0.00%
14	94	95	98.95%	0	0	0.00%
15	7	11	63.64%	0	0	0.00%
16	6	6	100.00%	0	0	0.00%
17	5	8	62.50%	0	0	0.00%
18	6	6	100.00%	0	0	0.00%
19	42	43	97.67%	0	0	0.00%
20	17	51	33.33%	0	0	0.00%
21	9	10	90.00%	0	0	0.00%
22	18	40	45.00%	0	0	0.00%
23	8	13	61.54%	0	0	0.00%
24	1	14	7.14%	0	0	0.00%
25	2	2	100.00%	3	3	100.00%
26	16	16	100.00%	0	0	0.00%
27	16	20	80.00%	1	1	100.00%
28	37	41	90.24%	0	0	0.00%
29	6	7	85.71%	1	1	100.00%
30	10	12	83.33%	0	0	0.00%
31	20	20	100.00%	0	1	0.00%
32	6	14	42.86%	0	0	0.00%
33	0	3	0.00%	0	1	0.00%
34	7	7	100.00%	0	0	0.00%
Sum	481	633				
Average	14.15	18.62	75.19%			
Median	9.00	13.00	85.71%			

Appendix O: Institutional Image and Video Aggregate Data

School	img w/ text	img total	img text %	Videos CC	Videos total	CC %
1	68	69	98.55%	1	2	50.00%
2	41	49	83.67%	1	1	100.00%
3	46	56	82.14%	0	5	0.00%
4	56	56	100.00%	0	0	0.00%
5	18	29	62.07%	0	0	0.00%
6	43	49	87.76%	0	0	0.00%
7	40	43	93.02%	0	0	0.00%
8	26	36	72.22%	0	1	0.00%
9	31	35	88.57%	0	2	0.00%
10	18	19	94.74%	0	0	0.00%
11	31	45	68.89%	0	0	0.00%
12	20	20	100.00%	0	0	0.00%
13	25	32	78.13%	0	0	0.00%
14	132	134	98.51%	0	0	0.00%
15	25	49	51.02%	0	0	0.00%
16	20	22	90.91%	0	1	0.00%
17	16	20	80.00%	0	0	0.00%
18	39	39	100.00%	0	0	0.00%
19	72	74	97.30%	0	0	0.00%
20	31	66	46.97%	0	0	0.00%
21	52	80	65.00%	0	0	0.00%
22	92	115	80.00%	0	0	0.00%
23	62	69	89.86%	0	0	0.00%
24	31	44	70.45%	0	0	0.00%
25	29	30	96.67%	6	6	100.00%
26	35	36	97.22%	0	0	0.00%
27	41	46	89.13%	2	2	100.00%
28	60	66	90.91%	1	2	50.00%
29	19	24	79.17%	1	1	100.00%
30	47	50	94.00%	1	1	100.00%
31	28	29	96.55%	0	1	0.00%
32	18	29	62.07%	0	0	0.00%
33	9	13	69.23%	1	2	50.00%
34	31	33	93.94%	0	0	0.00%
Sum	1352	1606		14	27	
Average	39.76	47.24	83.78%			
Median	31.00	43.50	88.85%			