

2020

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### Recommended Citation

Taylor, Zachary W. (2020) "Clicking in the Dark: Are Student Financial Aid Websites Accessible for Students with Disabilities?," *Journal of Student Financial Aid*: Vol. 49 : Iss. 2 , Article 2.

DOI: <https://doi.org/10.55504/0884-9153.1687>

Available at: <https://ir.library.louisville.edu/jsfa/vol49/iss2/2>

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# Clicking in the Dark: Are Student Financial Aid Websites Accessible for Students with Disabilities?

By: Zachary W. Taylor

*The United States (U.S.) Access Board, a branch of the federal government responsible for advancing the inclusion of people with disabilities into U.S. society, recently amended Section 508 of the Americans with Disabilities Act (ADA). On January 18th, 2018, the final Section 508 amendment required all Title IV institutions of higher education in the United States to conform to Web Content Accessibility Guidelines 2.0 (WCAG) at the Level-A and Level-AA thresholds. As students with disabilities are often minoritized from the U.S. higher education system, this study explored the web accessibility of institutional .edu financial aid websites (n=450) to learn if these websites were accessible for students with disabilities after the January 2018 mandate. Results suggest the average financial aid website included nearly 40 web accessibility errors, with only 16% websites being accessible enough for students with disabilities to navigate from the landing page to the federal student aid application instructions webpage. Implications for research and practice are addressed.*

**Keywords:** *Financial aid, students with disabilities, web accessibility, Internet, WCAG, ADA, Section 508*

Computer scientist Tim Berners-Lee is credited with inventing the Internet in 1989 and the first web client and server in 1990 (W3, 2018). Years before these world-changing accomplishments, in 1986, the United States (U.S.) Congress added Section 508 as an amendment to the Rehabilitation Act of 1973. In this original version of Section 508, Congress urged federal agencies to provide electronic information in ways which could be accessed by people with a wide range of disabilities. In 1998, Congress again amended the Rehabilitation Act of 1973 to require “Federal agencies to make their electronic and information technology (EIT) accessible to people with disabilities.” Under Section 508, “agencies must give disabled employees and members of the public access to information comparable to the access available to others” (U.S. General Services Administration, 2018, para. 1).

In the years since the 1998 amendment, hundreds of people with disabilities have brought lawsuits against specific types of federal agencies: institutions of higher education participating in federal student loan programs, also known as Title IV-participating institutions (Carlson, 2018). These lawsuits have alleged institutions of higher education have violated Section 508 of the Rehabilitation Act of 1973, arguing that inaccessible electronic information on institutional websites is a fundamental denial of one’s ability to pursue higher education in the United States (LaGrow, 2017). Lawsuits have targeted institutions failing to provide accessible textbooks and learning software for blind students, failing to publish closed-captioned videos for deaf students, and failing to publish web accessible admissions applications websites, denying students with

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disabilities the right to complete their application, along with many other institutional shortcomings (Carlson, 2018).

As a response, Congress again amended Section 508 with the final rule going into effect on January 18th, 2018, updating and reorganizing Section 508 “in response to market trends and innovations in technology” (U.S. General Services Administration, 2018, para. 3). Therein, Section 508 requirements hold all Title IV-participating U.S. institutions of higher education to Level-A and Level-AA conformance according to Web Content Accessibility Guidelines (WCAG) 2.0 standards (U.S. Access Board, 2018). These WCAG 2.0 standards are an international set of standards for web accessibility to provide guidance for computer programmers and content editors to render their websites as accessible as possible for people with disabilities using a wide range of assistive technologies to access online content (W3C, 2018b).

Section 508 adopted WCAG as the official standard of web accessibility, setting accessibility conformance at three levels. Level-A is the minimum level of conformance and satisfies all Level-A success criteria defined by WCAG, such as ensuring all audio content is captioned for those hard of hearing (W3C, 2018b). Level-AA is the standard level of conformance and the threshold Title IV-participating institutional websites must meet to be deemed web accessible and in compliance with ADA (U.S. Access Board, 2018). Level-AA success criteria encompasses all Level-A criteria, plus an additional level of conformance, such as color contrast minimums and using unique headings and labels to allow students to differentiate between webpages (W3C, 2018b). Finally, Level-AAA is the optimal level of conformance, including all Level-A and Level-AA success criteria (W3C, 2018b). Title IV-participating institutions do not need to meet Level-AAA conformance, as “It is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some content” (W3C, 2018c, para. 11).

WCAG 2.0 requires websites to be perceivable, operable, understandable, and robust for people with disabilities, as these four categories encompass diverse elements of a webpage, such as audio, video, images, text, hyperlinks, buttons, toolbars, and menus (W3C, 2018b). As a result, an institution’s website can be considered ADA and WCAG 2.0 compliant if a wide variety of assistive technologies are able to read the data in the website’s markup language—typically HTML or hypertext markup language—and render the content intelligible to a person with a disability (W3C, 2018b). For instance, a person who is blind may require an assistive technology which can vocalize text and visual elements of a website, while a deaf person may require an assistive technology which can caption aural elements of a website.

Extant research has examined web accessibility at four-year (Bradbard et al., 2010; Hackett & Parmanto, 2005; Harper & DeWaters, 2008; Kelly, 2002) and two-year institutions (Erickson et al., 2009; Flowers et al., 2011; Wisdom et al., 2006), with these studies finding postsecondary websites are rarely compliant with WCAG standards. Since the January 18th, 2018 deadline, Taylor and Bicak’s (2019) study of the web accessibility of two-year institution and community college websites has informed the U.S. higher education community of the ADA compliance of its online communication. Therein, the authors learned a random sample of 325 institutional websites varied in terms of web accessibility, with every institutional landing page in the sample including at least one WCAG 2.0 Level-A error, possibly violating the newest amendment of Section 508 (Taylor & Bicak, 2019). Similarly, Taylor found that many historically-Black college and university websites (2019a) and Texas postsecondary websites (Taylor, 2019b) were not compliant with ADA by the January 2018 deadline.

Beyond their study, no research has addressed the web accessibility of student financial aid websites published by Title IV-participating institutions of higher education in U.S. to learn if students with disabilities are being provided equal access to electronic information as outlined in the newest amendment to Section 508. In addition, it is important to update previous studies related to web accessibility, as assistive

technologies and web accessibility can frequently change and become more advanced (Kurt, 2018; Taylor, 2018b, 2019a, 2019b). Therefore, this study seeks to update and expand upon previous work by answering two critical research questions pertinent to students with disabilities:

- 1.) After the January 18th, 2018 amendment of Section 508, how web accessible are four-year, Title IV-participating institutional student financial aid website landing pages?
- 2.) If these landing pages are not entirely web accessible, which WCAG 2.0 standards are most abundant?

Answering these questions will not only inform the scholarly community but also inform financial aid practitioners as to whether their websites are compliant with federal law and accessible for an often minoritized population in higher education: Students with disabilities.

## Literature Review

Web accessibility is a difficult construct to measure given there are 1.5 billion websites currently online across the world, two new websites are published every second (Internetlivestats, 2019), and there exist hundreds of different assistive technologies that are used by people with disabilities to access Internet content, some of which may be more successful in accessing Internet content than others, depending on the robustness of the assistive technology and the acumen of its user (W3C, 2019). However, education and disability studies researchers have attempted to approximate the web accessibility of postsecondary websites through a variety of assessment measures, including both machine or software assessments and human evaluators engaging with assistive technologies.

### Machine Evaluations

A widely-used method of web accessibility evaluation is by use of machine, given the volume of websites and individual webpages historically and currently online. Kelly's (2002) analysis of United Kingdom (U.K.) university websites (n=162) employed a machine evaluation software to evaluate web accessibility. Kelly (2002) found only four U.K. universities were Level-AA compliant per WCAG 1.0 standards. Using the web-based Bobby™ accessibility tool, Kelly (2002) also asserted many web accessibility errors were made when images were missing alt text attributes, or, text that specifies what should be rendered on a screen when the element cannot be rendered (e.g., screen reader technology such as Mac OS X's Voiceover reading text to a person who is blind).

Akin to Kelly's (2002) work, Hackett and Parmanto (2005) also used a machine evaluator to determine the web accessibility over higher education websites over time, given the rapid evolution of Internet complexity and the types of digital content supported on newer websites (e.g., embedded videos). Their longitudinal study from 1997 until 2002 evaluated 45 institutional higher education websites, with every institution being a member of the Association of American Universities. Hackett and Parmanto (2005) learned that as Internet technology evolved, institutional websites became increasingly inaccessible for people with disabilities, speaking to the inability of institutional web administrators to keep pace with rapidly-changing Internet technologies. In the study, Hackett and Parmanto (2005) found that in 2002, many higher education websites contained the same errors as in 1997, including missing alternative text from images and missing labels for fillable forms. Since their work, no other studies have conducted a retrospective analysis of higher education websites over an extended period of time.

When WCAG 2.0 standards were updated and published in 2008, Harper and DeWaters (2008) employed an updated version of Bobby™ named "Watchfire® Bobby™" (p. 162) to examine the home or landing pages of 12 four-year U.S. institutions. The authors found one of 12 met Level-AAA standards, while four

of the 12 institutions did not comply with Level-A, Level-AA, or Level-AAA standards (Harper & DeWaters, 2008). Similarly, Flowers et al. (2011) used Bobby 3.2 to perform a machine evaluation of 253 community college home or landing pages. Flowers et al. (2011) learned only 23% of a sample of 253 community college homepages were web accessible for students with disabilities. Most recently, Taylor and Bicak (2019) used Tenon™ to evaluate two-year and community college home or landing pages and found all 325 institutional websites in their sample included at least one WCAG 2.0 Level-A error, possibly rendering these websites noncompliant with ADA. Taylor (2019a, 2019b) then expanded this work to evaluate the ADA compliance of historically-Black college and university websites and Texas postsecondary websites, learning a majority of these websites did not comply with ADA by the January 2018 deadline.

### **Combining Machine with Human Evaluation**

Thompson et al.'s (2003) analysis of four-year U.S. institutional websites. Using the most current web accessibility standards at the time, Thompson et al. (2003) applied WCAG 1.0 standards to 102 public research university websites using a web accessibility scale measured by two human evaluators. In total, their Thompson et al. (2003) evaluated 1,103 different webpages on 102 different websites, with one evaluator determining 182 webpages were entirely web accessible, while another evaluator found 42 webpages to be entirely web accessible using the same scale. For instance, evaluators were asked to perform several accessibility tests on each website, including turning off images to explore alternative text descriptions and altering the font size to determine whether the website was still readable (Thompson et al., 2003). However, these evaluators reported varying levels of web fatigue, resulting in these evaluators' moods influencing how accessible websites were from the perspective of the evaluator (Thompson et al., 2003). In a unique finding, Thompson et al. (2003) learned human web accessibility evaluators may differ in their perceptions of web accessibility, yet human judgement should be used alongside web accessibility software to provide a more holistic assessment of web accessibility of a given website. Moreover, human judgement can be influenced by web fatigue and the mood of the human, tainting data collection and analysis procedures (Thompson et al., 2003).

Using a series of manual checkpoints on institutional webpages, Thompson et al. (2010) performed a longitudinal, five-year study of 127 four-year U.S. institutional websites. The research team initially benchmarked each institutional website for web accessibility and then evaluated the same webpages three times per month over a six-month period from 2004-2005 and again in 2009. During the first time period, the researchers provided extensive training and support to a sample of the institutions to explore whether such professional development would lead to website improvements in the future. However, by 2009, Thompson et al. (2010) reasoned that there was no significant difference in the web accessibility between institutions that had received training and had not. Ultimately, Thompson et al. (2010) asserted advances in web technology made it difficult for institutions to reach or maintain WCAG 2.0 compliance. Moreover, the authors noticed a sharp decline in keyboard accessibility across the sample likely due to advances in technology. However, web accessibility training did help improve web accessibility of institutional websites in certain areas, including rendering images and videos more accessible and building menus with more detail so that different assistive technologies could access menu information (Thompson et al., 2010).

Erickson et al. (2013) also adopted a multipronged approach at evaluating the web accessibility of community college websites by combining machine and human evaluators across several different types of webpages. Across 276 total webpages on 30 different community college websites, Erickson et al. (2013) found zero webpages passed the "AccVerify" (p. 867) machine testing stage of evaluation, while the human evaluators asserted less than 1% of webpages from thirty two-year institutions met Section 508 guidelines and WCAG 2.0 standards.

## Other Approaches

Adopting a different approach to understanding web accessibility, Erickson et al. (2009) surveyed community colleges and found 90% of a sample of nearly 700 community colleges reported offering online courses, catalogs, and class schedules, yet only 50% of respondents reported their institution having written guidelines for web accessibility at their institution. Using interviews, Wisdom et al. (2006) examined web accessibility knowledge of staff members at Oregon community colleges. Wisdom et al. (2006) found information technology (IT) professionals and disability/student services staff members were the most knowledgeable about disability laws including web accessibility guidelines, yet IT professionals and disability staff members rarely collaborated to ensure web accessibility. This finding led Wisdom et al. (2006) to encourage communication between IT and disability/student services departments to collaboratively publish web accessible websites. Closely related to web accessibility, other studies have examined web accessibility policies at land-grant universities (Bradbard et al., 2010) and community colleges (Erickson et al., 2009), with both studies finding many institutions either did not have web accessibility policies or these policies were weak or poorly distributed among practitioners working at the institution.

Ultimately, given the rapidly-changing nature of Internet technologies and web accessibility (Kurt, 2018; Taylor, 2018b; Taylor & Bicak, 2019; Thompson et al., 2003; Thompson et al., 2010), this study will update and expand upon extant research to learn whether students with disabilities can access vital student financial aid information on institutional websites.

## Methodology

### Population and Sample

In 2018, an Integrated Postsecondary Education Data System (IPEDS) search for Title IV-participating institutions yielded a population of 6,519, including less than two-year, two-year, and four-year institutions. Understanding the vast majority of two-year students do not borrow federal loans at all, while four-year students frequently borrow federal loans students and hold the clear majority of federal student loan debt in the U.S. (The College Board, 2017), this study focused on four-year, Title IV-participating institutions: A population of 2,805 public, private non-profit, and private for-profit institutions. This study intentionally included public, private non-profit, and private for-profit institutions as long as these institutions were classified as Title IV-participating in IPEDS, as Section 508 of the ADA now requires all Title IV-participating institutions to publish web accessible websites, regardless of the oft disparate missions and organizational structures of public versus private non-profit, and private for-profit institutions.

After performing a power analysis with a 95% confidence level and 5 confidence interval, a sample of 450 institutions was targeted. All 2,805 institutions were assigned a number, and a random number generator assigned 450 institutions to this study's sample. Furthermore, Flowers et al.'s (2011) study examined the web accessibility of 253 community college websites. This study sought to expand upon and update this extant work, necessitating a larger—and potentially more representative—sample size. A description of institutions in this study's sample can be found in Table 1 below:

Table 1

*Description of institutions in the sample (n=450)*

<u>Sector</u>	<u>Institutions</u>	<u>% of sample</u>
Public	285	63.3%
Private	165	36.7%
Non-profit	86	19.1%
For-profit	79	17.6%
Total	450	100%

### Data Collection and Analysis

Once the random sample was identified, each institution's student financial aid website was located using the institutional website's embedded search tool. The terms "apply for financial aid" and "student financial aid" were used to locate each institution's student financial aid website. After searching for these terms, all 450 institutional student financial aid websites were located without issue: A database of these websites is available upon request from the author.

Once institutional student financial aid websites were located, Tenon™ accessibility software was used to analyze each website's web accessibility, specifically the institution's student financial aid landing page (e.g., <https://college.harvard.edu/financial-aid>). This study analyzed the student financial aid landing page following the logic that if this webpage is not web accessible, it would likely be difficult for students with disabilities to access this webpage's content and successfully navigate the remainder of the institution's student financial aid website, which could include thousands or tens of thousands of individual webpages. Other studies of web accessibility have analyzed home or landing pages following the same logic (Flowers et al., 2011; Harper & DeWaters, 2008; Thompson et al., 2010).

Following recommendations from recent literature (Taylor, 2018b; Taylor & Bicak, 2019), this study employed Tenon™, a robust freeware program capable of running nearly 100 total tests of web accessibility at the Level-A, Level-AA, and Level-AAA standards (Tenon LLC, 2018). Level-A standards correspond to the highest priority of web accessibility standards, as Level-A errors on a webpage could be "showstoppers and barriers that prevent some people from access to information altogether" (Harper & DeWaters, 2008, p. 161). Level-AA errors fall under the second priority tier, as web content developers should "satisfy these checkpoints in order to remove significant barriers to access information" on the webpage (p. 161). Finally, Level-AAA errors are of the lowest priority for web content developers and are not written into official guidelines for Section 508 compliance (U.S. Access Board, 2018). Tenon™ analyzes the web accessibility of webpages by reading the webpage's source code and searching for missing information which could render the webpage less web accessible, such as a missing language tag to specify a webpage's language (e.g., "en" for English or "es" for Spanish).

Any Level-AAA errors discovered in this study were removed from the analysis, as Title IV institutions are not required to meet Level-AAA conformance. However, it was important to employ an accessibility software which could evaluate Level-AAA conformance to explore institutions and identify exemplary and robust websites in terms of WCAG 2.0 and ADA compliance. In addition, Tenon™ was employed for its ability to allow researchers and practitioners to download a .csv report outlining the accessibility errors most prevalent and the HTML source code location at which to remedy the error. Comparative analyses of web accessibility evaluation software have found Tenon™ to be an efficient, accurate, and robust web accessibility evaluation tool (Ismail, Kuppusamy, & Nengroo, 2017; Taylor, 2018b, 2019a, 2019b; Timbi-Sisalima et al., 2018), justifying the use of Tenon™ for this particular study.

Once web accessibility error reports were generated, institutional IPEDS variables were merged with Tenon's™ error reports to organize the data by institution type and error type. Merging the data revealed the most frequent error types and which institutions published the least web accessible and most web accessible websites for students with disabilities. As a result, Tables 2 and 3 in the Findings section of this study clearly explain the overall sample mean, median, high, low, and standard deviation of errors, as well as descriptive statistics of errors by institution type. Additionally, the merged dataset was analyzed to create Table 3, clearly displaying the most frequent error types across all four strands of WCAG 2.0 web accessibility: perceivable, operable, understandable, and robust web elements (W3C, 2018b). Although each WCAG 2.0 strand include Level-A, Level-AA, and Level-AAA thresholds, it is important to understand which strand and which errors are most problematic, as practitioners (institutional web programmers or content developers) could learn of these errors and their methods of remedy.

However, simply because a website includes one WCAG 2.0 web accessibility error does not necessarily mean the entire website is inaccessible for students with disabilities (Erickson et al., 2013; Flowers et al., 2011; Hackett & Parmanto, 2005; Taylor, 2019a, 2019b; Thompson et al., 2010). Understanding this and adhering to prior research suggesting the use of human evaluation alongside machine evaluation (Thompson et al., 2003), each website was manually audited for web accessibility using Mac OS X's Voiceover, a fully-functional, robust, screen-reading assistive technology used by people with blindness, low vision, dyslexia, and many other disabilities. Voiceover has been found to be a reliable, efficient, and effective assistive technology used to add another layer of reliability beyond evaluation technologies such as Tenon™ (Edwards, 2005; Henton, 2012; Manduchi & Kurniawan, 2012; Taylor, 2019a, 2019b; Taylor & Bicak, 2019).

Using Voiceover, each student financial aid landing page was audited for web accessibility during the completion of one task: Navigating from the student financial aid landing page (e.g., <https://www.financialaid.ucla.edu/>) to the instructions for how to apply for federal student aid (e.g., <https://www.financialaid.ucla.edu/Prospective-Student/Applying-For-Aid>). This decision was made understanding two characteristics of institutional student financial aid websites. First, and arguably so, applying for federal student aid is one of the most important processes facilitated by institutional student financial aid websites and millions of students apply for federal student aid every year (The College Board, 2017). Second, it would be not be feasible to perform a web audit of every single webpage published on all 450 student financial aid websites in this study, as some websites may contain thousands or tens of thousands of individual webpages, resulting in the manual analysis of hundreds of thousands of webpages.

As a result, this study is delimited to the web accessibility error reports of student financial aid website landing pages generated by Tenon™ coupled with a Voiceover audit of each website to evaluate the web accessibility of hyperlinks leading to application instructions regarding how to apply for federal student aid. These Voiceover audits utilized a binary coding strategy: 1.) yes, a student with a disability could use Voiceover to navigate from the student financial aid website landing page to the application instructions for how to apply for federal student aid, and, 2.) no, the student financial aid website landing page was not web accessible enough to allow a student with a disability to use Voiceover to discover the application instructions for how to apply for federal student aid. These results are presented in Table 4 in the Findings section of this study.



## Findings

Table 2

*Descriptive statistics of web accessibility errors (n=17,517) of student financial aid websites for four-year institutions of higher education, by institution type (n=450)*

<u>Institution type</u>	<u>Web accessibility errors</u>				
	Mean	Median	High	Low	SD
All institutions (n=450)					
All error types	38.9	23	501	0	49.8
Level-A errors	36.9	22	499	0	48.9
Level-AA errors	1.6	0	54	0	4.8
Level-AAA errors*	0.3	0	51	0	2.6
Public (n=285)					
All error types	33.8	21	501	0	48.5
Level-A errors	32.4	20	499	0	48.1
Level-AA errors	1.1	0	38	0	2.9
Level-AAA errors*	0.3	0	51	0	3.2
Private, non-profit (n=86)					
All error types	39.7	24	251	1	43.9
Level-A errors	37.9	22.5	251	0	42.8
Level-AA errors	1.8	0	24	0	3.9
Level-AAA errors*	0.1	0	2	0	0.4
Private, for-profit (n=79)					
All error types	56.5	42	370	1	56.7
Level-A errors	52.6	37	370	1	55.2
Level-AA errors	3.5	0	54	0	8.9
Level-AAA errors*	0.3	0	10	0	1.4

\*Note: This study found 132 Level AAA; however, these errors were removed from subsequent analysis, as ADA guidelines only require Level-A and Level-AA web accessibility compliance.

Results in Table 2 indicate the average landing page of institutional student financial aid websites include 38.9 web accessibility errors, with 36.9 of these errors occurring at Level-A conformance and 1.6 errors occurring at Level-AA conformance. Public institutions (n=285), on average, published the most web accessible landing pages on institutional student financial aid websites (33.8 errors per landing page), whereas private, for-profit institutions (n=79) published the least web accessible landing pages (56.5 errors per landing page). It is also important to note three public institutions (Towson University, the University of California-Santa Barbara, and the University of Iowa) published landing pages with zero web accessibility errors, rendering their student financial aid websites the most web accessible in this study's sample. In the Voiceover analysis, these three institutional websites were also found to be web accessible (Table 4).

Moreover, multiple landing pages on institutional student financial aid websites included 200 or more web accessibility errors, rendering these websites very inaccessible for students with disabilities. Of websites including more than 200 errors, the Voiceover analysis found these websites to be inaccessible, as students with disabilities would not be able to navigate from the landing page to the application instructions for how to apply for federal student aid.

Table 3

*Analysis of Level-A and Level-AA web accessibility errors (n=17,385) of student financial aid websites of four-year institutions of higher education (n=450), by error type*

<u>Errors by type, all institutions</u>	<u>Errors</u>	<u>% of total</u>
Perceivable		
Level-A, 1.1.1, Non-text content	1517	8.8%
Level-A, 1.3.1, Information and relationships	2410	13.9%
Level-A, 1.3.2, Meaningful sequence	96	>1%
Level-AA, 1.4.5, Images of text	3	>1%
Operable		
Level-A, 2.1.1, Keyboard	400	2.3%
Level-A, 2.4.1, Bypass blocks	232	1.3%
Level-A, 2.4.2, Page titled	10	>1%
Level-A, 2.4.3, Focus order	552	3.2%
Level-A, 2.4.4, Link purpose (in context)	6683	38.4%
Level-AA, 2.4.6, Headings and labels	725	4.2%
Understandable		
Level-A, 3.1.1, Language of page	53	>1%
Robust		
Level-A, 4.1.1, Parsing	1713	9.8%
Level-A, 4.1.2, Name, role, value	2991	17.2%

Results in Table 3 suggest Operable, Level-A errors were the most common web accessibility error type in this study's sample, specifically 2.4.4 errors: Link purpose. These types of errors included an institution embedding a hyperlink on their landing page and failing to add alt text, or, descriptive text to inform the Internet user about the purpose of the hyperlink. For instance, multiple landing pages did not add alt text to the hyperlink leading to the application instructions for federal student aid. As a result, when Voiceover tried to read the hyperlink, Voiceover said, "Button" instead of "apply for financial aid" or another description of the purpose of the hyperlink. Errors such as these comprised 38.4% of all web accessibility errors in this study.

Robust, Level-A errors were also prevalent in this study, with 4.1.1. parsing errors and 4.1.2 name, role, value errors comprising 9.8 and 17.2% of all errors in the study. Parsing errors pertain to how HTML and other markup languages are written, specifically how these languages use tags to embed certain digital elements into a webpage, such as an image or hyperlink. This study found 1,713 parsing errors related to incomplete or missing element tags, meaning an assistive technology would be unable to parse, or, read a certain web element because its tag was not started or finished correctly. These errors can be as simple as a missing bracket to close a tag or an inadvertent space within a tag. Name, role, value errors pertain to the information relayed from the webpage to the assistive technology—such as Voiceover—when the Internet user interacts with the webpage. For instance, when an Internet user clicks a checkbox or collapsible menu, the webpage should tell the assistive technology what functions are available and what the Internet user can do next. This study found 2,991 errors of this type, indicating that when an Internet user employs an assistive technology on webpages with these errors, the user may not be given enough information to understand how they can interact with the webpage and what options they have after they have interacted with a certain web element on the webpage.

Finally, this study found 2,410 Level-A 1.3.1 information and relationships errors and 1,517 Level-A 1.1.1 non-text content errors, comprising 13.9 and 8.8% of all errors in the study. Both 1.3.1 and 1.1.1 errors

pertain to the amount of information provided to an Internet user and how that information is presented. Information and relationships errors include the amount and clarity of information relayed from the webpage to the assistive technology when the webpage changes, such as when a student completes a digital form on a webpage. One example of a 1.3.1 error would be if that digital form had several required fields but indicated required fields with red labels. In this case, a colorblind student may not understand which fields are required. A suggestion would be to mark required form fields in red and with an asterisk to better convey this information to a wide range of students with disabilities who may be using different assistive technologies. Level-A 1.1.1 errors pertain to the accessibility of non-text elements of a webpage, such as images, videos, and infographics. Many 1.1.1 errors in this study were instances of images, videos, and infographics without descriptive text, rendering the content inaccessible to many students with disabilities who rely on their hearing to process digital information.

Table 4

*Voiceover analysis of web accessibility of institutional student financial aid websites (n=450)*

Sector	Total institutions	Web accessible	% of type	% of sample
Public	285	53	18.6%	11.8%
Private	165	19	11.5%	4.2%
<i>Non-profit</i>	86	13	15.1%	2.8%
<i>For-profit</i>	79	6	7.6%	1.3%
Total	450	72	16%	16%

Results in Table 4 suggest few institutional student financial aid websites are web accessible enough to allow students with disabilities to navigate past the landing page to locate federal student aid application instructions. Across the entire sample, 16% of landing pages were web accessible to allow navigation to federal student aid application instructions: 53 public institutions, 13 private non-profit institutions, and 6 private for-profit institutions. There were two landing pages with ten web accessibility errors which were still web accessible per the Voiceover analysis. These landing pages represented the pages that included the greatest number of errors while still being web accessible to allow navigation to the federal student aid application instructions. No landing page with eleven or more errors was web accessibility per the Voiceover analysis. Three landing pages—with error counts of 501, 370, and 360—did not allow interaction with any web elements per the Voiceover analysis, rendering these pages the most inaccessible for students with disabilities.

## Limitations

This study has two primary limitations related to sample size and analytic method. First, this study examines 450 Title IV-participating four-year institutions of higher education: There are over 8,000 of institutions of higher education in the United States. Future research could expand this study's sample size and perform comparative studies of web accessibility using other websites that fall under ADA's purview, such as government websites.

Second, this study examines the web accessibility of the landing page of institutional student financial aid websites (the Tenon™ analysis) and whether a student with a disability could navigate past the landing page and to the application instructions for how to apply for federal student aid (the Voiceover analysis). However, this study is the first of its kind to evaluate the web accessibility of institutional student financial aid websites, even though extant research has examined many other types of websites, such as land-grant universities (Bradbard et al., 2010), community colleges (Erickson et al., 2013; Flowers et al., 2011; Taylor & Bicak, 2019; Wisdom et al., 2006), government websites (Ismail et al., 2017), United Kingdom university

websites (Kelly, 2002), Turkish university websites (Kurt, 2017), and Israeli university websites (Nir & Rimmerman, 2018). As a result, despite its limitations, this study fills an important gap in the literature related to the web accessibility of institutional student financial aid websites for students with disabilities, an often minoritized community of students in U.S. higher education (Brinckerhoff, 1996; Evans et al., 2017; Getzel, 2008; Getzel & Thoma, 2008; Taylor, 2018a; Taylor & Bicak, 2019).

### **Implications for Research**

Many of this study's findings echo prior research suggesting postsecondary websites are rarely accessible for students with disabilities (Bradbard et al., 2010; Erickson et al., 2013; Flowers et al., 2011; Ismail et al., 2017; Kelly, 2002; Kurt, 2017; Nir & Rimmerman, 2018; Taylor & Bicak, 2019; Taylor, LaRonde, & Taylor, 2019; Wisdom et al., 2006). As mentioned in the Limitations section of this study, future research could update previous research related to web accessibility of U.S. higher education websites, including websites focused on supporting minoritized postsecondary students, such as Hispanic-serving institution (HSI) websites, historically-Black college and university (HBCU) websites, and Asian American and Native American Pacific Islander-serving institution (AANAPISIs) websites. It is important to learn whether institutions who have historically served minoritized students, such as HSIs and HBCUs, are more or less adept at supporting students with disabilities in digital spaces, specifically institutional websites.

Related to students with disabilities, student financial aid research could explore how students with disabilities navigate digital resources during the financial aid application process, learning more about which digital resources are most important for or most used by these students. As Internet and digital technologies continue to advance, student financial aid research should work to keep pace with these advancements, especially understanding that students with disabilities often rely on emerging technologies to access digital content, thus accessing U.S. higher education. In addition, qualitative work could investigate whether student financial aid administrators or financial aid website content developers have taken steps to improve their website's accessibility or if they have been provided with any professional development focused on increasing awareness of web accessibility issues.

However, an important finding of this study suggests several institutions of higher education—and their student financial aid administration—understand web accessibility and have published very web accessible websites for students with disabilities. As previously mentioned, Towson University, the University of California-Santa Barbara, and the University of Iowa published error-free student financial aid websites per the Tenon™ analysis. After the Voiceover analysis, these websites were found to be the most web accessible in this study, as navigating these websites with an assistive technology was very easy, intuitive, and informative. As a result, student financial aid researchers should explore web accessible websites and learn how these institutions—and their student financial aid teams—published such web accessible content for students with disabilities. Perhaps practitioners can learn from their peers in this regard, as Towson University, the University of Santa-Barbara, and the University of Iowa served as exemplary websites from which student financial aid administrators at other institutions could learn.

### **Implications for Practice**

Hart et al. (2006) suggested students with disabilities often experience difficulty applying for and receiving federal student aid, potentially contributing to lower persistence and graduation rates than peers. Wolanin (2005) asserted federal student aid programs have not kept pace with rising costs of disability-related care, while the Free Application for Federal Student Aid (FAFSA) would become much more complicated than it already is if students with disabilities were asked to provide even more contextual information about their disability and specific costs relevant to their disability. Similarly, Madaus, Grigal, and Hughes (2014) found low-income students with disabilities are doubly marginalized by the federal student aid system, as federal

student aid programs often do not cover additional postsecondary expenses incurred by a student with a disability, such as mobility technology, individualized medical support, and accessibility services.

Given this extant research, coupled with the findings of this study and related studies before it, student financial aid administrators should address the web accessibility of their website as soon as possible, especially given the deluge of ADA violation lawsuits brought against colleges and universities by students with disabilities (Carlson, 2018; LaGrow, 2018; Taylor, LaRonde, & Taylor, 2019). Beyond the legal protection of one's institution against discrimination-based lawsuits, student financial aid administrators should embrace emerging technologies to publish web accessible websites, ushering in a new era of digital equity for students with disabilities pursuing higher education.

Of these emerging technologies, many are practitioner-friendly and do not require extensive knowledge of markup language or website administration. Taylor (2018b) outlined several web accessibility evaluation technologies—such as Tenon™—which produce simple, understandable web accessibility error reports, which could be forwarded to an institution's web development or web administration team. For instance, Tenon™ evaluates a webpage's source code to learn if pictures have had alt text or descriptive text added to them, allowing blind students and students with low-vision the opportunity to have the picture's description read aloud to them by a screen reader technology. Similarly, Tenon™ also explores every hyperlink embedded on a webpage to learn if these hyperlinks have informative descriptions added to them to alert students to where the hyperlink will take them if they click on the hyperlink. Granted, these are only two of potentially hundreds of web accessibility tests that Tenon™ and other software can run. Yet, if content developers in charge of student financial aid websites are aware of these simple tests, many images and hyperlinks could see their web accessibility improved. Here, student financial aid administrators do not need to be fully fluent in HTML, Java, C++, Python, or any other programming language to improve the web accessibility of their website. Instead, these administrators need to learn of issues pertinent to web accessibility, learn how to audit their website to become aware of these issues, and connect with the experts at their institution to explore methods of remedying the errors. Quite simply, many student financial aid administrators may not know what they do not know, leading to very inaccessible websites for students with disabilities.

Moreover, the vast majority of errors uncovered in this study are very simple to fix. One could add alt text to an image in a matter of seconds, rendering that image—that web element—accessible for students with disabilities. Perhaps more important than remediation efforts is the knowledge of how to create web accessible content before it is uploaded to student financial aid websites, not after. Student financial aid administrators should explore the World Wide Web Consortium (WC3) website and its reference guide for producing web accessible elements of a website (<https://www.w3.org/WAI/WCAG21/quickref/>). This reference guide educates web administrators as to how to produce web accessible content, how to diagnose and remedy web accessibility errors, and how to maintain pace with rapidly changing Internet technologies. In addition, YouTube features hundreds of web accessibility tutorial videos so individuals without web accessibility knowledge can learn more about high-quality computer programming at only the cost of one's time. Once again, many errors discovered in this study are very simple to fix: Even being aware of needing to add alt text to an image or hyperlink may dramatically decrease the number of web accessibility errors on a website, possibly rendering that website accessible for students with disabilities.

However, institutions of higher education—at the two- and four-year level and in public and private settings—may not have the money or human resources to provide institution-wide professional development. Surely, individuals with computer programming knowledge would consider adding language tags and alt text as “easy fixes,” but people without this knowledge or without the means to acquire this knowledge may be entirely unaware of the inaccessibility of their website(s). As a result, students with disabilities may be unfairly and illegally denied the right to an education. Here, institutions without such

resources may be forced into a discussion of what can be funded and what (or whose) expense. Carlson (2018) and LaGrow (2018) have expressed the pressing need for higher education web accessibility to improve, but without the necessary institutional support, those responsible for producing online content may be unable to best support students with disabilities through the publishing of accessible websites. Ultimately, as students with disabilities continue to be underrepresented in higher education (Getzel, 2008; Hong, 2012), and web accessibility lawsuits continue to be brought against institutions (Carlson, 2018; LaGrow, 2018), these institutions will continue to face difficult decisions when it comes to supporting students with disabilities while balancing budgets and training staff.

## Conclusion

More so than ever, the Internet can be an incredibly liberating space for students with disabilities given the voluminous amount and quality of information available online. However, the Internet can also be an incredibly marginalizing space where students with disabilities are not afforded the digital equity they need and deserve to access U.S. higher education and achieve their dreams. As extant research has contended, successfully applying for and receiving federal student aid is a crucial step toward accessing U.S. higher education for millions of postsecondary students each year (The College Board, 2017). Students with disabilities may experience more difficulty applying for aid (Hart et al., 2006) and affording a postsecondary education than their peers (Madaus et al., 2014; Wolanin 2005), but student financial aid professionals can actively promote digital equity by publishing web accessible websites. As a result, students with disabilities will no longer feel as if they are “clicking in the dark” trying to access a postsecondary education that does not need to be technologically out of reach.

### Nexus: Connecting Research to Practice

- Institutional student financial aid websites may not be accessible for students with disabilities, resulting in these students being unable to attain the information necessary to apply for federal student aid and access U.S. higher education.
- Many web accessibility issues are simple to fix and do not require extensive knowledge of programming language or web administration. There exist free, simple web accessibility technologies for use by student financial aid professionals seeking to publish a more web accessible website.
- The World Wide Web Consortium (WC3) publishes a web accessibility reference guide for use by practitioners to learn how to publish web accessible websites.

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