Original Article

Hispanic-Serving Institutions and Web Accessibility: Digital Equity for Hispanic Students With Disabilities in the 21st Century

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Abstract

The Americans with Disabilities Act (ADA) mandates that all Title IV-participating institutions of higher education publish web accessible websites for students with disabilities. This study sought to evaluate the web accessibility of Hispanic-Serving Institutional (HSI) websites ($n = 217$). Results suggest that the average HSI website landing page included 447 errors, violating ADA. Most errors were related to font size, color contrast, and hyperlinks and pictures. Implications for research, practice, and support for Hispanic students with disabilities are addressed.

Resumen

La Ley de Americanos con Discapacidades (ADA) manda que todas las instituciones de educación superior participantes en el Título IV publiquen sitios en la red mundial que sean accesibles para estudiantes con discapacidades. Este estudio buscó evaluar la accesibilidad a la red mundial en los sitios ($n = 217$) de las Instituciones de Servicio a Hispanos (HSI). Resultados sugirieron que el sitio HSI promedio de la página inicial incluía 447 errores, violando ADA. La mayoría de los errores se relacionaron con el tamaño de la letra, contraste de color, hipervínculos e imágenes. Implicaciones de investigación, práctica y apoyo para estudiantes hispanos con discapacidad se señalan.

Keywords

Hispanic-Serving Institutions, students with disabilities, web accessibility, people with disabilities, Hispanic students, technology, websites, Internet

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Web accessibility can be broadly defined as ensuring that websites are written to include robust and detailed information to allow people with disabilities access to the same digital, online content as people without disabilities (W3C, 2019). As a historically minoritized population in society, people with disabilities have been systematically excluded from many opportunities often afforded to people without disabilities, including pursuing higher education (Evans, Broido, Brown, & Wilke, 2017). To help remedy this ongoing and problematic issue, the Americans with Disabilities Act (ADA) of 1990 sought to mitigate the socially constructed discrimination facing people with disabilities (Jones, 1996), mandating that people with disabilities must be allowed comparable educational opportunities as their non-disabled peers (United States Department of Justice and Civil Rights, 2017). An important element of higher education access for people with disabilities is access to online resources, as the Internet is now the leading source of postsecondary information nearly for all types of aspiring postsecondary students (Burdett, 2013; Daun-Barnett, & Das, 2013; Venegas, 2006).

As a result of evolving and developing Internet technologies, the U.S. government has intervened and written legislation to ensure the law keeps pace with the digital needs of people with disabilities. In January 2018, U.S. Congress re-amended Section 508 of the ADA. In this new amendment, the ADA now holds all Title IV (federal loan-participating) institutions of higher education responsible for publishing web accessible websites for people with disabilities (U.S. General Services Administration, 2018). Subsequently, all Hispanic-Serving Institutions (HSIs) also participating in Title IV programs must publish web accessible websites for people with disabilities, including prospective Hispanic students with disabilities.

Historically, people of color with disabilities have experienced intersectional discrimination on the basis of their racial and ethnic identity, as well as their disability identity (Baynton, 2001; Erevelles, 2015), rendering it especially difficult for students of color with disabilities to access higher education. Although HSIs have been seen as beacons of access and opportunity for Hispanic students seeking higher education (Benítez, 1998; Contreras, Malcom, & Bensimon, 2008; Laden, 2004; Nuñez, Sparks, & Hernández, 2011), no research has examined the web accessibility of HSI websites and whether these websites are accessible for students with disabilities. In fact, Agarwal's (2011) study was the first to address HSI support of students with disabilities of any kind. As a result, this web accessibility study sought to answer three questions pertinent to digital equity and the accessibility of HSI websites for people with disabilities:

  R1: How are HSI websites facilitating digital equity for students with disabilities?
  R2: If HSI websites are not ADA compliant and digitally equitable, which web accessibility errors are most abundant, and therefore, most problematic for people with disabilities?
  R3: Are students with disabilities able to access the undergraduate application webpage on HSI websites, thus allowing these students to apply to the institution?

By answering these questions, both HSIs and the research community will be better aware of the web accessibility hurdles facing people with disabilities seeking access to HSIs of higher education. As a result, HSI researchers and practitioners will understand how to practice digital equity, or facilitating equal access to digital content for all people regardless of ability. By better understanding the web accessibility of HSI websites, HSI practitioners will learn how to improve the accessibility of their websites and thus digital equity for Hispanic students and all people seeking information on Hispanic-Serving Institutional websites.

Literature Review

Although decades of scholarship have examined multiple facets of HSIs and the students they serve (Benítez, 1998; Contreras et al., 2008; Laden, 2004; Nuñez et al., 2011), limited research has addressed how students with disabilities are supported on HSI campuses. Gina Garcia's recent and influential work interrogating the "servingness" of HSIs has addressed both how HSIs facilitate Latinx student access to and success in HSIs (Garcia, Núñez, & Sansone, 2019, p. 745; Garcia, Ramirez, Patrón, & Cristobal, 2019, p, 531). Garcia et al. (2019) argued that HSI-focused research has examined the outcomes of Latinxs attending HSIs, arguing that their "ideal HSI identity is connected to equitable graduation and persistence rates for Latinxs" (Garcia, Núñez, & Sansone, 2019, p. 747). Garcia, Ramirez, Patrón, and Cristobal, (2019) elaborated to discuss how organizational members at HSIs have been found to discuss "servingness" as primarily a concept related to Latinx student outcomes and culture, such as facilitating a "positive campus climate for Latinxs" (p. 748).

Similarly, in a qualitative study of 43 professionals working at HSIs in the Midwest, Garcia, Ramirez, Patrón, and Cristobal, (2019) found that many HSI professionals defined their organizational identity as primarily concerned with "outcomes and cultural indicators" (p. 522), including "high retention/graduation rates" (p. 523), "career readiness/job placement" (p. 524), "Culturally relevant curriculum/programs" (p. 525), and employing "Faculty/staff members of color" (p. 526). In Garcia, Ramirez, Patrón, and Cristobal, (2019) discussion of how these Midwest HSIs provided access to services and campus engagement opportunities for Latinxs, disability and accessibility services were not addressed, nor was intersectional identities and the intersectional minoritization experienced by Hispanic and Latinx students with disabilities. Instead, Garcia, Ramirez, Patrón, and Cristobal, (2019) found that access largely meant "an effort to close the educational gap between minoritized students and privileged students" (p. 527). Here, Garcia's work to better define "servingness" has not unearthed discussion of how disability and Hispanic or Latinx students with disabilities may be granted access to HSIs, in addition to any on-campus support services for these students.

Aside from Garcia's work on servingness, Franco and Hernández's (2018) recent discussion of the capacity for HSIs to serve Latinx students did not address disability, accessibility services, or the intersectional discrimination faced by Hispanic and Latinx students with disabilities. Moreover, these authors made no mention of

Table 1. Percentage of Students With Disabilities Enrolled in Hispanic-Serving Institutions and Non-Hispanic Serving Institutions in 2017-2018.

Sector	Enrolling less than 3% students with disabilities	Enrolling 3% or higher students with disabilities	Average students with disabilities enrollment if 3% or higher
HSIs			
Public			
Two-year (n = 222)	57.7%	42.3%	6.2%
Four-year (n = 133)	63.2%	36.8%	5.1%
Private			
Two-year (n = 22)	100%	0%	n/a
Four-year (n = 146)	78.1%	21.9%	7.3%
Non-HSIs			
Public			
Two-year (n = 661)	67.9%	32.1%	6.2%
Four-year (n = 617)	52.8%	47.2%	6.2%
Private			
Two-year (n = 80)	78.8%	21.2%	[a]7.6%
Four-year (n = 1,252)	53.8%	46.2%	9.1%

[a]Commonwealth Technical Institute (CTI) enrolled 99% students with disabilities in 2016-2017, as CTI's unique mission is to train people with disabilities toward vocational careers. CTI was removed from this calculation as an outlier: Including CTI would result in 13%.

disability or the intersectional identities held by Hispanic and Latinx students with disabilities. In addition, no research has addressed how students with disabilities are supported by HSI websites, nor has any research analyzed HSI websites in any form as of the writing of this study. Here, an under-researched aspect of the HSI experience and who is specifically served by HSIs may require an investigation of the digital equity of HSI websites. However, this gap in the literature may be due to the lack of an ADA mandate for postsecondary institutions to report much—if any—data regarding the enrollment of students with disabilities and which specific disabilities a student may have.

Per ADA, there are no federal requirements for Title IV institutions to report any disability-related information beyond percentages of an institution's overall enrollment. However, proximal estimations can be made comparing HSIs and non-HSIs in terms of percentages of students with disabilities enrolled in these institutions. Using 2017-2018 data from the Integrated Postsecondary Education Data System (IPEDS; National Center for Education Statistics, 2019), Table 1 displays the most recent percentages of students with disabilities enrolled in both HSIs (n = 523) and non-HSIs.

In 2017-2018, IPEDS data suggest public 2-year HSIs enrolled greater percentages of students with disabilities more frequently (42.3% enrolled 3% or higher) than public 2-year non-HSIs (32.1% enrolled 3% or higher). However, HSIs enrolled lower percentages of students with disabilities across all other institution types, possibly

bringing into question the servingness of HSIs and which types of students HSIs actually serve. It is important to note that IPEDS does not disaggregate students with disabilities data by race, rendering it very difficult to specifically understand how many Hispanic students with disabilities are served by HSIs. Despite the apparent enrollment gaps of students with disabilities between HSIs and non-HSIs, little research has examined the experiences of Hispanic students with disabilities at HSIs.

The solitary work examining how Hispanic students with disabilities can be supported specifically at HSIs was Agarwal's (2011) dissertation and Agarwal, Calvo, and Kumar's (2014) subsequent study. Agarwal's (2011) dissertation employed a case study of a single HSI through a mixed methods analysis of 104 survey participants and in-depth interviews with 11 participants, all of whom were Hispanic students with disabilities. The aim of Agarwal's (2011) dissertation was to understand students' with disabilities self-perceptions of academic success, institutional support, and factors that impact their college experiences while studying at an HSI. Overall, Agarwal (2011) argued that students with disabilities often felt comfortable on campus and supported by faculty, staff, and fellow students. However, Agarwal (2011) investigated interactions of students with disabilities with faculty to better understand these students' experiences in advocating for learning accommodations, and Agarwal learned that many students with disabilities reported having brief, need-based meetings with faculty members instead of casual, informal meetings, possibly leading to these students feeling distant from their faculty, producing feelings of isolation and loneliness. Moreover, Agarwal (2011) found that many students with disabilities felt socially alienated and misunderstood, as many students felt faculty members did not understand their disability and thus felt uncomfortable asking for accommodations.

In a subsequent study, Agarwal, Calvo, and Kumar (2014) focused on how a student organization meant to assist students with disabilities on an HSI campus could transform institutional culture and integrate students with disabilities into campus life activities. Results of their study suggested that the student organization had a significant impact on students with disabilities and their experiences with the university community, including facilitating a higher level of social interaction with non-disabled peers. In addition, Agarwal et al. (2014) learned that the student organization was able to catalyze an informal leadership network which developed opportunities for members with disabilities to train and educate non-disabled members about their struggles and successes, leading to enhanced levels of cross-cultural collaboration, communication, and belonging. However, Agarwal et al.'s (2014) study did not evaluate online or digital resources—including the HSI's official website—nor did the study identify the HSI website as a potential roadblock for students with disabilities to access their postsecondary education. Beyond Agarwal's (2011) and Agarwal et al.'s (2014) studies, no prior research has addressed how students with disabilities access HSIs or how HSIs specifically support students with disabilities once on campus. This lack of research brings into question the servingness of HSIs and whether HSIs serve Hispanic students with and without disabilities in equitable ways.

Extending beyond HSIs to all minority-serving institutions, extant research has addressed ways minority-serving institutions can improve student recruitment,

retention, and graduation (Gasman, Baez, & Turner, 2008; Merisotis & McCarthy, 2005; O'Brien & Zudak, 1998). However, this work has not specifically addressed how HSIs can improve digital online access Hispanic students with disabilities. Moreover, proposed a theoretical framework for conducting disability-related research at minority-serving institutions, but the authors did not detail how HSIs can improve digital access to online content for Hispanic students with disabilities. Although there appears to be a prior lack of work focused on HSI websites, it is important to assess whether HSI websites are digitally equitable for students with disabilities. Prior web accessibility research has suggested that institutional websites are rarely accessible for such students, even though the Internet is the most common source of postsecondary information for current and prospective students (Burdett, 2013; Daun-Barnett & Das, 2013).

Without defining it as such, dozens of studies have explored the digital equity of college and university websites through analyses of web accessibility and whether students with disabilities have equitable access to information as non-disabled students do. These web accessibility studies of college and university websites have found that these websites are rarely accessible for students with disabilities (Bradbard, Peters, & Caneva, 2010; Erickson et al., 2013; Flowers, Bray, & Algozzine, 2011; Hackett & Parmanto, 2005; Harper & DeWaters, 2008; Kelly, 2002; Thompson, Burgstahler, & Comden, 2003; Thompson, Burgstahler, & Moore, 2010). Kelly's (2002) study of UK institutional websites was one of the earliest in web accessibility studies, and Kelly (2002) found that UK websites were rarely compliant with early versions of Web Content Accessibility Guidelines (WCAG), rendering it difficult for students with disabilities to access these institutions' online content.

In the years since, researchers have employed several research methodologies, including survey studies (Harper & DeWaters, 2008), qualitative cases (Bradbard et al., 2010; Wisdom et al., 2006), quantitative analysis (Hackett & Parmanto, 2005), and studies using a combination of human and machine assessment to determine the degree of web accessibility of college and university websites (Thompson et al., 2003). In all of the above studies, only Harper and DeWaters' (2008) study yielded a single website that was entirely web accessible. In their study, the authors determined that only one of the 12 institutions published a website robust enough to pass all WCAG guidelines and be deemed an "exemplary website," which "serves people of all exceptionalities" (Harper and DeWaters, 2008, p. 163). In many studies, the authors have pointed to advancements in technology—specifically how multimedia content can be integrated into websites—as reasons that web accessible websites are difficult to publish and maintain (Erickson et al., 2013; Hackett & Parmanto, 2005; Thompson et al., 2010). Meanwhile, other studies have emphasized how a commitment to web accessibility has simply eluded many institutions of higher education, as practitioners have not been provided the appropriate professional development or web accessibility knowledge to support students with disabilities in digital settings (Bradbard et al., 2010; Thompson et al., 2003; Wisdom et al., 2006).

What is clear, however, is that web accessibility has been problematic across many different institutions. Although Harper and DeWaters' (2008) study focused on 4-year institutions of higher education in the United States, related research has also found

that community college websites often do not publish web accessible websites for students with disabilities, thus limiting the educational opportunity for these students (Erickson et al., 2013; Flowers et al., 2011; Taylor & Bicak, 2019). In addition, Taylor (2019a) most recently found that 94 of 100 historically Black college and university (HBCU) websites were inaccessible for students with disabilities, violating ADA guidelines. As a result, this study seeks to make a unique and multifaceted contribution to the current body of research, specifically addressing the digital equity of HSI websites and whether HSIs could improve their web accessibility for Hispanic students with disabilities. Of HSIs, this study will focus on both 2- and 4-year HSIs, as extant research has suggested that publishing web accessible websites is problematic for all types of institutions.

Method

Population and Sample

To identify this study's sample, the research team consulted the Hispanic Association of Colleges and Universities (HACU, 2017) website, as well as the U.S. Department of Education's (2016) definition of HSIs. Both HACU (2017) and the U.S. Department of Education (2016) define an HSI as non-profit degree-granting institutions of higher education with a full-time undergraduate Hispanic student enrollment comprising at least 25% of the overall full-time undergraduate student population.

When the research team began the conceptualization and data gathering process, the most recent list of HSIs was the 2017-2018 HACU list, published in 2018. As HACU did not publish a 2018-2019 list before data collection, the HACU (2017) list of HSIs was the most current at the time of data collection and analysis and includes 492 total HSIs in 21 states, including Puerto Rico. As a result, the research team considered 492 HSIs as the total population of HSIs at the time of the data collection and analysis for this study.

Once the HSI population was identified, the team performed a power analysis (95% confidence level, 5 confidence interval) to determine how many HSIs needed to comprise the sample for subsequent statistical analyses and generalization. A power analysis is a method of determining sample size using an overall population and calculating a large enough sample for subsequent statistical analyses. Using 95%/5 thresholds, the team learned that 217 HSI websites would need to be included in this study's sample for generalizability. Subsequently, all 492 HSIs were assigned a number using a random number generator, and a random sample of 217 HSIs was selected to be in the sample of this study. A description of the HSIs in this study's sample can be found in Table 2.

Data Collection and Analysis

Using the IPEDS (National Center for Education Statistics, 2019), the research team located the hyperlink to each HSI's institutional website and uploaded these

Table 2. Sectors of Hispanic-Serving Institutions in the Study (*n* = 217).

Sector	Institutions
Public	
Two-year	97
Four-year	65
Private	
Two-year	4
Four-year	51
Total	217

hyperlinks to a collaborative, online database. Once the team located all hyperlinks to the HSI websites, the research team employed Tenon™ accessibility software to analyze each website's web accessibility (Tenon LLC, 2019a). Tenon™ is a robust freeware program which evaluates a website's WCAG 2.0 level of compliance at all four success criteria: whether the website is perceivable, operable, understandable, and robust (Tenon LLC, 2019a). Moreover, each Tenon™ web accessibility evaluation runs 328 total tests of Level A web accessibility, 43 total tests of Level AA web accessibility, and 64 total tests of Level AAA web accessibility, rendering Tenon™ one of the most robust web accessibility software programs currently available (Tenon LLC, 2019a). However, any Level-AAA errors discovered in this study were removed from our analysis, as Title IV-participating institutions are not required to meet Level-AAA conformance (U.S. General Services Administration, 2019).

In addition, the research team utilized Tenon™ for its ability to allow researchers and practitioners to download a .csv report—compatible with Microsoft Excel, a common software program used by practitioners in higher education—outlining the web accessibility errors most prevalent and the HTML location at which to address the error. Recent comparative analyses of web accessibility evaluation software have found Tenon™ to be an efficient, accurate, and robust web accessibility evaluation tool (Ismail, Kuppusamy, & Nengroo, 2018; Taylor, 2018, 2019a, 2019b; Timbi-Sisalima, Amor, Otón, Hilera, & Aguado-Delgado, 2018) justifying the use of Tenon™ for the evaluation of HSI websites.

Once the research team generated web accessibility error reports for all 217 HSIs in the sample, institutional IPEDS variables were merged with Tenon's™ error reports to organize the error reports by institutional sector (e.g., public and private, 2- and 4-year) and error type (e.g., Level A, Level AA). We performed this merge by using STATA and appending the IPEDS data with the Tenon™ error reports. Merging the data revealed the most frequent error types and which HSIs published the least web accessible and most web accessible websites for people with disabilities. As a result, Tables 3 and 4 in the "Results" section of this study clearly outline the overall sample mean, standard deviation, and high and low web accessibility errors, as well as descriptive statistics of errors by institution type. In addition, the merged dataset was analyzed to create Table 4, clearly displaying the most frequent error types across all four strands

Table 3. Descriptive Statistics of Web Accessibility Errors (*n* = 97,125) of Homepages/ Landing Pages for Hispanic-Serving Institutions (*n* = 217), By Institutional Sector.

Institutional sector	Web accessibility errors		
	Level A	Level AA	Level A and AA[a]
All institutions (*n* = 217)			
Mean	366.0	81.5	447.6
Standard deviation	259.7	77	300
High	1,637	591	1,728
Low	42	0	53
Public, 2-year (*n* = 97)			
Mean	327.1	68.3	395.5
Standard deviation	207.3	52.5	237.1
High	1,095	271	1,247
Low	53	0	87
Public, 4-year (*n* = 65)			
Mean	392.8	82.2	475
Standard deviation	309	75.2	340.9
High	1,637	390	1,728
Low	42	9	53
Private, 2-year (*n* = 4)			
Mean	354.8	118.3	473
Standard deviation	192.2	33.5	217.2
High	576	166	742
Low	141	95	236
Private, 4-year (*n* = 51)			
Mean	403	93.7	496.8
Standard deviation	274.8	85.9	335.7
High	1,197	327	1,497
Low	73	9	82

[a]Only Level A and Level AA errors were reported, as Section 508 only requires Title IV-participating institutions to comply with the Level A and Level AA levels of web accessibility.

of WCAG 2.0 web accessibility—perceivable, operable, understandable, and robust web elements (W3C, 2019)—as well as the level of error (e.g., Level A or Level AA).

However, prior research suggests that because a website includes one WCAG 2.0 web accessibility error does not mean the entire website is inaccessible for students with disabilities (Erickson et al., 2013; Flowers et al., 2011; Hackett & Parmanto, 2005; Taylor, 2018; Thompson et al., 2003; Thompson et al., 2010). Understanding this, this study adopts an analytic approach similar to Thompson et al.'s (2003) study where both human and machine assessment were employed to determine web accessibility. As a result, in addition to the Tenon™ machine analysis, each website in this study was audited for web accessibility by members of the research team using Mac

Table 4. Descriptive Statistics of Web Accessibility Errors (*n* = 97,125) of Homepages/Landing Pages for Hispanic-Serving Institutions (*n* = 217), by WCAG 2.0 Error Type.

Errors, by type, all institutions	No. of errors	Percentage of all errors
Perceivable		
Level A, 1.1.1, Non-text content	20,844	21.5
Level A, 1.2.2, Captions (prerecorded)	33	<1
Level A, 1.3.1, Information and relationships	35,991	37.1
Level A, 1.3.2, Meaningful sequence	2	<1
Level AA, 1.4.3, Contrast (minimum)	1,168	1.2
Level AA, 1.4.4, Resize text	16,267	16.7
Operable		
Level A, 2.1.1, Keyboard	1,148	1.2
Level A, 2.1.2, No keyboard trap	1	<1
Level A, 2.3.1, Three flashes or below threshold	1	<1
Level A, 2.4.1, Bypass blocks	220	<1
Level A, 2.4.2, Page titled	6	<1
Level A, 2.4.3, Focus order	545	<1
Level A, 2.4.4, Link purpose (in context)	12,909	13.3
Level AA, 2.4.6, Headings and labels	260	<1
Understandable		
Level A, 3.2.1, On focus	65	<1
Level A, 3.2.4, Consistent identification	142	<1
Robust		
Level A, 4.1.1, Parsing	464	<1
Level A, 4.1.2, Name, role, value	7,059	7.2

OS X's Voiceover, a fully functional, robust, screen-reading assistive technology used by people with blindness, low vision, dyslexia, and other cognitive and physical disabilities. For instance, Voiceover's screen-reading technology can assist a person with dyslexia (a cognitive disability) and a person with low vision or blindness (a physical disability) by allowing them access to text information in audio formats. In addition, 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; Manduchi & Kurnaiwan, 2013; McHale, 2011; Taylor & Bicak, 2019). However, there exist hundreds of different assistive technologies to help people with cognitive and physical disabilities access online content.

Using Voiceover, each website was audited for web accessibility during the completion of one task: navigating from the home page/landing page (e.g., https://www.csun.edu/) to the instructions for how to apply for first-year or undergraduate admission (e.g., https://www.csun.edu/admissions-records/apply-first-time-freshman). This decision was made understanding two characteristics of institutional websites. First, and arguably so, applying for admission is the first and most important step in accessing an institution of higher education: A student with a disability

Table 5. Web Accessibility of First-Year/Undergraduate Admissions Application Instructions on HSI Websites (*n* = 217), Using Tenon™ and Voiceover.

Sector	Can navigate from home page/landing page to first-year/undergraduate admissions instructions?
All	17 (7.8%)
Public	11 of 162 public institutions (6.7%)
Two-year	5
Four-year	6
Private	6 of 55 private institutions (10.9%)
Two-year	0
Four-year	6

cannot access an institution of higher education if they are unable to successfully apply. Second, this study only analyzes the home page/landing page of the institutional website, as it is not feasible to perform a web accessibility audit of thousands of pages per website.

Given this study's combination of human and machine web accessibility assessment, the average HSI website required between 15 to 20 min of analysis, resulting in between 50 and 60 hr of overall analysis across 217 unique HSI websites. These Voiceover audits utilized a binary coding strategy: (1) yes, a student with a disability could use Voiceover to navigate from the HSI home page/landing page to the application instructions for how to apply for first-year/undergraduate admission, and (2) no, the HSI home page/ landing page was not web accessible enough to allow a student with a disability to use Voiceover to discover the instructions for how to apply for first-year/undergraduate admission. These results are presented in Table 5 in the "Results" section of this study.

Results

Descriptive statistics of web accessibility errors (*n* = 97,125) of homepages/landing pages for HSIs (*n* = 217) presented by institutional sector can be found in Table 3.

This study's first research question was "How are HSI websites facilitating digital equity for students with disabilities?" Results in Table 3 suggest that the average HSI website included 447.6 WCAG 2.0 errors, with a considerable range between the website with the most (1,728 errors) and the least errors (53 errors). This finding indicates that HSIs practice a wide range of digital equity, given their landing pages feature a wide range of web accessibility, from very inaccessible (thousands of errors) to somewhat accessible (53 errors).

In addition, Table 3 suggests public, 2-year institutions (*n* = 97) published the most web accessible websites, as these institutions contained an average of 395.5 errors, while private, 4-year institutions (*n* = 51) published the least web accessible websites, containing an average of 496.8 errors. However, it is important to note that a single Level A or Level AA error renders a website noncompliant with ADA, meaning that

public 2-year institutions may have published the most accessible websites, yet all public 2-year HSIs in this study were noncompliant with ADA. Across all institutional sectors, Level A errors were much more common than Level AA errors, as the average HSI website contained 366 Level A errors compared to only 81.5 Level AA errors. As referenced in Table 3's note, Level AAA errors were removed from the analysis, as ADA only requires Title IV institutional websites to reach Level A and Level AA compliance.

Descriptive statistics of web accessibility errors ($n = 97{,}125$) of homepages/landing pages for HSIs ($n = 217$) organized by WCAG 2.0 error type can be found in Table 4.

Results from Table 4 appropriately answered this study's second research question: If HSI websites are not ADA compliant and digitally equitable, which web accessibility errors are most abundant, and therefore, most problematic for people with disabilities? Data suggest that five types of WCAG 2.0 errors were responsible for the majority of the web accessibility errors in this study: Level A 1.1.1 (Non-text content), Level 1.3.1 (Information and relationships), Level AA 1.4.4 (Resize text), Level A 2.4.4 (Link purpose, in context), and Level A 4.1.2 (Name, role, value). These five errors comprised more than 85% of all errors in this study.

Level A 1.1.1 (Non-text content) errors were responsible for 21.5% of all errors in this study and pertain to how websites include non-text content such as pictures, buttons, hyperlinks, and other forms of non-text content. Non-text content should always contain text that tells the user what the non-text content is and how to interact with it, assisting both people with cognitive and physical disabilities. Similarly, Level A 1.3.1 (Information and relationships) errors pertain to how web elements (e.g., text, images, hyperlinks, menus) are related to each other and whether the website contains enough information for the user to understand how to navigate from one element to the next. These errors were responsible for 37.1% of all errors in this study. In many cases in this study, Level A 1.1.1 and Level A 1.3.1 errors meant that text was missing from the website to inform a user about how to interact with a certain web element or the description of a web element (e.g., a picture missing a description or not labeling all forms in a fillable online form; W3C, 2019).

Level A 2.4.4 (Link purpose) errors comprised 13.3% of all errors in this study and pertain to how descriptive hyperlinks are and whether users can determine the purpose of the link from the text alone. For example, a hyperlink leading to an institution's admissions page should include the text "This is a hyperlink to the admissions website," or a similar description, so that the user understands what the hyperlink is for and where it leads to (W3C, 2019). However, many hyperlinks in this study were missing critical information that a student with a disability may need to be able to understand the hyperlink and navigate to the intended content.

Level A 4.1.2 (Name, role, value) errors comprised 7.2% of all errors in this study and pertain to how web elements are described to the user and whether or not the website contains enough information for the user to understand how to interact with the element and if the element requires interaction to complete a certain process. For instance, if a webpage contains a checkbox, and the checkbox needs to be checked in order for a user to navigate from that webpage to another, the webpage should include

enough information to tell the user to check the checkbox and whether the checkbox has already been checked or not (W3C, 2019).

Finally, Level AA 1.4.4 (Resize text) errors comprised 16.7% of all errors in this study and pertain to the necessity for on-screen text to be able to be resized without the use of an assistive technology up to 200% of its original size, which is especially important for users with low-vision and cognitive disabilities. However, these types of errors may also affect people with physical disabilities if they require to rest their bodies in a certain position that does not allow them to be close to a computer screen. In many cases, Level AA 1.4.4 errors occur when either on-screen text is too small or there is no on-screen option to zoom in on the text and rescale the webpage so that critical information is not lost or compromised in the scaling process (W3C, 2019).

Beyond these five errors, there were numerous other Level A and Level AA errors discovered in this study that may have rendered HSI websites non-compliant with ADA guidelines. Many on-screen videos lacked captions (Level A, 1.2.2 errors), many webpage color schemes did not have strong enough contrast between light and dark colors (Level AA, 1.4.3 errors), and not all webpage content was accessible through a keyboard interface or assistive technology (Level A, 2.1.1 errors), as keyboard technologies are some of the most popular and most robust assistive technologies currently available. These technologies can assist people with both cognitive and physical disabilities, as people with autism or using wheelchairs could require a keyboard-assistive technology to access digital content.

Results from the web accessibility navigability test between HSI home pages/landing pages to first-year/undergraduate admissions application webpages using Tenon™ and Voiceover can be found in Table 5.

This study's third research question was, "Are students with disabilities able to access the undergraduate application webpage on HSI websites, thus allowing these students to apply to the institution?" Considering the machine analysis using Tenon™ and the human analysis using Voiceover, results in Table 5 suggest only 7.8% or 17 of all HSI websites in this study's sample ($n = 217$) were accessible enough for a student with a disability using Voiceover to navigate from the home page/landing page to the first-year/undergraduate admissions instructions webpage. Here, the majority of HSI website landing pages were not accessible enough to allow a student with a disability with digital access to the undergraduate admissions website, specifically denying digital equity for students with disabilities.

Across the entire sample, several HSI websites were notable for their digital equity, namely the University of California at Santa Cruz's website (https://www.ucsc.edu/) and a trio of Puerto Rican institutions, including Caribbean University at Carolina, Ponce, and Vega Baja. UC-Santa Cruz's website contained the fewest WCAG errors of any HSI in the study—only 42 Level A errors and 11 Level AA errors according to the Tenon™ analysis, and Voiceover had no issue navigating from the home page/landing page to the first-year/undergraduate admissions webpage. Similarly, Caribbean University's websites for their Carolina, Ponce, and Vega Baja campuses contained only 82, 84, and 85 overall WCAG Level A and Level AA errors, rendering these websites three of the most accessible in the study. In addition,

Voiceover was able to navigate from each institution's home page/landing page to the first-year/undergraduate admissions webpage. Here, these findings suggest that HSIs may embrace digital equity to different degrees, with HSIs such as UC-Santa Cruz serving all students regardless of disability status or identity.

The HSI website with the most WCAG errors which was still deemed accessible was Otero Junior College's (https://www.ojc.edu/) with 93 Level A and 61 Level AA errors, even though Voiceover was able to navigate from the home page/landing page to the first-year/undergraduate admissions webpage. However, using Voiceover, the research team was not able to access the undergraduate admissions website from the landing page from any HSI landing page with more than 156 errors, rendering these websites inaccessible and denying digital equity for students with disabilities.

Limitations

As the first study of its kind to evaluate the digital equity of HSI websites for students with disabilities, this study makes several important and unique contributions to the literature. However, this study is limited to the number of HSIs in the sample ($n =$ 217), the methods of analysis (Tenon™ and Voiceover), and the type of webpages analyzed. Although this study sought to provide a rich analysis of HSI websites and their web accessibility, only 217 HSI websites were analyzed, even though there were more than 500 recognized HSIs and another 328 emerging HSIs in 2018, according to the HACU (2017).

Moreover, a typical college or university website may include thousands of individual webpages (Hackett & Parmanto, 2005), and to navigate this content, a student with a disability may use one of hundreds of different assistive technologies to read and comprehend the material on the website depending on the student's particular disability (Manduchi & Kurnaiwan, 2013). Subsequently, this study may only provide a small glimpse into the web accessibility hurdles that students with disabilities may face when attempting to access digital content from HSI websites. Future research could expand the sample size of this study to encompass all HSIs, comparing the web accessibility of HSIs to predominantly White institutions to explore whether certain institution types are more or less web accessible than others. Moreover, future research could investigate different types of HSI websites, including financial aid webpages, Title IX webpages, or student affairs webpages to explore whether Hispanic students with disabilities can access other digital forms of institutional content.

Discussion of Digital Equity for Hispanic Students with Disabilities

Similar to recent studies evaluating the web accessibility of Title IV postsecondary websites (Taylor, 2019a, 2019b; Taylor & Bicak, 2019b), results of this study suggest students with disabilities may struggle to access HSI websites. Specifically, these students may be unable to use an assistive technology to navigate from an HSI's landing page to its undergraduate admissions website, meaning the student may be unable to

apply to the institution and enjoy a postsecondary education. These findings bring into question the "servingness" of HSIs (Garcia, Núñez, & Sansone, 2019, p. 745) and whether HSIs are serving Hispanic students with disabilities as they serve students without disabilities. Although HSIs have increased equity in higher education for Hispanic students (Benítez, 1998; Contreras et al., 2008; Garcia, Núñez, & Sansone, 2019; Laden, 2004; Nuñez et al., 2011), this study suggests many of these institutions may not be increasing their digital equity, making online information accessible for all people regardless of ability status or identity.

Building upon Garcia, Núñez, and Sansone's (2019) work of HSI "servingness" (p. 745), professionals working at HSIs may want to question when "servingness" begins—on campus or before the Hispanic or Latinx student arrives on campus? Garcia's work (Garcia, Núñez, & Sansone, 2019; Garcia, Ramirez, Patrón, & Cristobal, 2019) asserted that HSIs often conceptualize servingness as outcomes- or campus climate-based. However, HSIs may also want to conceptualize online spaces as part of an institution's campus climate, critically interrogating whether an HSI's online climate truly serves all Hispanic and Latinx students regardless of ability status. The findings of this study suggest HSI online campus climates can be made more inclusive of Hispanic and Latinx students with disabilities. Perhaps Garcia's definition of "servingness" (Garcia, Núñez, & Sansone, 2019, p. 745) in the context of HSIs could be expanded to embrace the intersectional discrimination faced by Hispanic students with disabilities.

Moreover, these findings suggest HSIs may be exposed to ADA-related lawsuits over the web accessibility of their online content, possibly harming an HSI's good reputation and the perception of the institution from a student's perspective. U.S. Congress has mandated that Title IV institutions—including all HSIs—must publish web accessible websites (Carlson, 2018; LaGrow, 2017), ushering in a new era of digital equity or equitable access to digital information for people of all abilities. Given the dearth of research specifically focused on HSI support of Hispanic students with disabilities (Agarwal, 2011; Agarwal et al., 2014), perhaps Hispanic students with disabilities have the most to gain from an increased emphasis on digital equity.

As evidenced by UC-Santa Cruz, it is possible to increase an institution's digital equity by publishing accessible websites, yet even shining examples of digital equity such as UC-Santa Cruz were not perfect. UC-Santa Cruz's website, although somewhat accessible, still contained many errors that render their website noncompliant with ADA. Here, digital equity may be a lofty goal, but certain HSIs are seemingly practicing much higher levels of digital equity than others. In addition, this study suggests that public 2-year HSIs were the most digitally equitable for students with disabilities, yet the average public 2-year HSI website contained hundreds of errors, rendering these websites noncompliant with ADA. Subsequently, HSIs such as UC-Santa Cruz may set the bar for digital equity among HSIs, but all HSIs could improve their digital equity for students with disabilities, also adhering to federal law.

Although scant research has addressed the experiences of Hispanic students with disabilities specifically at HSIs, an abundance of literature has asserted that Hispanic students have been systemically excluded from U.S. higher education (Benítez, 1998;

Contreras et al., 2008; Laden, 2004; Nuñez et al., 2011), thus necessitating the growth of HSIs. Similarly, students with disabilities have been excluded from U.S. higher education as well (Baynton, 2001; Evans et al., 2017; Jones, 1996; Taylor, 2018; Taylor, LaRonde, & Taylor, 2019), necessitating a focus on digital equity and the proliferation of information made accessible to all people with a diverse range of abilities. Kafer's (2013) work spoke at length of the intersectional discrimination faced by women, people with disabilities, and members of the queer community, resulting in an amplified discrimination experienced by individuals possessing multiple minoritized identities. In U.S. higher education, Hispanic students with disabilities may be among the most impacted by intersectional discrimination by race and ability. This study suggests that institutions that serve the greatest numbers of Hispanic students—HSIs—may not be promoting digital equity for Hispanic students with disabilities, further minoritizing this population. Moreover, results from Table 1 suggest that many non-HSIs serve larger percentages of students with disabilities than do HSIs, again questioning the servingness of HSIs and whether Hispanic students with disabilities are being served equitably. However, web accessibility researchers have produced reports to help HSI practitioners publish more accessible websites, promoting digital equity and eliminating the intersectional discrimination experienced by Hispanic students with disabilities.

First, Taylor (2018) outlined several low-cost or free web accessibility technologies that practitioners can use to check their own website and explore the accessibility of their webpages. Although postsecondary websites may include tens of thousands of webpages, practitioners should explore which webpages are most critical for student access—such as the admissions and financial aid webpages—and focus on improving the web accessibility of this content. If Hispanic students with disabilities are able to explore access-focused content on HSI websites, these students may be better able to enroll in these institutions and enjoy a postsecondary education.

In terms of remedying specific WCAG errors, Taylor et al. (2019) explained that many WCAG errors can be fixed relatively easily by focusing on several web accessibility principles. First, HSI web developers and content managers should ensure that all text is large enough for diverse audiences and the color scheme is contrastive enough so that light-colored text is overlaid on dark backgrounds and vice versa. Moreover, the researcher suggested that all images contain descriptive text and all videos include closed-captioning to ensure that this digital content is accessible for all people from diverse abilities. For more advanced web developers, Taylor et al. (2019) reasoned that attention should be paid to hyperlinks and menus, ensuring that this information includes informative titles to alert people with disabilities as to where a hyperlink or menu leads. If webpages omit this critical information, students with disabilities may be unable to access an undergraduate application webpage and submit an application to an institution of higher education, evidenced by the findings of this study.

Regarding the role of HSI researchers, more scholarly work should be focused on students with disabilities enrolled at HSIs and how these students accessed their institution. Although yearly reports such as Scott's (2019) outlined how certain students with disabilities access and enroll in institutions of higher education, HSI researchers should focus on the experiences of Hispanic students with disabilities inside and outside of the

institution, informing how other students with disabilities can overcome considerable odds to attend a postsecondary institution in the United States. Although Agarwal's (2011) and Agarwal et al.'s (2014) work provided a foundational understanding of how Hispanic students with disabilities have been supported at HSIs, researchers could do much more. As a postsecondary education has remained among the surest options to achieve socioeconomic mobility in the United States (Scott, 2019), HSI researchers ought to expand the current body of literature to include many more narratives of students with disabilities to provide more holistic view of the HSI experience.

Conclusion

While HSIs have embraced a unique and honorable mission to support the postsecondary education of Hispanic students, these institutions must continuously reflect on the servingness of their work, embracing Hispanic students from all ability statuses and identities. If Garcia's prior research (Garcia, Núñez, & Sansone, 2019; Garcia, Ramirez, Patrón, & Cristobal, 2019) began the interrogation of "servingness" (Garcia, Núñez, & Sansone, 2019, p. 745) within HSIs, this study urges for the extension of servingness to an intersectionality inclusive of disability for Hispanic and Latinx students. HSIs could invest in their institutional websites and engage with people with disabilities to ensure that communications are written *for* people with disabilities *by* people with disabilities. This would result in a heightened degree of digital equity— and thus, institutional access for students with disabilities—positioning these institutions as beacons of inclusivity and understanding across the entire U.S. higher education landscape. What would result would be markedly improved access for students with disabilities, but also a template for other institutions to follow, redirecting the course of U.S. higher education history toward digital equity and away from the (digital) injustices of its past.

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