UNDERSTANDING DISABILITIES & ONLINE STUDENT SUCCESS

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KEY WORDS

Disabilities, blind, deaf, invisible disabilities, learning disabilities, higher education, online learning, online education, assistive technologies, screen reader, Universal Design for Learning, accessibility, usability, simulation, demonstrations, engagement, military, veterans, student success

ABSTRACT

Online learning has been growing at an exponential rate over the past decade, providing new opportunities for students seeking quality courses and programs offered through flexible formats. However, as higher education continues to expand online offerings, services must be expanded simultaneously to support all students. This article focuses on online student success and the importance of ensuring that accessibility is at the forefront of course design. Included are responses to 20 questions regarding disabilities and online student success. The article is interactive and provides readers with the opportunity to engage in simulations, to complete online assessments, and to watch/listen to demonstrations on assistive technologies. Recommended resources and strategies are provided that can be integrated into course design and faculty development.

I. INTRODUCTION

Approximately 11% of all students enrolled in higher education reported having a disability in 2008 [1]. Although the percentage of students with disabilities in 2008 closely reflects the percentage reported in 2004, the US Government Accountability Office states that recent legislative changes have the potential to increase the diversity and number of students with disabilities pursuing higher education [1]. To support students with disabilities enrolled in higher education and in online learning, it is important to understand disabilities and the resources students need to actively engage in their courses and to achieve their academic goals. This article includes 20 questions regarding disabilities with collaborative responses from a diverse group of 10 leaders who work with disability services and have experience in online learning at eight higher education institutions and organizations. Some of the contributors also have disabilities, so the collective responses build upon research, professional experience, and personal experience. The responses include screenshots and resources, such as simulation links, video demonstrations, and website links to provide a more detailed understanding of disabilities, accessibility, and support resources. This article is designed to be interactive. *JALN* readers are encouraged to interact with the simulations and to watch or listen to the demonstration videos as a way to learn more about disabilities and how to support online student success.

II. QUESTION & RESPONSE

Question 1: What is a disability?

The term disability, with respect to an individual, is defined by the Americans with Disabilities Act (ADA) of 1990, as amended under Title 42, Chapter 26, Section 12102 as the following:

- a physical or mental impairment that substantially limits one or more major life activities of such individual
- a record of such an impairment
- being regarded as having such an impairment. [2]

As defined by the ADA, major life activities are divided into two areas—activities and functions:

1. Major life activities include, but are not limited to, caring for oneself, performing manual tasks, seeing, hearing, eating, sleeping, walking, standing, lifting, bending, speaking, breathing, learning, reading, concentrating, thinking, communicating, and working.
2. Major bodily functions include, but are not limited to, the immune system, normal cell growth, digestive, bowel, bladder, neurological, brain, respiratory, circulatory, endocrine, and reproductive functions. [2]

A student reporting a disability must self-disclose to the appropriate person or office at the enrolled institution, request reasonable accommodations, and provide appropriate documentation to receive the requested accommodations. The rationale for seeking information about a student's condition is to support the higher education professional in establishing the disability, understanding how the disability may affect a student, and making informed decisions about accommodations.

Question 2: How many people in the United States have a disability?

The US Census Bureau reported in 2010 that 56.7 million people in the United States had a disability, representing 19% of the population or nearly 1 in 5 people [3]. According to the Disability Funders Network, "of the 69.6 million families in the United States, more than 20 million have at least one family member with a disability" [4]. Within higher education, it was reported in 2008 that 11% of all postsecondary students had a disability [1].

Question 3: How are disabilities categorized?

The US Census Bureau categorizes types of disabilities into three domains: (1) communicative, (2) physical, and (3) mental. According to the Americans with Disabilities 2010 report, 30.3 million adults had a disability or disabilities in only one domain, 15.8 million had disabilities in two domains, and 4.0 million had a disability in all three domains [5].

The 2010 report provides a detailed overview of each domain:

> **Communicative Domain**
> People who have a disability in the communicative domain reported one or more of the following:
>
> - Was blind or had difficulty seeing.
> - Was deaf or had difficulty hearing.
> - Had difficulty having their speech understood.
>
> **Mental Domain**
> People who have a disability in the mental domain reported one or more of the following:
>
> - Had a learning disability, an intellectual disability, developmental disability or Alzheimer's disease, senility, or dementia.
> - Had some other mental or emotional condition that seriously interfered with everyday activities.
>
> **Physical Domain**
> People who have a disability in the physical domain reported one or more of the following:
>
> - Used a wheelchair, cane, crutches, or walker.
> - Had difficulty walking a quarter of a mile, climbing a flight of stairs, lifting something as heavy as a 10-pound bag of groceries, grasping objects, or getting in or out of bed.
> - Listed arthritis or rheumatism, back or spine problem, broken bone or fracture, cancer, cerebral palsy, diabetes, epilepsy, head or spinal cord injury, heart trouble or atherosclerosis, hernia or rupture, high blood pressure, kidney problems, lung or respiratory problem, missing limbs, paralysis, stiffness or deformity of limbs, stomach/digestive problems, stroke, thyroid problem, or tumor/cyst/growth as a condition contributing to a reported activity limitation. [5, p. 2]

Question 4: What are invisible disabilities?

Invisible disabilities are disabilities that are not immediately apparent since individuals with invisible disabilities do not use assistive devices such as a wheelchair, hearing aid, cane, etc. Disabled World, a web resource that provides information on disabilities (e.g., new articles, press releases, videos) defines invisible disabilities as "an umbrella term that captures a whole spectrum of hidden disabilities or challenges that are primarily neurological in nature" [6]. According to the Centers for Disease Control and Prevention, "it is estimated that 10% of people in the U.S. have a medical condition which could be considered a type of invisible disability" [6]. The Invisible Disabilities Association (IDA) states that invisible disabilities "refer to symptoms such as debilitating pain, fatigue, dizziness, weakness, cognitive dysfunctions, learning differences and mental disorders, as well as hearing and vision impairments" [7].

Invisible disabilities include health conditions such as chronic illness, chronic fatigue, mental illness, and chronic dizziness. Included are also asthma, attention deficit/hyperactivity disorder, anxiety disorders, Asperger syndrome, autism, bipolar disorder, brain injuries, Celiac disease (Coeliac disease), chronic fatigue syndrome, Crohn's disease, chronic pain, depression, diabetes, epilepsy, fibromyalgia, heart disease, kidney disease, lupus, major depression, metabolic syndrome, multiple sclerosis, narcolepsy, neuropathy, rheumatoid arthritis, schizophrenia, Sjogren's syndrome, and ulcerative colitis. A list of 47 disabilities considered invisible disabilities is available on the Disabled World website.

Video Resources:

Invisible No More TV: Tell Your Story (Testimonials), Invisible Disabilities Association Video
http://www.youtube.com/watch?feature=player_embedded&v=ufKAyeum8dU
Invisible Disabilities Postsecondary Education, Disabled World Video
http://videos.disabled-world.com/video/163/invisible-disabilities-postsecondary-education

Resources:

ADA National Network: Invisible Disabilities and the ADA
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCsQFjAA&url=http%3A%2F%2Fwww.ada-audio.org%2FArchives%2FADALegal%2FMaterials%2FFY2010%2F2010-06-02_Invisible_Disabilities_and_the_ADA_Brief_13.doc&ei=8gdUUocmgur0BLyTgfAK&usg=AFQjCNE53qDUjVoIa1PhwlaIe679N96ZeA&bvm=bv.53537100,d.eWU
Disabled World: List of Invisible Disabilities
http://www.disabled-world.com/disability/types/invisible/

Question 5: How many students with disabilities enroll in higher education?

The National Center for Special Education Research published a report in 2011 that revealed 19% of high school graduates with disabilities enrolled in a four-year college or university, and 44% enrolled in two-year community colleges [8]. It should be noted that 87% of these students received some type of accommodation or support because of a disability when they were in high school. However, only 19% reported receiving accommodations or support from their college or university because of their disability [8].

Question 6: What are vision disabilities?

Vision disabilities include different conditions that affect a person's eyesight and major life activities. Vision disabilities include visual impairments, low vision, severe visual impairment, and legal blindness. Like many other disabilities, vision disabilities can be progressive.

The World Health Organization (WHO) reports that "285 million people are visually impaired worldwide: 39 million are blind and 246 have low vision" [9]. According to the WHO, there are four levels of visual function: (1) normal vision, (2) moderate visual impairment, (3) severe visual impairment, and (4) blindness [9]. The term "low vision" includes moderate and severe visual impairments. The American Optometric Association and Veteran's Health Council both reference the following classifications of visual impairment used by the WHO:

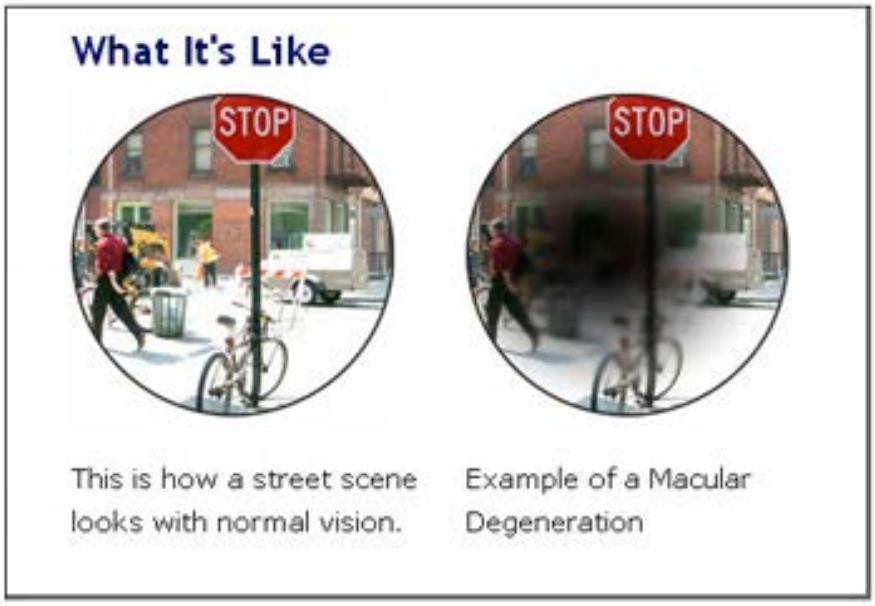
When the vision in the better eye (with best possible corrective lenses) is

- 20/30 to 20/60, it is considered mild vision loss, or near-normal vision;
- 20/70 to 20/160, it is considered moderate visual impairment, or moderate low vision;
- 20/200 to 20/400, it is considered severe visual impairment, or severe low vision;
- 20/500 to 20/1,000, it is considered profound visual impairment, or profound low vision;
- less than 20/1,000, it is considered near-total visual impairment, or near total blindness; and
- no light perception, it is considered total visual impairment, or total blindness. [9, 10, 11]

According to the American Optometric Association, "in the United States, any person with vision that cannot be corrected to better than 20/200 in the best eye, or who has 20 degrees or less of visual field remaining, is considered legally blind" [10].

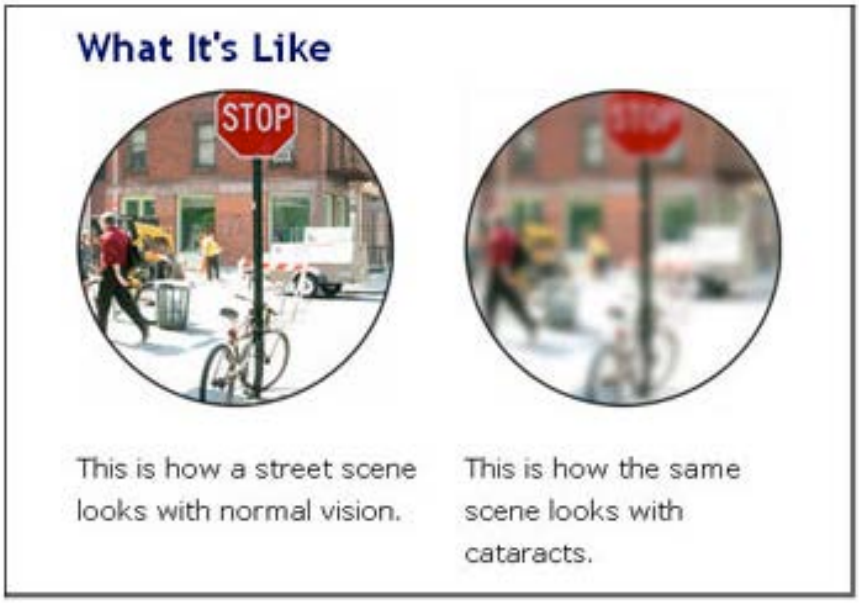
Low vision may require corrective lenses (glasses or contacts) and assistive technologies, such as a screen reader. Low vision includes disorders such as, but not limited to, age-related macular degeneration (AMD), cataracts, diabetic retinopathy, glaucoma, hemianopia, and retinitis pigmentosa [12]. The Lighthouse International website provides detailed information, videos, and images demonstrating what it is like to see a street scene with normal vision and different low vision disabilities as shared in figures 1–3.

Figure 1. What It's Like: Macular Degeneration



Source: Lighthouse.org (http://lighthouse.org/)

Figure 2. What It's Like: Cataracts



Source: Lighthouse.org, (http://lighthouse.org/)

Figure 3. What It's Like: Glaucoma

Source: Lighthouse.org, (http://lighthouse.org/)

Lighthouse International also provides a video vision simulator that uses different filters to simulate some of the visual problems a person with an eye condition experiences every day [12]. The simulator allows users to select one of four Lighthouse International videos or the option to put in a YouTube URL and then select one of five disorders: macular degeneration, diabetic retinopathy, glaucoma, hemianopia, or retinitis pigmentosa. Lighthouse created this interactive simulator "to help inform, educate and sensitize the public about low vision" [12].

Figure 4. Lighthouse International Simulation with Diabetic Retinopathy

Simulation:
Lighthouse International Simulation: Vision Disorders
http://www.lighthouse.org/about-low-vision-blindness/vision-simulator

Resources:

Lighthouse International: Age-related Macular Degeneration with Video Overview
http://www.lighthouse.org/about-low-vision-blindness/vision-disorders/age-related-macular-degeneration-amd/
Lighthouse International: Glaucoma with Video Overview
http://www.lighthouse.org/about-low-vision-blindness/vision-disorders/glaucoma/
Lighthouse International Information on Cataracts
http://www.lighthouse.org/about-low-vision-blindness/vision-disorders/cataract/

Question 7: What is a screen reader? What is speech recognition?

A screen reader is a software application that converts text (words or numbers), documents (e.g., a word processed document, a spreadsheet), or web pages on a computer display screen into audible speech [13]. Depending upon the screen reader application, Braille output, in addition to or instead of speech, can be provided. Screen readers are used by individuals who are blind or have low vision and are also used by students who have learning disabilities (e.g., dyslexia, dysgraphia, attention deficit disorder) or are English language learners. For example, a college student with dyslexia may use a screen reader to listen to a textbook read aloud while following along on the computer screen; as shared by Sheldon Horowitz, Director of LD resources at the National Center for Learning Disabilities, this process can be helpful for this condition [14]. Screen readers are also used by individuals who have motor disabilities caused by disease, genetic conditions, or injury, such as Parkinson's Disease, multiple sclerosis, muscular dystrophy, cerebral palsy, arthritis, nerve stress, loss of limbs, or spinal cord injuries.

Students with vision impairments have a variety of needs in terms of software. For example, students with low vision may prefer a screen magnification program that enlarges everything on the screen for greater clarity, while other students with low vision may prefer a screen magnification program that both enlarges and reads aloud everything on the screen. Software programs developed by Freedom Scientific, AI Squared, and Issist provide screen magnification and magnification/reading tools. For students whose vision loss precludes them from seeing what is on their screens, software programs developed by Freedom Scientific and Kurzweil provide Braille output in addition to or instead of speech.

Used in conjunction with personal computers, screen reader software can range in price from $250 to $1,500. It should be noted that screen readers vary in functionality and capabilities. For example, some screen readers may provide excellent navigation for research on the web but have limited functionality when working with math, science, or technical content as compared to other screen readers. The American Federation for the Blind (AFB) has a product search option on their website that allows for searching by category, manufacturer, task, and product. The AFB also provides a detailed list of questions that should be reviewed prior to purchasing assistive technology.

Speech recognition software converts spoken words to text. Speech-to-text software programs can be used to create documents, create e-mail, and search the web. Software developed by Dragon enables users to dictate a writing assignment, notes, e-mail, and more depending upon the specific Dragon software program. The Dragon Naturally Speaking software is an excellent assistive technology for students who may have difficulty writing, particularly online students who spend many hours each week in text-based discussion boards, working on written assignments, and corresponding by e-mail. With speech-to-text software, students who have carpal tunnel syndrome, dyslexia, multiple sclerosis, rheumatoid arthritis, or other motor disabilities can be actively engaged within their online courses while staying closely connected to instructors and peers. Dragon has multiple apps that can easily be downloaded to mobile devices.

Mobile devices come with many assistive features for individuals with disabilities. For example, Apple's iOS devices (iPhone, iPad, and iPod Touch) come standard with VoiceOver. VoiceOver is a gesture-based screen reader that allows individuals to fully interact by using gestures (tapping, swiping, flicking) on the screen of the iOS device. Bluetooth wireless braille displays can also be paired VoiceOver. Using apps that come with an iOS device, individuals can touch the screen to hear what is under their fingers and then gesture to control the device. Siri is Apple's intelligent agent that is integrated with VoiceOver, enabling individuals to use their voices to place phone calls, send messages, navigate the web, get directions, and

more. Zoom, a built-in magnifier that can increase magnification between 100 and 500% with a double-tap of the screen with three fingers, also works with VoiceOver. The large text feature enables individuals to increase the text size to up to 56 points for easier reading with Mail, Calendar, Contacts, and Notes. There is also a feature to invert colors for a higher contrast. Speak Selection is an app that will read e-mail, iMessages, web pages, documents, and books aloud. Dictation allows individuals to tap the microphone button then "dictate" a text, e-mail, etc. without having to type using the keyboard. Extensive information about iOS devices and accessibility features is available on the Apple Accessibility web page.

The Android 4.0 device integrates accessibility settings for vision- and hearing-impaired users. Some of the accessibility settings include speak passwords (it speaks passwords as you type them); manage call answering/ending (use a physical button to end calls); screen timeout (how long before the screen goes blank); TalkBack (speak all events that happen); explore by touch (hear or see descriptions of what you are touching on the device); negative colors (reverse colors of the screen); changing font size; etc. For a full list of accessibility settings and information on the Android 4.0 device, visit the Tech Republic website.

Technological advancements are bringing new products and applications to the market on a continuous basis. The products and applications mentioned represent just a few of the extensive products and applications available on the market.

Demonstrations:

Comparative Overview of ZoomText, Jaws & Dragon Naturally Speaking
http://www.youtube.com/watch?v=_YpNrOkW0Mw
Refreshable Braille and the Web
http://www.dingoaccess.com/accessibility/refreshable-braille-and-the-web/

Screen Readers:

Screen Readers: Eight Frequently Asked Questions (with Screen Reader Version of the Article)
http://www.practicalecommerce.com/articles/2114-Screen-Readers-Eight-Frequently-Asked-Questions
Survey of Preferences of Screen Reader Users
http://webaim.org/projects/screenreadersurvey/
Freedom Scientific
http://www.freedomscientific.com/
AI Squared
http://www.aisquared.com/
Issist
http://www.issist1.com/

Resources:

AFB Product Search: Category, Manufacturer, Task, and Product
http://www.afb.org/prodBrowseCategory.asp
AFB Assistive Technology Questions
http://www.afb.org/ProdBrowseCatResults.asp?CatID=49
Apple Accessibility Web Page
http://www.apple.com/accessibility/ios/#vision
Tech Republic's Accessibility Information on the Android 4.0
http://www.techrepublic.com/blog/smartphones/android-accessibility-options-for-vision-and-hearing-impaired/
Types of Motor Disabilities
http://webaim.org/articles/motor/motordisabilities
Working Together: Computers and People with Sensory Impairments
http://www.washington.edu/doit/Brochures/Technology/wtsense.html

Question 8: What is color blindness?

Color blindness is a color vision deficiency and is also considered an invisible disability. It is the inability to distinguish certain shades of colors and can range from mild to severe. It is often assumed that an individual who is color-blind only sees "in black and white." However, most color-blind people see color [15, 16]. Research reveals that 1 in 12 (8.0%) males and 1 in 200 (0.5%) females are color-blind [16]. Only 1 in every 33,000 people has achromatopsia, which is a visual disorder that includes the absence of color vision accompanied by other visual impairments [17].

Color blindness varies depending upon an individual's ability to differentiate hues of color. This variance is due to the functionality of the cone lights in the eyes. There are three type of color blindness:

- Red-green color blindness/red-green deficiency
- Blue-yellow color blindness/blue-yellow deficiency
- Total color blindness [18, 19, 20]

For individuals with normal color vision, they have trichromatic color vision, meaning that all three types of cone lights in their eyes function correctly [19]. Individuals with faulty trichromatic vision, also known as anomalous trichromacy, see color and use all three cones but one cone perceives light slightly out of alignment, producing three different color effects [16]. Even though these individuals can still see color, they are color-blind; their color blindness varies upon the faulty cone. Dichromatic color vision, also known as dichromacy, is when individuals have only two cones that perceive color [19]. Therefore, one color is totally absent. People with protanopia "are unable to perceive any red ever, those with deuteranopia are unable to ever perceive green and those with tritanopia are unable ever to perceive blue" [16]. Individuals with monochromatic vision, also known as rod monochromacy and achromatopsia, see no color at all with the exceptions of grey ranging from black to white [19, 20, 21]. Achromatopsia is very rare and is often associated with light sensitivity and poor vision [19, 20, 21].

Red-green color blindness is most common while blue-yellow color blindness is less common [20, 21]. Color blindness is typically genetic, so it is an inherited condition. Color deficiency can also be caused by specific diseases, medications, aging, and chemical exposure. A list of causes is provided by the American Optometric Association.

There are color blindness tests that individuals can take to identify color deficiency. One of the most commonly used for red-green color deficiencies is the Ishihara color test (the full test has 38 test plates and a smaller test has 24 plates [22]). Each Ishihara plate includes a pattern of dots. Individuals with no color deficiency see letters or shapes within these patterns while individuals with red-green color deficiency may have difficulty seeing numbers or shapes. Color vision tests are provided in the resources if you wish to test yourself for color blindness. In addition to online color blindness tests, there are new apps available for mobile devices that assist individuals with color identification, red and green color detection, and much more [23].

Since certain color combinations and patterns can result in difficulty seeing or even an inability in seeing numbers and shapes, it is important for web designers to understand color deficiency. In web design, it is especially important to understand how color deficiency can affect what users see on computer screens and mobile devices. As shared in "Ensuring Accessibility for People With Color-Deficient Vision" by Pabini Gabriel-Petit, "If you do not consider the needs of people with color-deficient vision when choosing color schemes for applications and Web pages, those you create may be difficult to use or even indecipherable for about one in twelve users" [24]. When developing PowerPoint presentations, also consider color selection. Keep in mind that when colored slide backgrounds are used with different colored fonts, some text may be difficult to see or invisible to color-blind individuals.

Color Blindness Tests:

Color Vision Test for Adults—Ishihara Plates
http://colorvisiontesting.com/ishihara.htm
Color Vision Test for Children
http://colorvisiontesting.com/online test.htm

Color Blind Test Video
http://www.youtube.com/watch?v=cnjwwa2deH8
Resources:

Accessibility Color Wheel
http://gmazzocato.altervista.org/colorwheel/wheel.php
American Optometric Association Color Deficiency List
http://www.aoa.org/patients-and-public/eye-and-vision-problems/glossary-of-eye-and-vision-conditions/color-deficiency
Effective Color Contrast
http://www.lighthouse.org/accessibility/design/accessible-print-design/effective-color-contrast/
Luminosity and Colour Contrast Ratio Analyzer
http://juicystudio.com/services/luminositycontrastratio.php
Snook Colour Contrast Tool
http://snook.ca/technical/colour_contrast/colour.html
20 Apps for the Color-blind
http://www.color-blindness.com/2010/12/13/20-iphone-apps-for-the-color-blind/

Question 9: What is hearing loss and deafness? What is tinnitus?

Hearing loss is a gradual or sudden decrease in how well an individual hears. Hearing loss can range from mild to severe and may be temporary or permanent. The American Speech-Language Hearing Association (ASHA) lists five causes of hearing loss:

- Hearing loss at birth (congenital hearing loss)
- Hearing loss after birth (acquired hearing loss)
- Ear infections (otitis media)
- Noise
- Ototoxic medications (medication effects) [25]

An audiometric evaluation, also known as a hearing test, measures an individual's ability to hear different sounds and tones. Hearing is not measured in percentages but in decibels (dB) [26]. There are five categorizations of hearing loss. As shared by Cochlear, the amount of hearing loss someone has is ranked as mild, moderate, severe, or profound [26].

- **Normal hearing**
  You can hear quiet sounds down to 20 dB HL (decibels Hearing Level).
- **Mild hearing loss**
  Hearing loss in your better ear is between 25–39 dB HL.
  You have difficulty following speech in noisy situations.
- **Moderate hearing loss**
  Hearing loss in your better ear is between 40–69 dB HL.
  You have difficulty following speech without a hearing aid.
- **Severe hearing loss**
  Hearing loss in your better ear is between 70–89 dB HL.
  Requires powerful hearing aids or an implant.

- **Profound hearing loss**
  Hearing loss in your better ear is from 90 dB HL.
  You need to rely mainly on lip-reading and/or sign language or an implant. [26]

In the United States, approximately 17% of adults (36 million) report some degree of hearing loss [27]. Data provided by the Gallaudet Research Institute, based on the National Health Interview Survey or the Survey of Income and Program Participation, provides more information on the deaf:

- About 2 to 4 of every 1,000 people in the United States are functionally deaf; fewer than 1 out of every 1,000 people in the United States became deaf before 18 years of age.
- However, if people with a severe hearing impairment are included with those who are deaf, then the number is 4 to 10 times higher. That is, anywhere from 9 to 22 out of every 1,000 people have a severe hearing impairment or are deaf. [28]

There are many causes of deafness. Some individuals are born deaf and others progressively lose their hearing as they age. The Christian Blind Mission states that congenital deafness describes "loss of hearing that is already present at birth." They also state how deafness may be hereditary; therefore, it can run in a family or be part of a genetic disease. Otitis media may cause deafness. This middle ear infection, which is caused by bacteria or viruses, can be chronic and lead to hearing loss and deafness. Progressive hearing loss, also known as presbyacusis, can be slight to severe and over time continue to degenerate. Noise-induced hearing loss, which is caused by loud noise, can lead to progressive hearing loss and deafness. Ototoxicity refers to medication caused hearing loss, which is often accompanied by tinnitus [29].

Overall, there are three types of deafness as outlined by the Safe Network:

- **Conductive deafness**: this means that sound cannot pass freely through the outer or middle ear.
- **Sensorineural deafness**: deafness is caused by a problem in the cochlea or auditory (hearing) nerve.
- **Neural deafness**: there is no auditory nerve or it is damaged, so the inner ear can no longer send information to the brain. [30]

The National Institute on Deafness and Other Communication Disorders (NIDCD) provides detailed information on hearing loss and deafness. Some NIDCD statistics on deafness include the following:

- About 2 to 3 out of every 1,000 children in the United States are born deaf or hard-of-hearing.
- Nine out of every 10 children who are born deaf are born to parents who can hear.
- Approximately 4,000 new cases of sudden deafness occur each year in the United States. Hearing loss affects only 1 ear in 9 out of 10 people who experience sudden deafness. Only 10% to 15% of patients with sudden deafness know what caused their loss. [27]

Tinnitus is a medical condition in which an individual hears ringing in the ears when there is no external sound present. The sound can range from ringing to hissing, chirping, clicking, or roaring [31]. Reports show 50 million Americans experience tinnitus to some degree [31, 32]. While tinnitus does not cause hearing loss, according to Neuromonics, tinnitus is typically triggered by a disruption to the auditory system and involves a form of hearing loss that may be associated with age, loud noise, medication, middle ear infection, or a list of other causes [32]. Tinnitus is listed as the number one disability for military veterans [32]. Triggers can be extensive; the Neuromonics website provides a list of tinnitus triggers.

There are many hearing loss and tinnitus simulators available online that provide an opportunity to experience different hearing impairments. The first simulator link included in this section's resources enables individuals to select the speech type (female, male, child), location (outdoor park scene, restaurant scene), and hearing-loss level (mild, moderate, severe). The second simulator enables individuals to listen to 11 representative sounds of tinnitus. The third simulator combines hearing loss and tinnitus in alignment with different ages (35 year old, 50 year old, and 80 year old).

Simulations:

Hearing Loss (Select Speech, Location and Hearing Loss Level)
|http://www.starkey.com/hearing-loss-and-treatment/identify-hearing-loss/Hearing-Loss-Simulator

Tinnitus (11 Representative Sounds)
http://www.hearing.nihr.ac.uk/public/auditory-examples-sounds-of-tinnitus
Hearing Awareness Week Simulator for Hearing Loss & Tinnitus
http://www.hearingawarenessweek.org.au/hearing-simulator

Hearing Test:
Online Hearing Test
http://www.starkey.com/hearing-loss-and-treatment/identify-hearing-loss/Online-Hearing-Test

Resources:

American Speech-Language Hearing Association
http://www.asha.org/public/hearing/Causes-of-Hearing-Loss/
Neuromonics (Tinnitus Triggers)
http://neuromonics.com/about-tinnitus/

Video Resource:

Living with Tinnitus Video
http://www.youtube.com/watch?feature=player_embedded&v=BAeFw9V5Odo

Question 10: What is American Sign Language? What are captions? What assistive technologies and services are available for people who are deaf or hard of hearing?

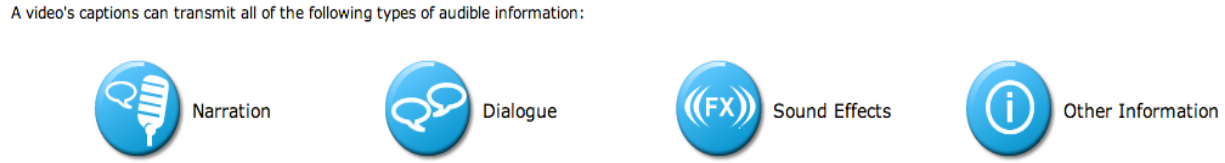
American Sign Language (ASL) is a visual language in which the hands, facial expressions, and body movement together convey information [33]. ASL is not English: it is another language that has its own grammatical rules and syntax. ASL is also not universal, so it is different in each country, including regional dialects.

Captions, as defined by the US General Services Administration, "provide the synchronized text equivalent of audio information in the same language as the audio" [34]. Captions include both speech and non-speech information, as well as sound effects, music, and laughter [34], which equalizes communication access for students who are deaf or hard of hearing. Captioning benefits students with learning disabilities and cognitive disabilities as well as English language learners. There are two types of captioning:

- **Open captions** are words that appear automatically on your video when you hit play; you cannot turn them off.
- **Closed captions** don't appear unless you turn them on. You can turn them off. [34]

Captions are different from subtitles. While subtitles appear in films in which "the audience speaks a different language than that used when the film was recorded" [34], captions are in the same language as the video's audio track. The US General Services Administration provides on their Caption Videos and Multimedia web page detailed information, including examples of correct and incorrect captions as well as resources. Additionally, the Described and Captioned Media Program, funded by the US Department of Education and administered by the National Association of the Deaf (NAD), provides a robust and interactive web page (Caption it Yourself-CIY) that uses icons to provide a better understanding of how captions transmit audible information. The National Captioning Institute website also provides extensive information on captioning (prerecorded, live, subtitling) and web captioning (prerecorded, live) as well as other resources.

Figure 5. Interactive Icons on Captioning, Described and Captioned Media Program



Technology and telecommunications continue to provide advancements in communication for the deaf and hard of hearing. According to NAD, assistive technologies for the deaf and hard of hearing include "real-time captioning services, Internet captioning applications, movie caption display systems, a wide range of relay services that provide access to the telephone network, digital televisions with digital captions, and video remote interpreting services" [35]. The National Institute on Deafness and Other Communication Disorders (NIDCD) provides detailed information on assistive devices for the deaf and hard of hearing on their website. iCanConnect provides information on assistive technologies for individuals who are deaf and blind. AbleData provides extensive information on assistive technologies, including products, resources, and a library for individuals who are deaf, blind, and deaf-blind.

The National Association of the Deaf provides information about the ADA and accommodations for people who are deaf or hard of hearing. As shared by NAD, "The Americans with Disabilities Act (ADA) mandates the provision of reasonable accommodations for employees and 'auxiliary aids and services' to ensure effective communication with people who are deaf or hard of hearing" [36].

Auxiliary aids and services as defined by the US Department of Justice include the following:

> qualified interpreters, notetakers, computer-aided transcription services, written materials, telephone handset amplifiers, assistive listening devices, assistive listening systems, telephones compatible with hearing aids, closed caption decoders, open and closed captioning, telecommunication devices for deaf persons, videotext displays, or other effective methods of making aurally delivered materials available to individuals with hearing impairments
>
> 28 C.F.R. § 35.104 and 28 C.F.R. § 36.303(b)(1), respectively. [36]

Within higher education, offices of disability services work with students to provide reasonable accommodations for those who are hard of hearing or deaf. Services include, but are not limited to, Computer Aided Realtime Captioning (CART), numerous types of personal frequency modulation (FM) systems, American Sign Language interpreters, C-Print speech-to-text system, note takers, and extra time on tests. Links for demonstrations on these services and systems can be accessed in this section's resources.

Captioning Resources:

Described and Captioned Media Program—Caption it Yourself (CIY)
http://www.dcmp.org/ciy/
National Captioning Institute
http://www.ncicap.org/
US General Services Administration—Caption Videos and Multimedia
http://www.howto.gov/social-media/video/how-to-make-video-captions
Web Captioning Overview
http://webaim.org/techniques/captions/
Audio Sync Technologies
http://www.automaticsync.com/captionsync/
3Play Media
http://www.3playmedia.com/
Experts in Video Accessibility
http://www.3playmedia.com/search/?cx=005974529852931073588%3Aqtsl1erzmdg&ie=UTF-8&q=experts+in+video+accessibility

Video Resources:

Demonstration: CART Services Video
http://www.youtube.com/watch?v=DHYFvZS3jwM
Demonstration: Video Relay Services Video
http://www.youtube.com/watch?v=eyjjpdtwz_k
Demonstration: FM Assistive Listening Device Video
http://www.youtube.com/watch?v=M4lBkdRereE
Demonstration: What Is C-Print? Video
http://www.screencast.com/users/CEA_NIC/folders/Deaf%20HoH%20Support%20Staff/media/6230358d-7269-4163-bd66-b8df07164a70
iCanConnect Overview Video
http://www.icanconnect.org/

Resources:

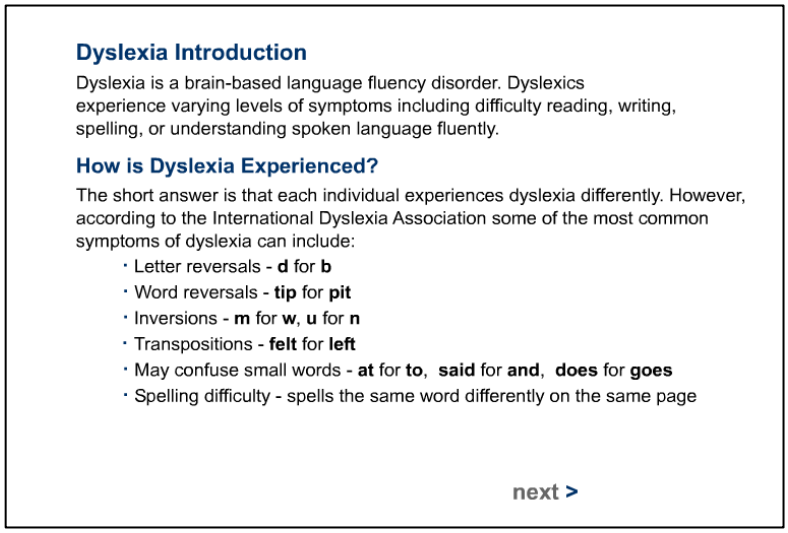
AbleData
http://www.abledata.com
iCanConnect Resources for the Deaf, Blind, and Deaf-Blind
http://www.icanconnect.org/resources
National Institute on Deafness and Other Communication Disorders
http://www.nidcd.nih.gov/health/hearing/pages/assistive-devices.aspx
Telecommunication Equipment
http://www.ntid.rit.edu/nce/employers/tele-equipment

Question 11: What are learning disabilities?

The National Center for Learning Disabilities states that learning disabilities (LDs) are a group of disorders that "affect the brain's ability to receive, process, store, respond to, and communicate information" [37]. LDs are lifelong; in many cases the cause of an individual's LD is unknown [37]. LDs are not the same as intellectual disabilities, sensory impairments (vision or hearing), or autism spectrum disorder [37]. Learning disabilities can affect an individual's ability to listen, speak, think, read, compute, spell, or reason.

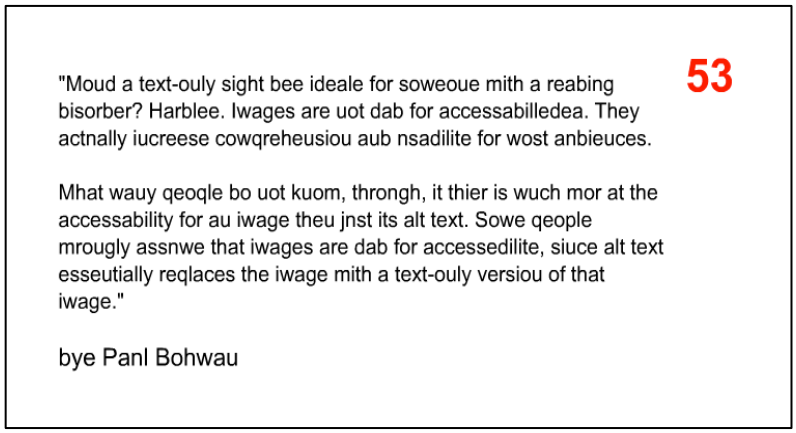
There are currently 2.4 million students in the United States who are diagnosed with LDs [38]. Some of the most common learning disabilities include dyslexia, dyscalculia, and dysgraphia. Dyslexia is a language processing disorder that can affect reading, writing, and spelling. Individuals with dyslexia often have difficulty with decoding words, spelling, and word recognition, which can cause problems with reading and comprehension [37]. Dyscalculia is a disability involving mathematics. Visual-spatial difficulties and language processing difficulties can contribute to dyscalculia. Individuals with dyscalculia may have difficulty with learning mathematical facts, concepts, and problem solving [37]. Dysgraphia is a disability that affects writing. Individuals with dysgraphia can have difficulty with handwriting, spelling, and putting their thoughts and concepts on to paper [37]. A dyslexia simulation, developed by WebAIM, provides individuals with an opportunity to complete a series of timed questions to learn more about dyslexia. You are encouraged to complete this interactive simulation.

Figure 6. Dyslexia Simulation Introduction



Source: WebAIM (http://webaim.org/simulations/dyslexia)

Figure 7. Dyslexia Simulation



Source: WebAIM (http://webaim.org/simulations/dyslexia)

The National Center for Learning Disabilities (NCLD) has developed an extensive table that provides detailed information on each LD. This table is available online, enabling users to click on the different disabilities to learn more about each one; links are also provided to videos and other resources [37].

Table 1. LD Terminology

LD Terminology			
Disability	**Area of difficulty**	**Symptoms include trouble with**	**Example**
Dyslexia	Processing language	• Reading • Writing • Spelling	Confusing letter names and sounds, difficulties blending sounds into words, slow rate of reading, trouble remembering after reading text
Dyscalculia	Math skills	• Computation • Remembering math facts • Concepts of time and money	Difficulty learning to count by 2s, 3s, 4s, poor mental math skills, problems with spatial directions
Dysgraphia	Written expression	• Handwriting • Spelling • Composition	Illegible handwriting, difficulty organizing ideas for writing
Dyspraxia	Fine motor skills	• Coordination • Manual dexterity	Trouble with scissors, buttons, drawing
Information Processing Disorders			
Auditory Processing Disorder	Interpreting auditory information	• Language development • Reading	Difficulty anticipating how a speaker will end a sentence
Visual Processing Disorder	Interpreting visual information	• Reading • Writing • Math	Difficulty distinguishing letters like "h" and "n"
Other Related Disorders			
Attention-Deficit/ Hyperactivity Disorder (ADHD)	Concentration and focus	• Over-activity • Distractibility • Impulsivity	Can't sit still, loses interest quickly, daydreams

Source: National Center for Learning Disabilities
(http://www.ncld.org/types-learning-disabilities/what-is-ld/what-are-learning-disabilities)

The Higher Education Research Institute (HERI) at the University of California, Los Angeles, published in 2011 a research brief entitled “College Students with ‘Hidden’ Disabilities: The Freshmen Survey Fall 2010.” This research brief provides an overview of newly collected data from the Cooperative Institutional Research Program Freshmen Survey, which is administered to incoming first-year students before they start classes at their institutions, and it asks students about “hidden” disabilities, including attention deficit/hyperactivity disorder (ADHD) and psychological disorders [38]. Of the 2010 respondents, 11.9% reported having one disability/medical condition, and 2.7% reported having two or more disabilities/medical conditions [39]. Table 2 provides an overview of the reported disabilities.

Table 2. Incoming Students Reporting a Disability/Medical Condition, by Sex (Percentages)

Table 1. Incoming Students Reporting a Disability/Medical Condition, by Sex (percentages)

Disability/Medical Condition	Men	Women	All Students
Attention-deficit/hyperactivity disorder (ADHD)	6.4	3.8	5.0
Psychological disorder (depression, etc.)	2.6	4.9	3.8
Learning disability (dyslexia, etc.)	3.1	2.7	2.9
Physical disability (speech, sight, mobility, hearing, etc.)	2.7	2.7	2.7
Chronic illness (cancer, diabetes, autoimmune disorders, etc.)	1.3	2.1	1.8
Other	2.8	3.6	3.3
One reported disability/medical condition	11.9	11.9	11.9
Two or more reported disabilities/medical conditions	2.5	2.9	2.7

Source: The Higher Education Research Institute
(http://www.heri.ucla.edu/PDFs/pubs/briefs/HERI_ResearchBrief_Disabilities_2011_April_25v2.pdf)

Simulations:

Dyslexia
http://webaim.org/simulations/dyslexia#sim
ADHD and Learning Disorders
http://kctherapist.blogspot.com/2012/04/walking-in-their-shoes-adhd-and.html

Resource:

Learning Disabilities Table
http://www.ncld.org/types-learning-disabilities/what-is-ld/what-are-learning-disabilities

Question 12: What is the difference between accessibility and usability?

The words accessibility and usability may seem synonymous. However, for a student with a disability, the difference can be the ability to navigate a website, use a software program, read course content shared by a professor, or actively engage in a course. The World Wide Web Consortium (W3C) provides definitions for accessibility, web accessibility, usability, and usable accessibility.

W3C definitions include the following:

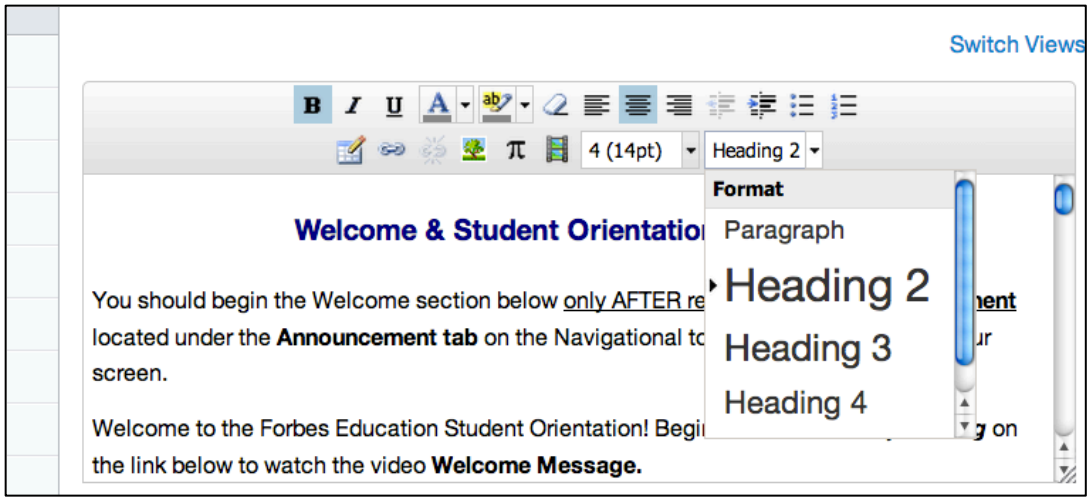
- **Accessibility** is about ensuring an equivalent user experience for people with disabilities, including people with age-related impairments.
- **Web accessibility** means that people with disabilities can perceive, understand, navigate, and interact with websites and tools, and that they can contribute equally without barriers.
- **Usability** is about designing products to be effective, efficient, and satisfying.
- **Usable accessibility** combines usability and accessibility to develop positive user experiences for people with disabilities. [40, n.p.]

Accessibility and usability are critical for online student success. As shared by Freedom Scientific, “It is in everyone's best interest to create Web pages and other documents that are both accessible and easy to use” [41]. For online students with disabilities, navigation and layout are very important. Course developers and instructors need to consider how students will access and interact with both web content and documents. Therefore, accessibility and usability should be at the forefront of course development.

Within learning management systems, course developers an faculty should modularize content and use descriptive header levels so the navigation is easier to use for students who use screen readers. For example, it is better to have two shorter, segmented pages of lesson content than one page that requires students to scroll extensively to access information. The integration of descriptive headers enables students with

disabilities to skim the course content more quickly so they can readily find needed information. When headers are not included on a page, screen readers process the text word by word and number by number, therefore causing a student using a screen reader to go through the content on each page word by word, line by line, from the top of the page to the bottom of the page each time the student navigates into a new section of the course each week. It should be noted that creating headers does not simply mean putting the title in bold and enlarging the font size. While a student with normal vision can easily recognize this format as a header, a screen reader will not. Within the learning management system, there are formatting options that allow for the selection of headings and subheadings as shown in figure 8.

Figure 8. Heading Options in Canvas by Instructure

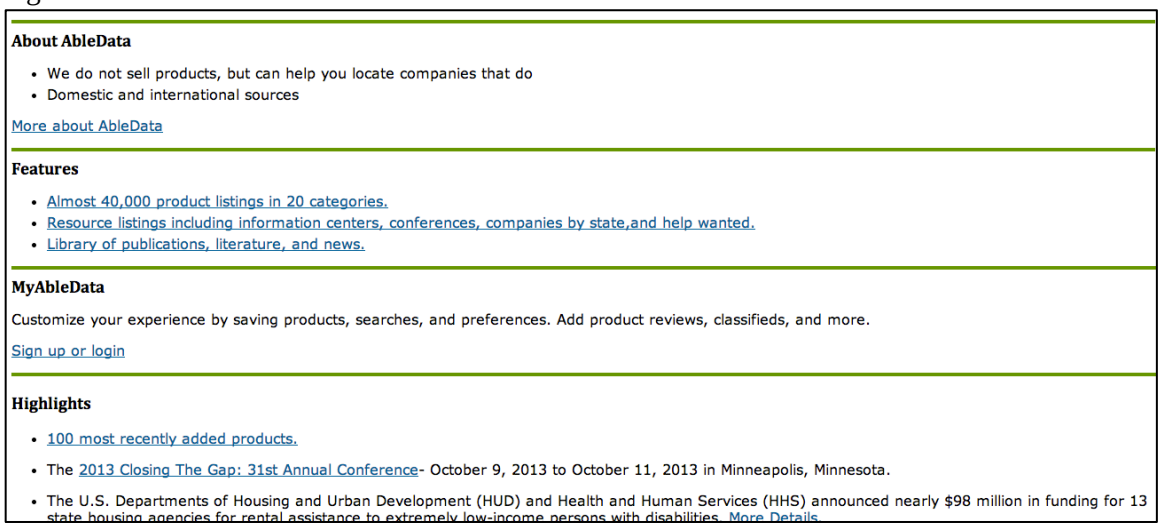


For courses that provide extensive lists of web resources as electronic links within the learning management system, course developers and faculty should break the list of links into sections using descriptive headers so students using screen readers can find links more quickly. Without headers, a student using a screen reader has to go through each electronic link individually and then recall which specific link in a long list of links is needed; this process can be very time consuming. One method to solve this issue is to use an alternate layout. For example, the AbleData website has a link on the top of their home page for an alternate layout. The link for the alternate layout is the first option on the top toolbar next to Content, Site Map, A-Z Index, Help, and Search. The alternate layout provides the website content in a more structured manner, where the resource lists are shorter and fall under detailed headings for easier navigation. It should be noted that within course materials (e.g., Word documents, Excel spreadsheets, PowerPoint presentations, etc.) the same layout structure should be applied for long lists of web resources with electronic links. By breaking the resources into sections using descriptive headers, students can more easily navigate and optimize the web resources. Lastly, it is recommended that higher education intuitions consider providing an alternate layout link on their websites so students using screen readers can find information more readily on the web pages.

Figure 9. AbleData Website Alternate Format Link, First Option on the Top of the Screen

Source: AbleData

Figure 10. AbleData Website Viewed in Alternate Format



Source: AbleData

A recently published open-access guide entitled, *How-To Guide for Creating Accessible Online Learning Content*, provides detailed information about accessibility, usability, and best practices for creating usable content that benefits all students. This guide, listed in the resources for this section, focuses specifically on online course content and students with disabilities.

Resources:

Accessibility and Usability: General Tips for Writing Better HTML or Other Documents
http://www.freedomscientific.com/Training/accessibility.asp
How-To Guide for Creating Accessible Online Learning Content
http://projectone.cannect.org/

Penn State University: Heading and Subheadings
http://accessibility.psu.edu/headings
W3C Resources: Web Accessibility and Usability Working Together
http://www.w3.org/WAI/intro/usable

Question 13: What can be done to ensure Microsoft documents are accessible (e.g., Word, PowerPoint, Excel, etc.)?

Creating accessible Microsoft documents is not difficult to do. In fact, all of the functions you need to make a document accessible are built into the programs. It is simply a matter of remembering to select the formatting functions when creating the documents. These formatting options simply require a click of your mouse to turn a document into an accessible document.

Creating accessible documents greatly benefits students who use screen readers, including individuals with vision impairments, learning disabilities, and other disabilities. Screen readers are also used by many English language learners. Keep mind that creating accessible documents benefits everyone who may be trying to access a course or institutional materials, including potential students, faculty, administrators, administrative staff, alumni, the community, funders, etc.

The use of headers as shared previously is very important to accessibility. For example, when creating Word documents, headers and subheaders allow students using screen readers to quickly skim through a document. A 10-page syllabus without headers and subheaders can be daunting; however, by using the formatting options within Microsoft, this document can easily become more accessible. By utilizing the available tools within Microsoft for adding bullets, indentation, page numbers, etc., students who use screen readers will spend less time searching for content and more time actively using the content.

A Microsoft web page, provided in this section's resources, includes handouts, shortcuts, and videos on how to create accessible documents. There also are many higher education institutions, such as Michigan State University, Penn State University, and George Mason University, that provide open-access content on accessibility and usability. Look for open-access sites to serve as references as you build on your accessibility training content or to look for potential accessibility partners.

Resources:

Microsoft: Creating Accessible Documents with Office
http://www.microsoft.com/enable/products/office2010/
George Mason University: Web Accessibility
http://webaccessibility.gmu.edu/
Penn State University: Accessibility and Usability at Penn State
http://accessibility.psu.edu/
Michigan State University: Web Accessibility
http://webaccess.msu.edu/tutorials/index.html

Question 14: How can an institution take a more proactive approach to accessibility?

Accessibility is more than a compliance issue; it requires a change in cultural thinking and an institution-wide effort to integrate accessibility into campus business processes. Accessible technology and information should not be the sole responsibility of the disability services office. Sharing information should be a collective responsibility for anyone creating websites, teaching courses, purchasing technology, or creating multimedia. Integrating accessibility into the campus culture is a necessary step to providing sustainable removal of accessibility barriers. A successful campus-wide accessibility effort includes empowering people, shared governance, and continuous business process improvement. Some specific elements that support these three key strategies include the following:

Empowering People

- Provide strong executive support.
- Identify stakeholders and outline responsibilities.

- Educate campus personnel so they know what to do, know how to do it, know why they are doing it, and know the consequences of their choices.
- Promote a collective understanding of the capabilities and commitment to continuous improvement that will lead to sustainable organizational change.

Shared Governance

- Provide leadership through an executive steering committee that works with stakeholders and actively develops strategies and leads projects.
- Develop communities of practices to bring together stakeholders from procurement, instructional materials, and web accessibility so that everyone understands the roles and responsibilities of each person in a campus-wide accessibility effort.

Continuous Process Improvement

- Identify the processes, practices, and procedures that need to be in place for the sustainable removal of accessibility barriers.
- Plan and implement projects and activities that will integrate accessibility into the identified campus processes, practices, and procedures.
- Measure progress.

In 2004, California State University (CSU) Chancellor Charles Reed signed an executive order affirming CSU's commitment to ensuring equal access for persons with disabilities. This executive order, which led to the establishment of the Accessible Technology Initiative (ATI) in 2006, provided the first steps for CSU to take a more proactive approach to accessibility from both the campus level and system level. In 2010, the Continuous Process Improvement Approach was developed through the CSU shared governance process that included diverse groups of CSU campus stakeholders coming together to share their accessibility expertise and knowledge. This approach is based on a set of goals and success indicators that serve as the framework for a repeatable yearlong cycle of planning, working the plan, and measuring progress. The framework includes 22 goals and 142 success indicators spread across three priority areas: (1) web, (2) procurement, and (3) instructional materials.

The example shown in table 3 is an abbreviated look at a business process area from the Web Continuous Process Improvement Framework. This example includes a goal and some of the associated success indicators. Progress towards meeting the success indicator and ultimately accomplishing the goal is measured by a set of status levels. The status-level criteria are shown in table 4.

Table 3. Web Accessibility Evaluation Process Example for Goal 1.0: Identify and Repair or Replace Inaccessible Websites, Web Applications, and Digital Content

Success Indicator	Status Level
1.1 Assigned responsibility for the evaluation process to a body (person(s) or business entity).	Established
1.2 Inventoried all campus administrative websites.	Established
1.3 Inventoried all administrative websites developed by contract vendors.	Defined
1.4 Established a process to perform regularly scheduled accessibility audits using established criteria to identify websites that need remediation.	Established
1.5 Conducted automated accessibility evaluations on websites and web applications.	Established
1.6 Conducted manual accessibility evaluations on websites and web applications.	Initiated

Source: CSU Web Continuous Process Improvement Framework

Table 4. Status-Levels Criteria

Status Levels	Description for Procedures	Description for Documentation	Description for Resources
Optimized	The campus has a mature practice. In addition, procedures are in place to conduct regular administrative reviews of success indicators to gauge effectiveness and implement improvements.	Documentation is continually revised to reflect the managed practice. Periodic administrative review of documentation is conducted.	Resources have been both identified and allocated. Periodic administrative review of resource allocations is conducted
Managed	The campus has a mature practice. Procedures are also in place to track and capture success indicators (milestones and measures of success).	Documentation is complete and fully reflects the standard practice.	Resources have been both identified and allocated.
Established	The campus has a standard practice. Procedures are consistent and formal.	Documentation is complete and fully reflects the standard practice.	Resources have been both identified and allocated.
Defined	The campus has a common practice. Procedures, if in place, are consistent but informal.	Documentation, if present, is in working draft.	Resources have been firmly identified but not yet allocated.
Initiated	The campus has an ad hoc or developing practice. Procedures, if in place, are generally ad hoc.	Documentation is generally absent.	Resources have been tentatively identified but not yet allocated.
Not Started	No action has been taken yet.	No documentation has yet been generated.	No resources have yet been allocated.

Source: CSU Web Continuous Process Improvement Framework

CSU campuses use the Continuous Process Improvement Framework and follow a yearlong cycle:

- **Planning**: each campus establishes a plan based on priorities, such as impact and capacity, to guide their work on success indicators throughout the year.
- **Working the plan**: each campus works with the campus-based ATI Steering Committee to implement their plan. Additionally, the ATI system-wide team organizes projects to address specific high impact success indicators. These projects are collaborative efforts across our campuses that produce deliverables that can be adopted and adapted by an individual campus.
- **Measuring progress**: ATI annual reports that cover all the goals and success indictors measured by status level are submitted by each campus. System-wide aggregate reports are compiled from the individual campus reports.

This approach has resulted in continued accessibility improvements across the system.

CSU has learned many valuable lessons while implementing accessible information and technology, and the university is willing to share what has been learned from both an institutional and system-wide approach. Collaboration inquiries can also be sent to ati@calstate.edu.

Question 15: What is VPAT? Does VPAT mean a product is accessible?

VPAT is the acronym for Voluntary Product Accessibility Template—a "template" adopted by the Information Technology Industry Council. VPAT is a document that vendors fill out to disclose the extent that their products and services are in alignment with Section 508 federal technical accessibility standards. For institutions and university systems, VPAT can be a starting point for analyzing the current accessibility of a product, evaluating bids, and providing a record to track accessible procurements.

In analyzing which technology is the most accessible, it is important to note that a VPAT should *not* stand on its own without further review. VPATs provide a way to enter into greater discussion with vendors, allowing you to explore not only the extent to which the VPAT reflects current practices, but also to discuss how committed the vendor is to ongoing improvements in accessibility. You may also request that vendors share the results of accessibility testing to support their VPAT claims and to gain a more complete picture of product accessibility. To summarize, working with VPATs is a three-step process:

1. VPATs should be reviewed by someone involved in product purchases.
2. Ask questions about the vendor's commitment to accessibility.
3. Request test results to better understand overall product accessibility.

Campuses need to determine a process that fits with the campus culture and allows all stakeholders (faculty, administration, IT staff, and purchasing) to work collaboratively across an institution to ensure that the technology being purchased is accessible and usable. The CSU system first established policies in January 2007 and required each campus to "develop a policy and implementation plan for the procurement of electronic and information technology covered under Section 508 in compliance with California state Government Code 11135" [42]. Policy development had four key requirements:

1. Identify roles and responsibilities for overseeing Section 508 procurement compliance.
2. Establish implementation milestones and timelines.
3. Identify the process and person(s) responsible for determining "undue burden" and "fundamental alteration."
4. Create a communication and training plan to educate the campus about Section 508 requirements and the established policy.

> These four requirements can serve as a starting point for other institutions in order to develop accessibility policies. Information about VPATs, procurement, and acquisition are provided in this section's resources.

Resources:

CSU Accessible Electronic and Information Technology (E&IT) Procurement
http://www.calstate.edu/Accessibility/EIT_Procurement/
Information Technology Industry Council
http://www.itic.org/public-policy/accessibility
Section 508.gov: Acquisition FAQs
http://www.section508.gov/index.cfm?FuseAction=Content&ID=75
Section 508.gov: How to Read a VPAT
http://buyaccessible.net/blog/?tag=vpat
Section508.gov: Buy Accessible
http://www.section508.gov/index.cfm?fuseAction=BuyAccessible
US General Services Administration: Buy Accessible Wizard
http://www.buyaccessible.gov/

Question 16: What do higher education institutions need to know about military veterans with disabilities?

Colleges and universities actively recruit veterans to enroll in courses and programs, particularly online learning. Data reveals that since August 2009, more than 500,000 veterans have used benefits offered through the Post-9/11 GI Bill to enroll in higher education courses and programs [43]. However, research indicates that the newest returning veterans are "filing for disability benefits at a historic rate," claiming between eight to 14 ailments [44].

The article, "Operation Graduation," focuses on returning veterans and a study conducted at seven public institutions across the United States. The results of the study revealed that "when student veterans are supported by their colleges and universities, their grades, retention and graduation rates are higher than those of their peers" [43]. As shared by Wendy Lang, director of Operation College Promise, "it's one thing to get a veteran student to a college campus, but if that veteran student gets to campus and doesn't receive support services they will not get a degree" [43]. For students who enroll in online programs, there may be an increased risk of attrition if support services are not easily accessible.

The following are statistics regarding disabilities reported on returning veterans:

- At least 20% of Iraq and Afghanistan veterans have post-traumatic stress disorder (PTSD) and/or depression [45].
- There are 50% of those with PTSD who do not seek treatment [45].
- There are 19% of veterans that may have a traumatic brain injury (TBI) [45].
- About 60% of deployed military service men and women have noise-induced hearing loss, tinnitus, and other hearing injuries [46].
- Tinnitus is currently the number one service-connected disability of veterans returning from Iraq and Afghanistan [47].
- Usually brought on by exposure to loud noise, the problem [of hearing loss] is especially significant in the military, with more than 34% of returning veterans from Iraq and Afghanistan suffering from the condition [32].
- The Department of Defense has confirmed that some 13% of all wounded evacuees from Iraq have experienced a serious eye injury, the highest percentage for any war in American history for which records are available [48].
- The number of veterans with any type of disability in 2008 was 5.5 million [49].

Upon completion of their military service, veterans are screened for any disabilities that may be service connected. If service-related disabilities are discovered, these veterans are informed about the different offices that provide services but not the specific resources available.

As shared in the previous statistics, many veterans have both hidden and visible disabilities. However, many may be too proud to ask for assistance from disability services. Therefore, it is important for disability service offices to connect with veteran services to share the needs and requirements of these services to veterans. Research shows that veterans need someone they know and trust to work with them regarding medical and psychological services needed for college courses [50].

A recent study conducted at Penn State World Campus identified veterans with sensory impairment who were not aware that these resources existed, and furthermore, were not aware of their rights as a student as it pertains to accessible courses [50]. The Penn State World Campus study found that a key factor to successfully getting veterans to seek services is to understand their connection and relationship with other veterans (based on triggers). Through this relationship, veterans may then be connected through other veterans to directly introduce the appropriate services and resources (known as coaching). Utilizing this model, Penn State World Campus has taken their veteran disclosure rate from 0% to 80%; the veterans' comfort level of self-disclosure has also increased by a substantial margin within a year [50].

Remember that most veterans may not be comfortable with self-disclosing that they have disabilities; many may downplay their conditions, such as brain injuries, post-traumatic stress disorders, psychological conditions, hearing impairments, and visual impairments. Therefore, it is also very important to make

courses with built-in accessibility, such as captioning for hearing impairments. If colleges and universities provide universally designed courses for all, veterans who still do not ask for help may still be able to get the assistance they need without self-disclosure because the accessibility is built into the course. This preemptive design strategy is critical for both resident and online programs. However, even with accessible design, colleges and universities need to work with veteran services to determine the best way to help these students lower their defenses and receive the help they need to ensure educational success.

Resources:

ADA: Know Your Rights-Service Members
http://www.ada.gov/servicemembers_adainfo.html
Disabled World. US Veteran Facts and Statistics
http://www.disabled-world.com/disability/statistics/veteran-statistics.php
Invisible Wounds: Serving Service Members and Veterans with PTSD and TBI
http://www.ncd.gov/publications/2009/March042009/
Veterans Health Council
http://www.veteranshealth.org/about.html
Veteran Statistics: PTSD, Depression, TBI, Suicide
http://www.veteransandptsd.com/PTSD-statistics.html

Question 17: What is universal design?

Universal design is an architectural concept developed by Ron Mace in the mid-1980s. Mr. Mace was an architect who also happened to use a wheelchair for mobility. His idea was to build design elements into the environment that made it more usable for all persons, including those with disabilities. Mr. Mace founded the Center for Universal Design at North Carolina State University to further the research and development of universal design of environments and products. The center provides information, research, and technical assistance related to universal design.

There are seven principles of universal design:

- Principle 1: Equitable use
- Principle 2: Flexibility in use
- Principle 3: Simple and intuitive use
- Principle 4: Perceptible information
- Principle 5: Tolerance for error
- Principle 6: Low physical effort
- Principle 7: Size and space for approach and use [51]

There are multiple examples of universal design built in the environments we know, live, and work in every day. Do you use a sidewalk curb cut at the airport so you can pull your wheeled luggage behind you? Or have you taken a small child for a walk in your neighborhood by pushing the child in a stroller without lifting it onto the sidewalk because a curb cut was available? Have you ever approached a closed door with an armful of packages and been able to open it because it has a levered door handle instead of a doorknob? Do you enter a store through a door that opens automatically as you approach it? Have you ever used the Undo function in a word processing or other computer application? All of these elements—the curb cut, the levered door handle, the automatic doors, the Undo function—are examples of how the seven principles of universal design create more usable environments for all persons, regardless of disability status.

Question 18: How has universal design been applied to learning?

Several researchers and organizations have recognized that the seven principles of universal design could be applied to seated, traditional learning environments and offer benefits to all students, not just those with disabilities. Significant work in this area has been done by the Center for Applied Special Technology (CAST), which was founded in 1984, and the National Center on Universal Design for Learning, which was

founded in 2009. CAST and the National Center for UDL work collaboratively in Wakefield, Massachusetts. The National UDL Center developed guidelines for educators wanting to infuse universal design into their learning environments and activities. The UDL guidelines are organized by three primary principles for educators desiring to infuse universal design into their learning environments and activities:

1. Provide multiple means of representation.
2. Provide multiple means of action and expression.
3. Provide multiple means of engagement. [52]

There is a color-coded graphic organizer of the three UDL guidelines that provides explanations and bulleted examples of each of the three principles on the UDL website http://www.udlcenter.org/aboutudl/udlguidelines/udlguidelines_graphicorganizer).

Both the original seven principles from the Center on Universal Design and the guidelines developed by UDL apply to online courses in higher education in various, and at times, overlapping ways. For example, when course developers utilize a tool, such as an at-a-glance module to provide a road map for students to easily and efficiently find the lecture resources as well as the reading, writing, and discussion assignments, developers would include several guidelines of both sets of universal design principles, such as the following:

- Flexibility in use (UD)
- Simple and intuitive use (UD)
- Low physical effort (UD)
- Provide options for comprehension (UDL)
- Provide options for physical action (UDL)
- Provide options for executive function (UDL)
- Provide options for sustaining effort and persistence (UDL)

There are many other examples of ways that universal design can be built into online course environments, such as providing text, audio, or visual means to represent the same content, which allows students to choose how to demonstrate knowledge of course material. An additional example is in utilizing commonly known graphic representation of standard functions, such as an envelope button to represent the e-mail function in a course. A recommended resource is the *How-To Guide for Creating Accessible Online Learning Content*, which provides information on universal design for online educational content and the web. The guide also aligns the seven principles of universal design with accessibility and online learning.

Resources:

Center for Applied Special Technology
http://www.cast.org/udl/
Center for Universal Design
http://www.ncsu.edu/ncsu/design/cud/index.htm
How Online Educational Content Benefits from Universal Design
http://projectone.cannect.org/universal-design/benefits.php
How-To Guide for Creating Accessible Online Learning Content, Seven Principles of Universal Design
http://projectone.cannect.org/universal-design/seven-principles.php
National Center on Universal Design for Learning
http://www.udlcenter.org/
The 7 Principles of Universal Design
http://www.ncsu.edu/project/design-projects/sites/cud/content/principles/principles.html
Universal Design for the Web
http://projectone.cannect.org/universal-design/

Question 19: What resources are available to the public regarding accessibility?

There are multiple resources available to the public regarding accessibility. The Department of Justice's (DOJ) ADA web page includes multiple legal and policy developments as well as resources to help not only

individuals with disabilities but also employers, educators, and other professionals who may have to provide accommodations for individuals with disabilities. For those working within the educational technology and online course environments, DOJ anticipates releasing new rules and regulations pertaining to web accessibility in late 2013 or early in 2014. These rules and regulations are likely to provide additional, important guidance regarding the standards all online activities and entities need to meet to ensure accessibility.

The Department of Education's Office of Civil Rights (OCR) web page provides links for programs/initiatives, reports, news, and more relating to equal access to education. In 2010, OCR and DOJ sent a Dear Colleague Letter (http://www2.ed.gov/about/offices/list/ocr/letters/colleague-20100629.html) to all campus and university presidents that detailed both agencies' expectations that all educational activities, including technology, should be accessible to students with disabilities. The following year, OCR developed a Frequently Asked Questions document to further clarify and explain its guidance to colleges and universities (http://www2.ed.gov/about/offices/list/ocr/docs/dcl-ebook-faq-201105.pdf).

Government Resources:

Department of Education: Office for Civil Rights
http://www.ada.gov
Department of Justice: ADA
http://www.ada.gov
US Department of Education: Advisory Commission on Accessible Instructional Materials in Postsecondary Education for Students with Disabilities
http://www2.ed.gov/about/bdscomm/list/aim/meeting/aim-report.doc

Institutional and Organizational Resources:

Accessibility and Usability at Penn State
http://accessibility.psu.edu
Affordable Learning Solutions
http://als.csuprojects.org/accessibility
Association on Higher Education and Disability
http://www.ahead.org
ATI Annual Reports: Goals and Success Indicators
http://ati.calstate.edu
Automatic Sync Captioning Contract
http://teachingcommons.cdl.edu/access/docs_multi/docs_mm_applications.shtml
Disability Statistics: Reports for United States
http://www.disabilitystatistics.org/
Lighthouse International
www.lighthouse.org/
The California State University: Accessible Technology Initiative
http://www.calstate.edu/accessibility
The California State University: Professional Development with Training and Tutorials
http://teachingcommons.cdl.edu/access/index.html
Science, Technology, Engineering, and Mathematics: NCAM STEM Diagram Information
http://ncam.wgbh.org/experience_learn/educational_media/stemdx
UDL Universe: Universal Design Resources
http://enact.sonoma.edu/content.php?pid=218878&sid=1818170
University of Michigan, Accessibility
http://hr.umich.edu/webaccess/
University of Washington's DO-IT Initiative
http://www.washington.edu/doit/
Web2Access, University of Southampton, UK
http://www.web2access.org.uk

Web Accessibility in Mind
http://webaim.org
World Wide Web Consortium
http://www.w3c.org

Question 20: Is accessibility training required by colleges and universities that offer online learning?

There is no current research that shows what percentage of colleges and universities require accessibility training for full-time and/or part-time faculty who teach online courses or for course developers who work with online courses. "Should" accessibility training be required by colleges and universities that offer online learning? The answer is yes.

In June 2010, the US Department of Justice and US Department of Education wrote a letter to college and university presidents regarding technology and accessibility. The letter stated the following:

> The Departments of Justice and Education share responsibility for protecting the rights of college and university students with disabilities. . . . The general requirements of Section 504 and the ADA reach equipment and technological devices when they are used by public entities or places of public accommodation as part of their programs, services, activities, goods, advantages, privileges, or accommodations. [53]

As educators and leaders, we all share the responsibility for protecting the rights of college and university students with disabilities. It is through understanding disabilities and what is needed to support student success that we can collaboratively ensure equal access and equal opportunity for all students, both on campus and online.

Resources:

"From Where I Sit" Video Series—Students Sharing Their Stories
http://teachingcommons.cdl.edu/access/materials/fwis.shtml
Professional Development for Accessible Technology: Documents & Multimedia
http://teachingcommons.cdl.edu/access/docs_multi/index.shtml
US Department of Justice and US Department of Education: Letter to Presidents
http://www.ada.gov/kindle_ltr_eddoj.htm

III. CONCLUSION

"People with disabilities are the world's largest minority group, the only one any person can join at any time." ~ Disabled World [54]

Technology is progressing so quickly that accessibility initiatives are typically afterthoughts rather than built-in aspects of the systems we design or purchase. Disability service offices are often looked at to solve all issues of accessibility with accommodations. However, we must be proactive and realistic if accessibility and usability are to be realized within higher education.

Accessibility is a collective responsibility that requires an institutional commitment across all units. Understanding disabilities and online student success is just the beginning. Accessibility requires leadership, foresight, education, and collaboration. We encourage you to reach out to and work with colleagues across campuses, across systems, across states, and globally to assist in bringing about the cultural and paradigm shift needed to ensure equal access and opportunity for all students.

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V. ABOUT THE AUTHORS

Kristen Betts, Ed.D., is the chief academic officer at Forbes Education. Dr. Betts has served as the director of Online and Blended Learning at Armstrong Atlantic State University and the senior director for eLearning at Drexel University. Additionally, Dr. Betts has served as the director of the blended Ed.D. program in Educational Leadership and Management program for the Philadelphia campus and the founding director of the online Master of Science in Higher Education program at Drexel University. While at Armstrong and Drexel University, she led program and campus initiatives that received distinguished statewide, national, and international awards. Dr. Betts has been a keynote speaker at conferences and government-supported events in Sweden, South Korea, Canada, and across the United States. She serves on several advisory boards and as a conference reviewer for several national and international associations. Dr. Betts is a Quality Matters certified peer reviewer and master reviewer. She is also a Higher Education Resource Services (HERS) Institute alumna and has been a reviewer for the *Journal of Asynchronous Learning Networks* (*JALN*), *Journal for Online Learning and Teaching* (*JOLT*), *Journal of Online Pedagogy and Course Design* (*IJOPCD*), *Journal of Tourism & Hospitality* (*JTH*), and *EDUCAUSE Quarterly* (*EQ*). Dr. Betts publishes and presents nationally and internationally on online and blended education, student/faculty recruitment and retention, adult learning, branding, Online Human Touch, Online First-Year Experience, eAdvising, eStudent Affairs, dashboards, accessibility, cooperative education/work integrated learning, stackable credential programs, and faculty development.

Bill Welsh, M.A., is currently the executive director of Disability Initiatives at Rutgers University in New Brunswick, NJ. He has over 20 years of experience working with individuals with disabilities in higher education. Bill made the change to Rutgers after 14 years as the director of the Office for Disability Services at Penn State University's 24 campus system. In this position, Bill was responsible for ensuring equal access for students with disabilities throughout Penn State's multi-campus system. Bill has worked at several other colleges in this same capacity, including Drexel University and Burlington County Community College. Bill provides trainings, seminars, and consultation on various topics on accessibility and usability on a national level.

In addition to his role as director at Penn State, Bill was the co-chair of Penn State's Accessible Technology and Information (ATI) committee. The charge of the ATI committee is to develop and implement policies; procedures; and strategic plans for implementation of University-wide initiatives on web accessibility, accessible technology and information, accessible instructional materials, and procurement practices. Through the efforts of the ATI committee, Penn State has established University-wide communities of practice groups that include web accessibility review and implementation; accessibility training; a University-wide accessibility web site (http://accessibility.psu.edu); accessible online learning; captioning; assistive and adaptive technology; accessible instructional materials; procurement; and the University Libraries accessibility initiative. In addition, the ATI committee is responsible for ensuring compliance and reporting Penn State's progress in meeting the National Federation of the Blind agreement. As co-chair of the ATI committee, Bill and a team of experts from Penn State developed comprehensive strategic plans, best practices, communities of practice and policies, and procedures for University-wide accessible technology and information.

Cheryl Pruitt, M.S., is the director of the Accessible Technology Initiative with the California State University (CSU) Office of the Chancellor. Cheryl has been a key leader responsible for implementing the Accessible Technology Initiative across the 23 CSU campus system. Cheryl has 11 years of experience in the accessibility field, working towards and promoting access for all. Additionally, she has seven years of

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Kelly Hermann, M.A., has been the director of the Office of College-wide Disability Services at SUNY Empire State College since 2005. Ms. Hermann is responsible for ensuring that all students with disabilities are granted equal access to the programs, activities, and courses at all of the college's 34 locations throughout the State of New York and online. She was awarded Empire State College's award for excellence in professional service in 2008 for her work in establishing the office of college-wide disability services. Ms. Hermann has significant experience providing accommodations for adult learners with disabilities, including veterans, in online courses. She has presented her work in online accommodations and with wounded warriors transitioning to college at various state and national conferences, including the New York State Disability Services Council, the Association for Higher Education and Disability (AHEAD), the Sloan-C Asynchronous Learning Networks, the National University Technology Network (NUTN), the Council for College and Military Educators (CCME), and the National Association for Developmental Educators (NADE). As a recognized leader in the field of accessible online learning, Ms. Hermann has been asked to present at several colleges and universities on universal design and online learning and has also delivered audio conferences and webinars for the Sloan Consortium, Eduventures, and Thompson Interactive on related topics. Ms. Hermann was the chair of AHEAD's standing committee on public policy from its inception in 2008 until 2012 and co-chair of AHEAD's Online Learning and Distance Education Special Interest Group. In 2008, Ms. Hermann was named by then-Governor David Patterson to New York State's Instructional Materials Advisory Council. The council is mandated by New York's Chapter 219 e-text law, which requires publishers to provide electronically formatted textbooks to students with print-based disabilities. Academically trained in speech and language science, Ms. Hermann has worked in higher education with students with disabilities since 2000 and is currently a doctoral student in Educational Administration and Policy Studies at the University of Albany. Her research interests include the application of universal design to educational technology, online learning, and international disability policy.

Gaeir Dietrich is the director of the High Tech Center Training Unit of the California Community Colleges located at De Anza College in Cupertino, California. She is a nationally recognized expert in the area of alternate media and is a founding member of the AHEAD E-text Solutions Group and co-developer of the AHEAD E-text Institute. Gaeir serves on several advisory boards, which include Bookshare, the Alternate Text Production Center, AHEAD, and the Silicon Valley Independent Living Center. She led the Veterans Resource Center project for the California Community Colleges Chancellor's Office. In 2010 and 2011, she served as the chair for the national advisory commission on Accessible Instructional Materials in Postsecondary Education.

Jorge G. Trevino, DBA, SHC (SW) USN, Ret., is a Navy veteran of 24 years, retiring as a US Navy chief petty officer in 2004. While on active duty, he spent over eight years as an Educational Service Officer on board the USS Paul Hamilton DDG 60, USNS Comfort T-AH20, and the National Naval Medical Center in Bethesda Maryland. While on active duty, he also completed an A.A. in Liberal Arts and a B.A. in History and Political Studies from Chaminade University of Honolulu, a M. S. in Management, and Ph.D. in Business Administration with a specialization in Homeland Security Policy from the National Graduate School & University. Dr. Trevino is currently an academic adviser for Penn State University World Campus military programs in Business, Turf Grass Management, and Organizational Leadership, in addition to being a lecturer in Organizational Leadership Studies for the College of Liberal Arts at Penn State and a principle investigator for a study on methods of disclosure concerning veteran on-line students with disabilities.

Terry L. Watson, M.S., is the disability contact liaison for Penn State World Campus. Prior to Mr. Watson's arrival at World Campus, he worked in Student Affairs for 5 years. During this time, Mr. Watson worked with students in transition (SIT) and non-traditional students (adult learners, veterans, and active

duty military personnel). Prior to his Student Affairs profession, he worked in the mental health field as a behavioral specialist for the State of Maine for eight years. Mr. Watson did his undergraduate and graduate work in Human Development at the University of Maine, Orono.

Michael Brooks is an educational technologist with Penn State University's World Campus. In his role, he manages a group of educational technology consultants and specializes in the accessibility and usability of electronic information. His responsibilities focus on the user experience, particularly in terms of instantiating accessible technology within online courses. His expertise in these areas has been developed through formal education and training, conducting user testing, and working directly with users of varying abilities. Since starting with Penn State, Michael has provided usability and accessibility consultation on projects, course designs, and educational web technologies implemented across various colleges and units at the University. He has developed a wide range of training and seminars on the topic of accessibility and presented them at internal, national, and international events. He currently serves on several accessibility advisory committees regarding accessibility strategic planning and design practices, both internal and external to Penn State.

Alex H. Cohen, M.S., is currently a Ph.D. student in Marketing at the LeBow College of Business at Drexel University, where his research focuses on accessibility marketing. Prior to beginning his doctoral program, Alex taught courses as an adjunct professor in Drexel University's School of Hospitality Management. He has over 15 years of experience in the hospitality industry, holding positions such as director of sales and marketing, general manager, and senior VP of operations. As a nontraditional student, Alex completed his master's degree in Hospitality Management in an online program at Drexel University. Diagnosed at age 20, Alex has a degenerative retinal disease known as retinitis pigmentosa, which has robbed him of most of his vision. Alex lives in downtown Philadelphia with his wife and two young sons.

Norman Coombs, Ph.D., is the CEO of EASI (Equal Access to Software and Information) as well as professor emeritus from the Rochester Institute of Technology where he taught history for 36 years. He pioneered RIT's distance learning program and was given Zenith's Master of Innovation Award for his uses of distance learning to mainstream students with disabilities and also was chosen as New York State CASE, (Council for the Advancement and Support of Education) Teacher of the Year in 1990 for using computers in teaching. In 1998, he was selected Man of the Year by AHEAD; in 1999, he received the Strache National Leadership Award from the CSUN Center on Disabilities. In 2000, he was the recipient of the Francis Joseph Campbell Award of the American Library Association for work in helping libraries to meet the needs of customers with disabilities. In 2007, he received the Richard Johnson Pioneers in Educational Technology Award from the Western Cooperative on Educational Technology. Coombs, who is blind, has found adaptive computer technology has transformed his life, and he eagerly works to spread this information to benefit others. Dr. Coombs teaches distance learning classes for RIT. He has taught at a distance for San Diego State University, the New School for Social Research, the University of Washington, the University of Southern Maine, for Environment Canada, and for EASI Corp. He has lectured on distance learning and on making information systems accessible to students with disabilities across the US as well as in Canada, England, Ireland, Hungary, Mexico, Switzerland, and Turkey. He is the author of three books:

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