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Assistive Technology Guidelines for Higher Education Disability Support Staff

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Assistive Technology Guidelines for Higher Education Disability Support Staff

by

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We hereby certify that this dissertation, submitted by Brenda DeLee, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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Abstract

With the changing laws and effective integration of assistive technology into the classroom environment, students can have the provision of multiple means to complete their work with greater independence. In postsecondary education, any student who discloses a sensory, cognitive, or physical disability is eligible to request and receive assistive technology and other services. When used correctly, assistive technology can help students with reading, writing, math, and communication skills. With a possible influx of students, disability support staff must be prepared and willing to meet the needs and address issues relating to students with disabilities. If their needs are not met, this student population may be left to face accessibility challenges that will hinder their academic success.

The goal was to make the college experience positive for all students by producing a resource guide for Disability Support Staff (DSS). This was accomplished by conducting an extensive literature review along with collecting data from DSS professionals from various community colleges within North Carolina. Analysis of the data resulted in recommendations on topics including, specific assistive technology solutions according to disability, training for students and faculty along with various outreach activities that can be used to increase awareness of services and accommodations provided by DSS.

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Chapter One

Introduction

Background

Participation of students with disabilities in postsecondary education has been increasing steadily in the past two decades (Katsiyannis, Zhang, Landmark, & Reber, 2009). According to Guyer and Uzeta (2009), revised federal laws and the explosion of assistive technology (AT) are making postsecondary education a realized dream for these students. Due to these changes, higher education administrators must be willing to acknowledge and address issues surrounding accessibility. Hamblet (2014) and Fleming, Plotner, and Oertle (2017) reported that many do not complete their degrees at the same time as their typical peers. The differences in educational settings, a possible lack of Disability Support Staff (DSS) knowledge, and limited AT resources may be reasons for unsuccessful completion.

It is imperative that postsecondary institutions have an individual or office dedicated to supporting students with disabilities. Disability Service Offices (DSOs) play a vital role with students on campus as they are responsible for providing AT and the training needed to use it (Cory, 2011). Once a disability is disclosed, students meet with staff to determine how their disability may have an impact on their college experience. However, with the differing laws regarding identifying disabilities, some DSS may experience challenges when assisting this student population.

Problem Statement and Relevance

Federal laws supporting the rights of students with disabilities access to postsecondary education and the increased selection of AT have helped to facilitate a significant increase in the number of individuals with disabilities pursuing higher education (Summers, White, Zhang, &

Gordon, 2014). However, despite the legislative laws and additional resources the rate at which students complete their education continues to fall behind students who do not have disabilities (Barnard-Brak, Lechtenberger, & Lan, 2010; Fleming et al., 2017; Katsiyannis et al., 2009; Summers et al., 2014). Bolt, Decker, Lloyd, and Morlock (2011) equated the low completion rates to the differing legislative laws between secondary and postsecondary environments. Barnard-Brak et al. (2010) attributed a lack of understanding by institutions of higher education for this special student population as a reason for low completion rates while Holmes and Silvestri (2012) suggested the lack of expertise of personnel identifying and providing training in AT.

As more students with disabilities enter higher education, it is critical to obtain an accurate profile of who these individuals are and what factors influence their persistence in college (Mamiseishvilli & Koch, 2010). According to Guyer and Uzeta (2009), most postsecondary institutions have a DSO or a similar department devoted solely to assisting students. Even though postsecondary institutions are increasing the services they provide to students needing accommodations, there is still a lack of focus on providing appropriate accommodations to address specific learning needs of individual students (Floyd, 2012). Shackelford (2009) stated with the enhanced benefits in the GI Bill, a greater number of veterans are pursuing higher education. DSS must also be trained to distinguish and comprehend accommodation and AT issues as each student may have a unique circumstance.

Banerjee, Madaus, and Gelbar (2015) maintained there is a continuous necessity to identify and target professional development needs of DSS. When researching how providers received training, they found that 63% reported obtaining their primary training via conferences

and workshops. Due to lack of knowledge and resources, eligibility decisions may be made based on insufficient information. DSS who are not adequately trained can have a negative impact on students, faculty, and staff.

Guyer and Uzeta (2009) implied that it would be wise for higher education institutions to assist students in seeking out all possible available AT resources; therefore, it is imperative for DSS to market their existence and services they provide. While some students may be able to navigate the system for seeking information, others face challenges when locating these resources. Newman and Madus (2014) found that only 23% of students received accommodations once they entered postsecondary education as opposed to 95% in secondary school. Newman equates the low utilization rate to the lack of student awareness of existing accommodations and the benefit they offer.

If students request and receive AT, it may not be beneficial as it may not meet their needs or because training was not provided on to how to use it. When examining students' perceptions relating to requesting services, Bolt et al. (2011) found that over 36.2% of students considered system-level issues to be a hindrance. This included a lack of available AT and training needed to use it as well as issues navigating the system of support.

According to Katsiyannis et al. (2009), educators play an essential role in ensuring that students with disabilities receive quality instruction. However, there are many factors that could influence their willingness to provide accommodations including lack of knowledge relating to the importance of serving this student population and awareness of government mandated laws. Even when presented with proper documentation, some professors may still be unwilling to accommodate students (Marshak, Wieren, Ferrell, Swiss, & Dugan, 2010). Additionally, a lack

of training on how to use AT and create accessible course content could be a reason for faculty reluctance to provide accommodations. If faculty are to successfully interact and provide assistance to these students, it is vital that they are properly trained.

While AT training is normally focused on access for students, the training of librarians must not be forgotten (Guyer & Uzeta, 2009). Having accessible libraries are crucial to student's success as they must provide auxiliary aids and services necessary to locate and use library resources and materials. Therefore, training is needed for librarians to properly aid this student population.

For students with disabilities, a successful navigation of the postsecondary environment means working with DSS, faculty, and staff to determine what resources are available to enhance their overall learning experience (Cawthon & Cole, 2010). When investigating barriers students faced when requesting and receiving AT and other accommodations, Cawthon and Cole (2010) found students' unawareness of available services, unwillingness of professors to provide accommodations, and university's refusal to provide specific AT as major challenges. The problem identified for investigation was that some DSS are not adequately prepared to serve students with disabilities. This student population is left to face challenges due to lack of awareness of services provided or how AT can help them as well lack of training provided to correctly use requested AT. Faculty play a vital role in assisting students with disabilities; however, most may not be aware of the laws that mandate accessibility. Additionally, they may not be properly trained on how to deal with student issues or how to aid them when using technology in the learning environment.

Dissertation Goal

Despite changing federal legislation and increased access to AT, students with disabilities continue to face challenges that result in lower graduation rates compared to students their peers (Marshak et al., 2010). Guyer and Uzeta (2009) affirmed that increased usage of AT will aid in student success but only if it is specific to their needs and training is provided on how to use it. Fleming et al. (2017) added increased awareness of disability laws, providing adequate support, and repressing negative mindsets towards students with disabilities are vital to establishing a path for improved outcomes for this student population. The goal was to consolidate useful guidance for higher education DSS to best serve students by producing and disseminating a resource guide for DSS to use when identifying and providing specific AT. Topics discussed in the guide include:

1. Government mandated accessibility laws
2. Assistive technology solutions based on specific disabilities
3. Training for students
4. Training for faculty
5. Activities and events disability support staff can use to create awareness for students, faculty and staff relating to assistive technology and other available services

Research Questions

The following research questions were used to guide this study.

1. What are the government prescribed mandates of the DSO?
2. What processes are used to reach out to students to identify disabilities?
3. What technologies are used to provide necessary accommodations?

4. How do students obtain necessary technology and training to use it?
5. What technical training must DSOs provide to faculty?
6. What are the guidelines that should be provided to institutions to ensure student success?

Barriers and Issues

There were no barriers during this study.

There were no issues during this study.

Limitations and Delimitations

Gay, Mills, and Airasian (2012) described limitations as aspects of the study the researcher cannot control but believes may impact the results. The primary limitation of this study is that participants will be asked to be involved throughout the entire process which may include several phases of evaluations. With this research focusing on the educational environment, an influx in student enrollment and students' needs may prevent DSS from providing feedback in a timely manner.

The study was limited to DSS serving two-year, postsecondary community colleges within North Carolina. Further research would need to take place to determine if the guidelines would be applicable to business or industry environments.

Definitions and Acronyms

Accessibility – access of computer systems, software, or other related items to all people regardless of disability or severity of impairment (Sobczak, 2013).

Accommodations **-** altering the education environment to allow students with disabilities equal access to (Oertle & Bragg, 2014).

American with Disabilities Act (ADA) **–** The American with Disabilities Act is federal legislation that prohibits discrimination based on disabilities (Guyer & Uzeta, 2009).

Assistive Technology (AT) – Assistive Technology refers to equipment, software, and any other technology related device that can assist people with disabilities in their daily activities (Coleman & Berge, 2018).

Assistive Technology Act (ATA) – The Assistive Technology Act is a law crucial to the increase and availability of AT devices and services (Alkahtani, 2013).

Assistive Technology Services –any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device (http://idea.ed.gov/explore/view/p/,root,regs,300,A,300%252E6).

Cognitive Disability **–** a disability that will cause individuals to struggle with problem-solving, memory, attention, and comprehension (Sobczak, 2013).

Disability – A physical or mental impairment that substantially limits one or more major life activities of an individual (Coleman & Berge, 2018).

Disability Service Office (DSO) – The Disability Service Office is a centralized office with professionals who are knowledgeable about accessibility laws and serves at the primary point of contact for students with disabilities (Oertle & Bragg, 2014).

Disability Support Staff (DSS) – Disability Support Staff is personnel who are responsible for supporting students with disabilities (Cory, 2011).

Individuals with Disabilities Education Act- (IDEA) – The Individuals with Disabilities Education Act is a law that mandates that students with disabilities between the ages of 3 and 21 will receive a free and appropriate education (Floyd, 2012).

Physical Disability – any impairment that limits the physical function of one or more limbs (Sobczak, 2013).

Postsecondary Education –Education involving any educational program that takes place after you complete your secondary education which includes: community college, professional certification, undergraduate education and graduate school (http://classroom.synonym.com/difference-between-secondary-postsecondary-education-1288.html).

Rehabilitation Act of 1973 (Section 504) - a law that requires postsecondary institutions to provide equal access to all aspects of a college campus and its programming (Marshak et al., 2010).

Rehabilitation Act of 1973 (Section 508) – a law the requires all government funded technology to be accessible. (Coleman & Berge, 2018).

Secondary Education - Secondary education refers to schooling that takes place during the middle and high school years, between sixth and twelfth grade. (http://classroom.synonym.com/difference-between-secondary-postsecondary-education-1288.html).

***Sensory Disability* –** impairment relating to seeing, listening, and communicating (Asselin, 2014).

***Students with Disabilities* –** students with a physical or mental impairment which substantially limits one or more major life activities (Cawthon & Cole, 2010).

***Transitioning Students* -** students making the transition between high school and college (Cawthon & Cole, 2010).

Summary

This research study consists of five chapters. Chapter 1 contains the Introduction which include reasons that substantiate the need for the resource guide and a problem statement that is relevant to the research. The goal is to make the college experience positive for all students by producing a resource guide.

Chapter 2 contains a comprehensive review of the literature and laws that affect students with disabilities. Outreach activities and events along with the various roles that DSS, students, and faculty have in requesting and providing AT are reviewed. Different AT solutions for specific disabilities found in higher education and the training needed to use them are discussed.

The research methodology is discussed in chapter three. Specific details regarding instruments used to collect data and the framework used to create the guide are highlighted along with the steps taken to answer each research question. Data collection and analysis procedures in addition to resources needed to conduct the research are discussed.

The results of the research are presented in chapter four in a narrative format. Chapter 5 focuses on the conclusions of the study. Implications and recommendations for future research are also discussed.

Chapter Two

Literature Review

Overview

Although an increasing number of students with disabilities are considering higher education opportunities, many of these students find the challenges intimidating as compared to their secondary educational experiences (Garrison-Wade, 2012). Postsecondary institutions are required by law to provide reasonable academic adjustments and assistive technology (AT) to students who disclose their disability and request assistance (Newman & Madus, 2014). However, the diverse needs of this student population may pose challenges for higher education institutions.

This literature review discusses the profiles of students with disabilities and the increased number that enter higher education. Additionally, it focuses on Disability Support Staff (DSS) and the laws that govern accessibility along with activities and events used to create awareness among students, faculty, and staff. Student and faculty responsibilities and perceptions are discussed. Common AT solutions used in higher education for specific disabilities are examined along with appropriate training needs of students and faculty.

Students with Disabilities and Higher Education

The American with Disabilities Act (ADA; https://www.ada.gov/ada_intro.htm) defined disability "as a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment." The National Center on Accessible Educational Materials (AEM; http://aem.cast.org) grouped disabilities into three broad

categories: sensory, physical, and cognitive (DeLee, 2015). The Centers for Disease Control and Prevention (CDC; http://www.cdc.gov) suggest there are many types of disabilities that can affect a person's vision, movement, thinking, remembering and learning. Communication skills, hearing, mental health and social relationships may also be affected. Disabilities can affect people in different ways even when one individual has the same type of disability as another.

Expanding the postsecondary educational opportunities for students with disabilities has been a priority for more than 20 years (Katsiyannis et al., 2009). Lightner, Kipps-Vaughan, Schulte, and Trice (2012), maintained the number of high school graduates with learning disabilities enrolling in higher education has tripled in the last two decades.

According to The National Center for Learning Disabilities (NCLD; http://www.ncld.org) 50% of students with learning disabilities will enroll in a two-year or community college education within eight years of leaving high school. Additionally, 36% will enroll in a business, vocational, or technical school while 21% will attend a 4-year college or university.

The National Center for Education Statistics (NCES; http://nces.ed.gov) researched various degree granting higher education institutions to determine the number of enrolled students with disabilities. Eighty-eight reported having students taking one or more courses (http://files.eric.ed.gov/fulltext/ED520976.pdf).

Types of Disabilities

Cognitive Disabilities

DeLee (2015) stated researchers Judge and Floyd (2011) affirmed that individuals with cognitive impairments experience challenges acquiring information due to difficulty with

memory, association, and attention. There are at least two ways to diagnose cognitive disabilities: clinically or functionally.

Clinical diagnoses of cognitive disabilities include autism, Down Syndrome, traumatic brain injury (TBI), and even dementia. https://www.disabled-world.com/disability/types/cognitive/. Additionally, psychological disabilities fall under this category. These disabilities include depression, anxiety, schizophrenia, and post-traumatic stress disorder. A functional diagnosis ignores the medical or behavioral causes of the disability and instead focus on the resulting abilities and challenges. Some of the main categories of functional cognitive disabilities include deficits or difficulties with: https://webaim.org/articles/cognitive/

- Memory – The ability to recall learned content.
- Problem-solving – To define a problem and identify or create a solution
- Attention – Focused and not easily distracted
- Reading, linguistic, and verbal comprehension – Difficulty understanding non-literal and non-existent text
- Math comprehension – Difficulty working with numbers and number processes
- Visual comprehension – Difficulty processing visual information

Sensory Disabilities

Sensory disabilities can affect any of the five senses including vision, hearing, smell touch, and taste. For educational purposes, it generally refers to a disability related to hearing either vision, or

both http://www.doe.virginia.gov/special_ed/disabilities/sensory_disabilities/index.shtml.

According to The American Foundation for the Blind (AFB; http://www.afb.org/info/living-with-vision-loss/eye-conditions/glossary-of-eye-conditions/low-vision-and-legal-blindness-terms-and-descriptions/1235#VisualImpairment), a visual impairment is a general term that describes a wide range of visual function, from low vision through total blindness. Visual impairments can be due to disease, trauma, or congenital or degenerative conditions. There are some different terms used to describe levels of vision disability. These terms include, 'Partially-Sighted,' 'Low-Vision,' 'Legally Blind,' and, 'Totally Blind.'

According to DeLee (2015), Sobczak (2013) stated hearing disorders interfere with an individual's ability to analyze and process information taken in through the ears. Hearing loss is typically described as slight, mild, moderate, severe, or profound. The American Speech-Language-Hearing Association (ASHA; https://www.asha.org/public/hearing/Types-of-Hearing-Loss/) confirmed three types of hearing loss:

- Conductive – happens when sounds cannot get through the outer and middle ear
- Sensorineural – happens after inner ear damage
- Mixed – happens when the outer, middle, and inner is damaged

Physical Disabilities

A physical disability limits the physical function of one or more limbs (Sobczak, 2013). Some of the common disabilities include: cerebral palsy, spinal bifida, muscular dystrophy, and multiple sclerosis. The disability can be mild or severe and may interfere with an individual's ability to perform daily activities such as writing, walking, or running.

Higher Education Accessibility Laws

Bolt et al. (2011) asserted there are different laws that govern how students with disabilities receive accommodations. When transiting into postsecondary education settings, students enter a legal and regulatory framework that is substantially different from that found in their K-12 schools (Lovett, Nelson, & Lindstrom, 2014). The ADA of 1990 (ADA) and the American with Disabilities Act Amendments Act (ADA-AA) apply to postsecondary students while the Individual with Disabilities Education Act, 2004 (IDEA) serves pre-school to high school students (Leake & Sodden, 2014). The Rehabilitation Act of 1973 (Sections 504) pertains to students in both secondary and postsecondary educational environments while (Section 508) eliminates barriers in information technology. The Assistive Technology Act (ATA), first passed in 1988 as the Tech Act, relates to increasing AT awareness.

ADA

In recent years there has been an increase in the number of students with disabilities seeking higher education. According to Summers et al. (2014), students enrolling in postsecondary education is an outgrowth of the ADA and the ADA-AA.

Under the ADA, postsecondary institutions are required to provide reasonable accommodations to students who disclose their disability and request assistance (Newman & Madaus, 2014). These regulations have afforded students equal opportunities to pursue higher education. Simon (2011) affirmed the ADA prohibits discriminatory actions which include:

1. Denying qualified students equal opportunity to participate in programs and activities
2. Providing aids and services that are not “equal to” or as “effective as” those provided to others
3. Use methods of administration that result in discrimination

4. Use eligibility criteria that screen out or tend to screen out individuals with disabilities
5. Fail to provide reasonable accommodations

IDEA

The IDEA was enacted to serve students with disabilities in secondary institutions. Under this mandate, students at the K-12 level are guaranteed services (Newman & Madaus, 2014).

According to Floyd (2012), individuals between the ages of 3 and 21 are provided with a free and appropriate education under the mandates of the IDEA. The Department of Education (DOE; http://idea.ed.gov/) state the IDEA is a law that ensures services to children with disabilities throughout the nation (DeLee, 2015).

Rehabilitation Act of 1973 (Section 504)

Section 504, a part of the Rehabilitation Act, applies to secondary and postsecondary educational environments. According to Katsiyannis et al. (2009, p. 36), Section 504 mandates that no qualified individual with a disability be "excluded from the participation in", be denied benefits of, or be subjected to discrimination under any program or activity receiving federal funding.

All public and most private colleges and universities that receive federal assistance must adhere to these laws (Katsiyannis et al., 2009). In addition, institutions may not place quotas regarding admission of individual with disabilities nor can they be excluded from participating in or receiving benefits from academic research.

Rehabilitation Act of 1973 (Section 508)

Section 508, also part of the Rehabilitation Act, originally mandated that all electronic and information technology used by the federal government be accessible. A recent update of

this law still applies mainly to federal agencies; however, colleges and universities are subject to compliance under Title II of the Higher Education Act. Title II protects individuals with disabilities from discrimination on the basis of disability in services, programs, and activities provided by state and local governments (https://www.ada.gov/ada_title_II.htm).

ATA

According to The Center for Parent Information and Resources (CPIR; http://www.parentcenterhub.org/repository/ata/#purpose), the ATA was first signed into law by the President as the Technology-Related Assistance Act of 1988 and has been reauthorized in 1994, 1998, and 2004. The focus of the ATA has always been to increase awareness and access to assistive technology (http://www.idahoat.org/ATtheLaw/TechnologyAct.aspx).

The DOE (http://www2.ed.gov/programs/atsg/legislation.html) stated the purposes of the ATA are to:

1. Support state efforts to improve the provision of AT to individuals with disabilities through state programs and technology-related assistance.
2. Provide states with financial assistance that supports programs designed to maximize the ability of individuals with disability and to obtain AT devices and AT services.

Disability Support Staff

The primary point of contact for students with disabilities on postsecondary education campuses is typically the disability services office (DSO). The number of staff in these offices and their skill level varies from campus to campus. According to Gallego and Busch (2015), these offices are now common if not essential elements of student services and are responsible for assuring that students receive specific AT services and accommodations. The CIPR

(http://www.parentcenterhub.org/repository/ata/#purpose) outlined possible services provided by DSOs to include:

1. Evaluating the AT needs of individuals
2. Creating awareness of services and accommodations
3. Purchasing AT devices
4. Training and technical assistance for students and faculty

To aid in student success, DSS collaborate with other departments on campus such as academics, the learning center, career services, information technology services, as well as the library. In addition to providing support, they have the responsibility of suggesting technologies for instructors to integrate into the learning process and provide training for faculty (Gallego & Busch, 2015). Fichten, Asuncion, and Scapin (2014) recommended DSS train all who are involved with students on how to effectively use AT. Fleming et al. (2017) suggested collaboration between DSS, educators, and counselors is needed to assist students with preparation for academic and career success.

Assistive Technologies

The National Assistive Research Institute (NARI; http://natri.uky.edu/resources/fundamentals/defined.html) defined AT as a combination of *assistive* devices, which help people with disabilities perform a given task and *adaptive* devices which are used to change or modify the environment. The NARI suggests that AT be classified in four different categories including:

1. High tech – devices that incorporate sophisticated electronics or computers
2. Medium tech – mechanical devices such as wheelchairs
3. Low tech – adapted spoon handles or Velcro fasteners

4. No tech – physical therapy or occupational therapy

Guyer and Uzeta (2009) added AT does not have to involve technology and described it as pieces of equipment used to increase functional capabilities for individuals with disabilities. Newman and Madaus (2014) maintained non-tech AT such as extended exam time and alternative exam formats are commonly used in education.

Purpose of AT

With effective integration of AT into the classroom environment, students can have the provision of multiple means to complete their work with greater independence (Ahmad, 2015). Each individual is unique and what is suitable for one may not be appropriate for another. Gregg, 2011; Lindstrom, 2007 (as cited by Weiss, Dean, and Osborne 2014) stated AT that is specific have the potential to provide the greatest benefit.

When used as an accommodation, AT can help students with reading, math, and communications skills (Asselin, 2014). Guyer and Uzeta (2009) added that the use of AT will allow students to gain increased access to instruction and active engagement in learning and make simple tasks such as taking notes or doing library research possible. Effective use can be the key to keeping students motivated as well as the difference between experiencing success or failure for students (Alkahtani, 2013; Conner & Beard, 2015).

Disabilities and AT

Many more individuals with disabilities are setting postsecondary education goals (Guyer & Uzeta, 2009). To be eligible for AT and other accommodations, postsecondary students must demonstrate substantial limitations that keep them from accessing academic, residential, or other programs that their college or university provides (Lovett et al., 2014).

Whether a student needs AT that is technology related or not, it is important that it proves to be beneficial. Each student is unique and what enhances the learning process for one may hinder it for another. Lyman et al. (2016) found students received AT that was not effective or helpful and in some cases was a detriment.

Coleman and Berge (2018) stated cognitive disabilities are not always evident and often go unnoticed by educators. Due to the broadness and uniqueness of these disabilities, AT options should be as plentiful as possible.

According to Brault (2012), the 2010 census report revealed over 14 million people had some type of sensory disability and required the use of AT. Screen readers, braille displays, and speech-to-text programs are some of more common types of AT available for students with vision impairments, while closed-captioning should be used to ensure equal access for those with hearing difficulties.

Students with physical impairments require AT that is specific to their needs. Due to the limited mobility of these students, course materials should be created with keyboard shortcuts. Having easy to find menu options can also be beneficial for students who use technologies that are not equipped with a standard mouse such as a smartphone (Coleman & Berge, 2018). Using conventional assistive technologies such as voice recognition software or expanded keyboards are recommended (DeLee, 2015). These tools may assist students engage in educational activities independently and lessen the need for specialized educational support.

Postsecondary institutions have an obligation to provide auxiliary aids to assist students when using library services; however, it is important to know that different disabilities require different AT (Guyer & Uzeta, 2009). It is essential to ensure that AT solutions are need-based,

cost effective, and easy to use. Table 1 shows a list of disability categories along with specific AT solutions that can be used to enhance the learning process (Ahmad, 2015; Arzola, 2016; Asselin, 2014; Guyer & Uzeta, 2009; Sobczak, 2013).

Table 1. AT Solutions

Category of Disability	Assistive Technologies
Sensory • Vision • Hearing	1. Text-to-speech Software *(Kurzweil, Read and Write, Adobe Reader, and WYNN)* 2. Digital Books 3. Screen Reader Programs *(Zoom Text and JAWS)* 4. Screen Enlargement 5. Speech-to-text software (*Dragon Naturally Speaking, Speak Q, and Windows Narrator)* 6. Enlarged Print Textbooks 7. Large Monitors 8. Digital Audio Recorders 9. Learning Management Systems 10. Podcasts (lecture recordings) 11. Blogs 12. Wikis 13. Captioned Videos
Cognitive • Attention Deficit Hyperactivity Disorder • Memory loss issues	1. Electronic Organizers 2. Recorded Materials 3. Hand held scanners 4. E-readers 5. Talking Calculators 6. Digital Pens 7. Incorporating graphics and illustration in course content 8. I-pads and Laptops 9. Learning Management Systems 10. Captioned Videos 11. Cloud Storage *(Dropbox, Google Docs, and One Drive)*
Physical • Cerebral Palsy • Spinal Cord Injury • Degenerative Diseases • Multiple Sclerosis	1. Adjustable Tables 2. Ergonomic Chairs and Keyboards 3. Trackballs and Mouse controls 4. Learning Management Systems 5. Interactive White Boards 6. Digital Pens 7. Speech-to-text software (*Dragon Naturally Speaking, Speak Q, and Windows)* 8. Touch Screens 9. Text-to-speech Software *(Kurzweil, Read and Write, Adobe Reader, and WYNN)*

Technology has great potential in providing access for all learners (Ahmad, 2015). As technology continues to advance so should the refinement of accommodations. With emerging technologies and the greater number of students with disabilities attending postsecondary education institutions, Guyer and Uzeta (2009) stated such institutions need to stay current on new AT. According to Asselin (2014), institutions should become familiar with Web 2.0 technologies like social networking, blogs, conferencing tools, learning and organization applications on mobile devices and participation in learning courses to enhance cognitive and functional aspects of the college environment. Fichten et al. (2014) implied that current approaches to online learning and accessibility will continue into the next decade and will allow increased usage of new technologies such as:

1. Wearable technologies - Smartwatches
2. Mobile technologies – Laptops, Notebooks, Smartphones, and Tablets

Students

Barriers

Marshak et al. (2010) viewed postsecondary education as a critical component in gaining suitable and meaningful employment. Being in an unfamiliar environment can be challenging for some students. Adding the responsibility of requesting AT or accommodations can be overwhelming for those who are not transiting directly from high school, in particular.

According to Marshak et al. (2010), federal laws require most postsecondary institutions to provide equal access and reasonable accommodations for students with disabilities. However, due to various reasons, some students may not fully take advantage of the services provided to them. When examining why students do not request assistance, Marshak et al. (2010) found that

confusion about accessibility and the services provided by the DSO were major concerns for students. Identity issues, not wanting to be singled out, perceived quality and usefulness of services, and negative experiences with professors were also found to be concerns. In a similar study, Cawthon and Cole (2010) found some students with disabilities felt that faculty did not want them enrolled in their classes or thought them to be incompetent. Others faced difficulties due to their professors not being aware of how to assist them or unwilling to provide specific accommodations (Fleming et al., 2017).

According to Simon (2011), higher education must make academic adjustments to ensure that students have equal access to education. Therefore, it is important that institutions continuously improve how they serve students with disabilities.

Student Responsibilities

Students with disabilities who make the transition from secondary to higher education can encounter multiple challenges (Asselin, 2014). In addition to getting acclimated to their new environment, familiar services and accommodations they received in high school may not be available in the new setting. These students begin searching for colleges early and it is important that the institution they select is the right fit for them (Korbel et al., 2011). The type and accessibility of AT along with other support services can be the deciding factor on which college they select.

In higher education students are required to request accommodations. It is pertinent that transitioning students are fully aware of what is needed to aid them in academic success and the difference between high school and college. Documentation that was required and accepted in one environment may not meet the needs or requirements of the other. Each institution may

require different types of verification to identify disabilities. When determining if and what types of documentation postsecondary institutions requested to validate disabilities, The National Center for Education Statistics (NCES; (http://nces.ed.gov) found 92% percent of institutions required students to provide documentation to validate their disability (http://files.eric.ed.gov/fulltext/ED520976.pdf). Eighty percent reported accepting vocational rehabilitation evaluations while 44% accepted Individual Educational Plans (IEPs) from secondary schools. Forty percent stated accepting Section 504 plans as documentation to determine eligible disabilities.

Student Training

Students need to be supported in learning to use the technology to be able to successfully access it; otherwise, the results may prove to be worse than having no access at all (Ahmad, 2015). Training students on how to use AT is normally the responsibility of DSS (Fichten et al., 2014). While some students who enter higher education with documented disabilities may be comfortable with using AT, others are not. With more adult learners and veterans taking advantage of higher education, DSS must be willing and able to provide the training needed to use the more common AT such as text-to-speech software, voice recognition software, audio recorders, and trackballs or mouse controls.

While DSS are mainly responsible for supporting students with disabilities, Guyer and Uzeta (2009) stated that libraries in postsecondary education institutions have an even greater role in educating and assisting students. Not only should the facility be accessible but libraries should provide updated AT that make programs accessible. One of the most basic assistive technologies provided by postsecondary libraries is books in alternative formats. Summers et al.

(2014) found a lack of compatibility between the e-texts and the AT being used as students were receiving materials that were not same as the ones being used in their current courses. An accessible library with significant AT is worthless, unless the students know how to use such technologies (Guyer & Uzeta, 2009).

When examining accessibility challenges students faced in online courses using Blackboard (Learning Management System), Muwanguzi and Lin (2010) found students were dissatisfied with the lack of training received to properly use the Learning Management System to locate course materials. Roberts, Crittenden, and Crittenden (2011) stated with distance education on the rise as an alternative to traditional education, institutions should increase their services and provide training to this sometimes forgotten student population.

Faculty

Faculty Responsibilities and Perceptions

Faculty play a crucial role in assisting students accomplish their educational goals. Ahmad (2015) and Katsiyanns et al. (2009) argued that it is the responsibility of all faculty to understand federal mandates regarding disability services. Also, it is an ethical obligation for faculty to identify and apply best practices and effective instructional strategies to aid students with disabilities. They recommended higher education institutions provide training to faculty so they can effectively implement these strategies.

Lomardi and Murray (2011) evaluated faculty attitudes and perceptions towards students with disabilities. Findings revealed several factors relating to this student population including:

1. Fairness in providing accommodations
2. Knowledge of disability law
3. Adjustment of course assignments

4. Campus resources and training
5. Accessibility of course materials
6. Willingness to invest time

With increasing numbers of students taking advantage of online learning, providing adequate accommodations for students with special needs is a crucial component to their overall success. According to Roberts et al. (2011), more programs are developed for online delivery, thus creating additional educational avenues for a diverse population of students who, for various reasons, may have been unable to succeed or participate in a traditional educational environment.

According to Owusu-Amsah, Neill, and Haralson (2011), despite the expanded opportunities that technology affords in student-access to higher education, most institutions of higher education are hesitant to offer technology-based distance education courses. This hesitation stems partly from faculty concerns regarding training needed to properly address accessibility issues.

Faculty Training

According to Ahmad (2015), a major challenge in the effective use of AT is the level of expertise and training educators have regarding the technology use and application. In addition to providing training on accessibility laws, DSS have the responsibility of providing technical assistance to faculty (Katsiyannis et al., 2009).

Harvard and Piper (2013) found a lack of training to be one of the top concerns of faculty when creating accessible instructional materials. Since it is impossible to know in which courses student with disabilities will enroll, Fichten et al. (2014) suggested training faculty on how to use technology to enhance overall instruction.

According to Alkahtani (2013), it is essential that faculty know how to use computer software to enhance instruction, e-readers, digital pens, and other commonly used AT by students. When examining the knowledge level of educators, he found that 94% reported having little to no knowledge or skills using AT. Providing adequate training and support for faculty may alleviate some of the challenges and increase motivation and desire to teach and accommodate students with disabilities. Fichten et al. (2014) recommended faculty should be trained in areas that will allow them to create accessible course content such as:

1. Webpage creation
2. Creating accessible audio and video files
3. Proper use of Learning Managements Systems
4. Using application software to create accessible documents
5. Proper use of Social Media for instruction
6. Creating instructional materials using Universal Design for Learning principles

To ensure students receive equal access, DSS must be willing to train faculty how to use AT to enhance instruction. Fichten et al. (2014) added that it may be impossible to know which courses a student with a disability may take. Therefore, the training should anticipate and assume this reality.

Outreach and Awareness

Korbel, Lucia, Wenzel, and Anderson (2011) expressed the importance of making students aware of services offered at post-secondary institutions. Fleming et al. (2017) stated it is crucial for DSS to increase their visibility on campus to ensure students are able to easily access services needed.

Prior to arriving on a campus, students should know where the DSO is located and the process for requesting accommodations and services. Lightener et al. (2012) suggested DSS contact local high schools to provide them with information regarding available services. Hamblet (2014) proposed reaching out to families to ensure they understand the college accommodation system such as disability accommodation services and the benefits associated with applying for disability support services. Korbel et al. (2011) recommended that higher education DSS dedicate a full day for secondary school personnel to attend workshops and presentations. Garrison-Wade (2012) added arranging for secondary students to visit college campuses could lessen some of the challenges faced with moving from one educational setting to another.

According to Lightner et al. (2012), some new students can easily become overwhelmed when arriving on campus because they receive countless brochures, catalogs, and other information from almost every department at the institution. It would be easy for documentation regarding disability services to get lost in the mounds of paper. It is important for students to know when they arrive on campus or soon thereafter, what accommodations and AT are provided by the institution.

Some students transitioning from secondary education may be able to quickly adapt to the new environment and technologies; however, adult learners may come to campus without knowledge of how AT can aid them in the learning process (Gomez, 2014). Garrison-Wade (2012) proposed creating a mentoring program consisting of other students with disabilities and faculty to assist these students. Arzola (2016) recommended engaging students in more assemblies to increase awareness while Gomez (2014) suggested having information in the

student handbook for busy adults who only come to campus for classes and leave immediately after or students who take online courses. Sending mailings, brochures, or using the website are other means of disseminating information (Marshak et al., 2010).

According to Hamblet (2014), preparing students with disabilities for success at college requires a focused effort by everyone involved. Arzola (2016) maintained that DSS should consult with higher education administration to create and increase awareness. Additionally, it is equally important for faculty, staff, and other students to know how to interact with this student population.

A recent study conducted by Fleming et al. (2017) found students felt ignored, insignificant, misjudged, and overlooked at their university. These feelings were based on interactions with professors, advisors, and other staff members. Lyman et al. (2016) conducted similar research that resulted in students sharing negative experiences they incurred with faculty and staff. Due to the influx of students with disabilities obtaining post-secondary education, institutions should work diligently to create a campus that promotes an inclusive environment.

Summary

According to Floyd (2012), there is a rising population of learners taking advantage of higher education who need AT to assist them with successful completion of their degree. It is vital that those who are responsible for supporting them are adequately prepared. With such diverse disabilities, each student may pose a unique situation and higher education must be aware of the possible changes needed to fully accommodate these students. Floyd (2012) asserted that designing and providing effective services is critical so students can receive full benefits from their postsecondary education. Information presented in this literature review

reveals the importance of providing specific AT and reasonable accommodations to students with disabilities.

Chapter 3

Methodology

Overview

Changes in federal legislation and evolving assistive technology (AT) have allowed students with disabilities to take advantage of higher education. New laws mandate that institutions provide students with disabilities equal access to learning opportunities by providing appropriate AT to enhance their learning experience. While some Disabilities Service Offices (DSOs) may have Disability Support Staff (DSS) who are properly trained to serve this student population, others face difficulties. These difficulties may be partially due a lack of knowledge and resources.

The goal was to consolidate useful guidance for higher education DSS to best serve students. A resource guide was designed and developed that covers the following topics:

1. Government mandated accessibility laws
2. Assistive technology solutions based on specific disabilities
3. Training for students
4. Training for faculty
5. Activities and events disability support staff can use to create awareness for students, faculty and staff relating to assistive technology and other available services

Research Design

Creswell (2013) stated that utilizing research design means having a plan to conduct a study. The study focused on designing, developing, implementing, and evaluating a resource guide for personnel who work in higher education disability services. Both qualitative and quantitative methods were used to conduct this study.

Qualitative research is an inquiry process of understanding based on a distinct methodological approach to inquiry that explores a social or human problem (Creswell, 2013). Additionally, it allows for a detailed understanding of why the resource guide is needed. This can only be addressed by directly communicating with the individuals involved.

Quantitative research is the collection and analysis of statistical data to describe or explain a phenomenon of interest (Gay et al., 2012). Evaluation instruments containing closed-ended questions were used with answers crafted in the form of a Likert scale. According to Gay et al. (2012), this is an attitude scale that measures an individual's beliefs or perceptions about a situation. Response options for frequency consisting of "1 –very rarely, 2 – rarely, 3 - occasionally, 4 –frequently, 5 – very frequently" were used. Options for agreement consisting of "1 – strongly disagree, 2 – disagree, 3 – neither agree nor disagree, 4 – agree, 5 – strongly agree" were also used.

An instructional design process was used to create the resource guide. According to Holden (2015), the concept of instructional design was introduced over five decades ago. It is a framework for creating learning materials in an organized format.

ADDIE is a generic, five-step model for instructional design (Branch, 2009). Its components are:

Analyze – Determine the target audience and collect pertinent data from experts.

Design – Plan and identify course objectives. Decide how the content will be delivered.

Develop – Produce the instructional materials.

Implement – Utilize instructional materials in real life situations.

Evaluate – Collect feedback from actual users.

It is used in an iterative fashion to ensure materials are developed in a systematic manner thus making the learning process logical and organized. Evaluations normally occur at the end of each step. However, for this study formative evaluations occurred during analysis and after development. A formative evaluation was also performed during implementation of the guide to determine ease of use and relevant coverage. The simplicity of ADDIE combined with multiple prompts for inclusiveness continues to prove its effectiveness (Branch, 2009).

The goal was achieved by designing, developing, and implementing a disability support staff resource guide following the steps of the ADDIE model. Branch (2009) maintained ADDIE is a process that functions as a guiding structure for complex situations and is appropriate for developing learning resources.

Analyze

The purpose of the analysis phase was to identify possible reasons for creating the guide. Branch (2009) asserted that the analysis phase is the most important step of the process as these data will aid in determining all future decisions. Following a comprehensive literature review, a content outline was created to serve as a basis to construct instruments used for collecting data to design and develop the guide.

During the analysis phase the focus should be on the learner and meeting the overall goal. Holden (2015) stated in most cases, the difference between what the learner knows and should know drives the requirement for instruction. Therefore, it is important to determine the real need as opposed to the perceived need.

Design and Development

This study combined the design and development phases. Branch (2009) implied the procedures and sequence of ADDIE can vary based on course content and do not have to take place one step at a time.

Procedures commonly associated with design are identifying objectives, selecting content, choosing a delivery method, and generating assessment instruments (Branch, 2009). According to Holden (2015), the development phase results in creation of the resource guide. The guide was designed and developed using responses collected from a panel of DSS experts and a literature review. Topics included federal mandated laws, AT solutions, training for students and faculty, along with outreach and awareness activities. All tools needed to implement and evaluate instruction were in place by the end of the development process.

Implementation and Evaluation

Holden (2015) stated the implementation phase delivers the instructional materials that were designed and developed in the prior stages. The panel of experts implemented and evaluated the guide through an extensive review process which included receiving updated materials and providing feedback.

The Delphi Process

The Delphi technique was used to aid in collecting data. It is a research methodology developed in the early 1950s by the Rand Corporation and is used to elicit, distill, and determine the opinions of a panel of experts from a given field (Nworie, 2011). Kalaian and Kasim (2012) added that it is a systematic way of arriving at an informed and consensus-based decision. It is based on the assertion that the combined perspectives of expert panelists are of richer quality than the limited viewpoint of an individual. According to Stitt-Gohdes and Crews (2004), the Delphi method has been used by government, business, and educational institutions due to its ability to garner opinion and seek consensus from a diverse group. Green (2014) added Delphi studies have been effective in educational environments when formatting guidelines or standards.

According to Alder and Ziglio (as cited in Stitt-Gohdes and Crews 2004), the Delphi method is a communication process that is structured to have a select group of participants review and discuss a specific topic. While obtaining consensus is a part of the process, it may not be easily obtained. Therefore, it is essential that all participant communications be conducted in a way that allows for inclusion of all perspectives in a timely manner. Rowe and Wright (1999) listed four important characteristics of the Delphi Method (as cited in Mohr and Shelton, 2017):

1. Participant anonymity that allows for free expression
2. Iterative process that offers opportunities for participants to refine their views during each round based on feedback.
3. Controlled feedback that allows for participants to change their opinions during each round.
4. Data collected can be quantitatively analyzed and interpreted.

According to Kalaian and Kasim (2012), the Delphi method consists of a series of rounds of survey administration to a panel of experts in a specific field of study. Hsu and Sanford (2007) maintained the process can continue until consensus is achieved. The following stages of the Delphi Technique occurred during research:

1. Selection of the panel of experts
2. Creation and distribution of survey to conduct a needs assessment (Round One)
3. Collection and analysis of collected data to create resource guide
4. Distribution of resource guide and a survey to evaluate the format of the guide (Round Two)
5. Collection and analysis of collected data along with revision of guide
6. Distribution of revised resource guide and a survey to evaluate the overall effectiveness and timeliness of the guide (Round Three)
7. Consensus achieved
8. Data analysis
9. Report of findings

Panel Selection

With the Delphi technique focusing on obtaining expert opinions in a brief time, participants are generally selected based on area of expertise (Hsu & Sanford, 2007; Habibi, Sarafrazi and Isadyar, 2014). According to Habibi et al. (2014), selecting panel members is one of the most crucial parts of the Delphi Technique due to the validity of the results depending on the knowledge of the members selected. As a possible motivator for remaining active throughout

the research, Stitt-Gohdes and Crews (2004) suggested participants be made fully aware of the goal of the study. Additionally, participants must believe their contributions are valuable.

Purposeful sampling technique, which involves selecting individuals who can purposefully provide feedback related to the research problem based on their knowledge and experience, was used. The intent was to conduct a thorough investigation of how DSS in higher education provide AT for students. Therefore, participants were purposefully selected based on experience and the nature of the study as per Creswell (2013).

The panel of experts consisted of 10 DSS selected from various community colleges within North Carolina. They served to provide feedback relating to the designing, developing, and evaluating the resource guide. Habibi et al. (2014) stated the panel size may vary based on the topics being researched. Criteria for participation included, years of experience, job responsibilities, and educational background. Clear criteria provide a basis for describing and defending purposive sampling (Gay et al., 2012).

To select research participants, phone calls and online meetings occurred with the Associate Director for Student Support of the North Carolina Community College System. Based on the criteria, 25 possible participants were identified and an invitation (Appendix A) was sent to seek participation. Thirteen responses were received and 10 DSS professionals were selected to participate. Phone calls were initiated by three participants in search of additional information. Upon agreement of participation, a consent form (Appendix B) was sent to each individual.

Instrumentation

According to Nworie (2011), development of evaluation instruments is an essential process of the Delphi study. An instrument is a test or tool used to collect data. It can be a

questionnaire that consists of open and closed-ended questions (Gay et al., 2012). Nwoire (2011) implied that using both types of questions will provide richer feedback.

Gay et al. (2012) stated that instruments must be reliable and consistent to ensure valid results. They defined validity as the degree to which an instrument measures what is supposed to be measured while reliability focuses on consistency. Testing instruments before distribution allows for possible deficiencies to surface and suggestions for improvement to be made. During the analysis stage, after development, and during implementation, three formative instruments - the AT Needs Assessment, Design and Development, and Implementation (Appendices C, D, and E) were used to help improve the evolving document. According to Branch (2009), formative evaluations are used to collect data that can be used to revise instruction.

Three experts from the selected core group formed a sub-group to pilot test the instruments before deployment. Brief telephone conversations took place explaining the pilot testing process. One participant suggested adding an additional focus area to the AT Needs Assessment (Appendix C). Once revised, the instrument was sent to the sub-group for approval.

The "AT Needs Assessment" (Appendix C) was used in round one of the study to collect data from the panel of experts that confirmed the content for the guide. The instrument consisted of four sections containing both closed and open-ended questions. According to Creswell (2013), closed questions may provide useful information regarding concepts and theories in the literature while open inquiries may allow further exploration of responses to the closed-ended questions. Section A ranked the frequency of outreach and awareness activities conducted by DSS. Experts were asked to list other activities that might be used to reach out to students. Section B required ranking the commonly used AT solutions used in higher education for specific disabilities.

Questions relating to other AT solutions that might be used by students with specific disabilities were asked. Additionally, participants were provided with an opportunity to list outside agencies in which they have established partnerships. Section C addressed student training needs and those responsible for providing training. Questions asking for other training that might be provided to aid students in using AT and where students may be able to seek training were listed. Section D ranked the frequency of types of training, found in the literature, which should be provided to faculty. Additionally, experts were asked to list other training that might be provided to faculty to aid students with disabilities.

The "Design and Development Survey" (Appendix D) was used during round two of the study and focused on the layout and content presented in the resource guide. Open-ended questions were asked to determine if the guide contained the necessary content along with how to make the guide more appealing to potential users.

The "Implementation Survey" (Appendix E) was used during round three of the study. Questions relating to the usefulness and accessibility of the resource guide were asked.

Delphi Rounds

Once revisions were made to the instruments, round one of the study began. The remaining seven experts completed the "AT Needs Assessment" (Appendix C), to provide additional information for the guide. According to Kalaian and Kasim (2012), during round one questioning experts are given a chance to suggest other topics as possible considerations for inclusion in the guide. A letter (Appendix F) outlining specifics regarding the survey was sent along with a link to the survey to be completed.

Round Two of the Delphi study occurred after development. Experts were presented with a letter (Appendix G) explaining the details of round two and a prototype of the guide, which included all data collected during round one, and asked to complete the "Design and Development Survey" (Appendix D). At this point, panelist could modify previous statements made based on reviewing feedback from others (Hsu & Sanford, 2007). Revisions were made when needed.

Round Three started after all data were collected, reviewed, and organized from round two. At this point, the guide consisted of revisions made as a result of data collected during round two. Experts were sent a letter (Appendix H) with details regarding round three and asked to provide feedback on the effectiveness, relevancy, timeliness, and ease of use of the guide by completing the "Implementation Survey" (Appendix E). Normally, if needed, revision of the guide would occur again. Branch (2009) asserted evaluation initiates the ADDIE process, permeates the ADDIE process, and concludes the ADDIE process.

Data Collection and Analysis

According to Gay et al. (2012), qualitative research involves collecting descriptive data to gain insights into the phenomena of interest. As long as the data collected are ethical and feasible, they may be obtained via interviews, questionnaires, or email. Initially, an invitation was sent to selected DSS explaining the research study as well as asking for their participation. Once participation was established, a consent form was sent to obtain permission, explain the risks and benefits, and provide other important details.

To aid with collecting and organizing data, Survey Monkey® (https://www.surveymonkey.com) was used. It is a cloud-based computer software program that

provides templates for developing questionnaires and surveys and has the ability to analyze results. According to Gay et al. (2012), using computer software expedites data collection and enhances research analysis.

Gay et al. (2012), stated data analysis in qualitative research involves summarizing data in a reliable and precise manner. Data analysis occurred from the initial interaction participants.

Resources

Time, commitment, people, and technology were resources needed to conduct this study. The experts were selected from various community colleges within North Carolina. They consisted of full-time practicing DSS who support students with disabilities. Table 2 shows a list of panel members. Initials are used to protect the anonymity of the panel members.

Table 2. Panel of Experts

Pseudonym	Job Title	Community College
C. D.	Accessibility Services Coordinator	Vance-Granville Community College
W. H.	Former Director of Disability Services	Catawba Valley Community College
S. J.	Director of Disability Services	Central Piedmont Community College
N.L.	Director of Disability Services	Caldwell County Community College and Technical Institute (Watauga Campus)
H.P.	Director of Disability Support Services	Asheville-Buncombe Technical Community College
D.P.	Assistive Technology Specialist	Catawba Valley Community College
T.R.	Coordinator of Disability Services	Bladen Community College
T.S.	Coordinator of Disability Services	Caldwell County Community College and Technical Institute (Main Campus)
H.W.	Disability Services Counselor	Rowan-Cabarrus Community College
R.W.	Director of Disability Support Services	Wake Technical Community College

Technology costs included, a laptop, Internet service, webcam, Microsoft Office Application software, and other mobile devices used. In addition, Survey Monkey was used to collect and analyze data. Standard miscellaneous costs included basic office supplies.

Summary

With the increasing number of students taking advantage of higher education, it is vital that those who are responsible for supporting them are adequately prepared. Providing AT and accommodations that are based on individual need may increase student satisfaction and academic progress.

The goal was to develop a resource guide that provides information to effectively assist students with disabilities. The foundation for the guide was based on a comprehensive literature

review. The guide covers topics related to, government mandated laws, AT solutions based on specific disabilities, training for students and faculty as well as awareness events and activities.

Three rounds of the Delphi process were used to allow a panel of experts to review and validate the guide. During round one, the preliminary foundation was created. Round two involved the panel reviewing the guide and providing feedback. After revisions were made, round three began with a final review from the panel expert panel to evaluate, validate, and implement the guide through a thorough review process that included providing feedback for revisions. The final resource guide is included as Appendix I of this report.

Chapter 4

Results

Overview

The goal was to consolidate valuable guidance for Disability Support Staff (DSS) in higher education to serve students. A resource guide was developed and addressed federal mandated laws, assistive technology (AT) solutions, training for students and faculty, in addition to activities for outreach and awareness.

After the approval of the Institutional Review Board, (Appendix J) recruitment began for possible participants. An invitation was sent describing the research study. Once participation was established and consent forms were received, data were collected and analyzed using three rounds of the Delphi review process.

Chapter 4 presents the results of research that focused on combining valuable and relevant information to be used when serving students with disabilities. The findings resulted in designing and developing an assistive technology resource guide to be used by DSS in higher education.

Delphi Panel of Experts

The panel of experts consisted of 10 DSS professionals employed with various community colleges within the North Carolina Community College System. The system is divided into three regions - central, eastern, and western. Table 3 shows a summary of the geographical locations of the community colleges.

Table 3. Geographical locations

Participants	**Geographic Region**
10	Central = 2 Eastern = 1 Western = 7

Each expert was responsible for providing AT and training for students at their respective colleges. Job titles varied with each institution and included: Accessibility Services Coordinator, Assistive Technology Specialist, Coordinator of Disability Services, Director of Disability Services, Director of Disability Support Services, and Disability Services Counselor. The experience level of the participants ranged from 7 – 25 years. Nine experts hold Master's Degrees while one obtained a Bachelor's Degree. Table 4 shows the job titles, education, and years of experience.

Table 4. Panel of Experts Credentials

Job Title	**Educational Level**	**Years of Experience**
Accessibility Services Coordinator Assistive Technology Specialist Coordinator of Disability Services Director of Disability Services Director of Disability Support Services Disability Services Counselor	Master of Social Work = 2 Master of Arts = 3 Master of Science = 3 Master of Education = 1 Bachelor of Science = 1	21 – 25 years = 2 15 – 20 years = 3 10 – 14 years = 2 7 – 9 years = 3

Findings

Delphi Round One was initiated with an AT Needs Assessment that contained four sections and 14 total questions. The panel was asked to rank specific items according to the frequency of use at their institutions.

Section A addressed awareness and outreach activities that could be used to increase awareness of specific AT and services provided by the DSO. Participants were asked to rank these activities. An open-ended question was presented at the end to obtain additional activities that may not be listed. Quantitative results for Section A are listed in Appendix K

Participant Comments:

Participant 1. Meetings with high schools.

Participant 2. Posters in every classroom, brochures with every application packet and in racks in two different places on campus, New Student Orientation sessions, New Faculty and Part-time Faculty Orientations, Faculty and Staff Meetings, Bi-semester informational email to faculty and staff called "Five Minutes for Disabilities:

Participant 3. Partner with Wellness Center on campus to offer awareness activities surrounding mental health and social justice issues.

Participant 4. Posters in classrooms, flyers with applications, links from various places on the college's website, statements on class syllabi, faculty training, faculty and staff meetings, periodic newsletters

Participant 5 Disability Support Services New Student Orientation – an orientation designed specifically for students with disabilities and their parents.

Section A also addressed partnering with outside agencies. An open-ended question was presented at the end of the section to allow participants to list names of outside agencies in which they established partnerships to aid in serving students with disabilities.

Participant Comments:

Participant 1. North Carolina Services for the blind, other schools, and TEACH NC – Teacher Education and Compensation Helps

Participant 2. Services for the Deaf, CART Providers, Book-share, Learning Ally,

Participant 3. Public Schools of North Carolina – Exception Children, Transportation Services

Participant 4. Autism Society

Participant 5. Easter Seals, Mental Health Agencies

Section B focused on AT that could be used for students with sensory, cognitive, and physical disabilities. For each disability type, participants were asked to rank AT used at their institutions. An open-ended question was posed at the end of the section to provide an opportunity to add AT not listed. Quantitative results for Section B are listed in Appendix K.

Sensory Disabilities

Participant Comments:

Participant 1. Livescribe Pens

Participant 2. CART, Magnification Hardware

Participant 3. Note-takers, Earplugs, Voice Enhancers

Participant 4. Tactile graphics, 3-D images, Braille

Cognitive Disabilities

No comments

Physical Disabilities

Participant Comments:

Participant 1. Sip and Puff Controls

Section C addressed types of training DSS provided to students on their perspective campuses. As with the previous sections, participants ranked the AT used by frequency. An open-ended question at the end of Section C allowed for additional training to be listed. Quantitative results for this section are listed in Appendix K for responses to closed-ended questions.

No Comments

Section C also focused on where students may be able to obtain training on how to use specific AT. Participants were encouraged to provide names of additional locations and departments where students could seek training. Quantitative results for this section are listed in Appendix K.

Participant Comments:

Participant 1. Outstanding Computer Student

Participant 2. Does not have the resources to offer training to students. Expect them to know how to use the equipment. If not, attempt to connect them with local agencies

Participant 3. The vendor of the item, YouTube videos, or other students

Participant 4. Responsibility of DSS department only.

Section D of the AT Needs Assessment was dedicated to types of training faculty should receive to aid SWD. Participants ranked training according to frequency offered and provided

additional training by responding to the open-ended questions at the end of the section. Quantitative results for Section D are listed in Appendix K.

No comments

Round Two – Design and Development. All feedback from round one was collected and formatted into a prototype of the resource guide. Participants were asked to review the guide and provide feedback based on organization and completeness. Six questions were asked. Response options given ranged from strongly agree to strongly disagree. Comments or recommendations were encouraged. Open-ended questions addressed the necessary content listed and what changes were needed.

Contained Necessary Content

Participant Comments:

Participant 1. There could be whole books about how to educate faculty. I would just make sure to add more language/focus on psychological disabilities (depression, anxiety, PTSD, Autism Spectrum, etc.)

Participant 2. Specific examples of technology are missing

What changes are needed

Participant Comments:

Participant 1. Nothing at this time. Useful guide

Participant 2. It's pretty easily digestible

Participant 3. Add more examples of innovative AT available

Participant 4. Nothing. Very clear and informative.

Participant 5. Add information about Section 508.

Participant 6. More AT examples

Participant 7. Nothing at this time.

Round Three was the final round. Five of the seven participants responded. The guide was revised to include the AT examples and specific disability information. Participants were given one week to review the additional information and complete the final survey. No additional recommendations or modifications were suggested by the panel members. The Implementation Survey, focused on the comprehension level, the value, and relevancy of the guide. Overall, all five panel members found the guide easily comprehensible and that it provided relevant information. Consensus was reached relating to the comprehension, value, and relevancy of the guide. The final guide was completed and will serve as an additional resource for DSS within the North Carolina Community College System.

Chapter 5

Conclusions

Overview

This chapter discusses the conclusions arrived through research using the Delphi Technique and ADDIE Instructional Design Model to develop an *Assistive Technology Resource Guide for Higher Education Disability Support Staff.* Additionally, implications of designing and developing a guide are addressed as well as the strengths, weaknesses, and limitations of the study. Finally, a list of recommendations for future research is provided along with a summary of the overall research.

The guide covers topics related to, government mandated laws, AT solutions based on specific disabilities, training for students and faculty, in addition to awareness events and activities. Following are the procedures that moved the research questions from the stated problem to the achieved goal.

Conclusions

RQ 1. What are the government prescribed mandates of the Disability Services Office?

Responsibilities of Disability Services Offices (DSOs) vary across educational institutions. However, all must comply with federal mandates as they relate to providing AT and accommodations for students with disabilities (Sobczak, 2013). This question was answered through an extensive literature review. Federal mandated laws such as the Americans with Disabilities Act, Individual with Disabilities Education Act, Rehabilitation Act of 1973 – Sections 504 and 508, along with the Assistive Technology Act of 2004 were created to protect people with disabilities from discrimination and ensure equal opportunities by removing obstacles that may hinder them.

RQ 2. What processes are used to reach out to students to identify disabilities?

Marshak et al. (2010) expressed the significance of DSOs having campus-wide awareness events to create a climate that values students with disabilities. This question was answered through an analysis of responses given on the AT Needs Assessment completed by the panel of experts. Quantitative data were provided from questions based on a Likert-scale format and qualitative data from open-ended questions.

The guide contains various activities used to create awareness of services provided by the DSO including providing information on the college's website, providing local high schools with information, partnering with outside agencies, sending mail and brochures, and arranging campus visits for high school students.

RQ 3. What technologies are used to provide necessary accommodations?

AT is used to increase the functional capabilities of students with disabilities (Guyer & Uzeta, 2009). This question was answered through an analysis of responses given on the "AT Needs Assessment" during Delphi round one. Both quantitative and qualitative data were collected.

The guide contains a diverse selection of technologies used to accommodate students. To be beneficial Gregg (as cited by Weiss et al., 2014) affirmed accommodations must be tailored according to each students' needs. Because disabilities are categorized it may not be possible for all students to use the same technology. Several factors need to be considered when providing AT, including disability type. To aid in determining specific technology, the expert panel listed AT solutions according to cognitive, sensory, and physical disabilities.

RQ 4. How do students obtain the necessary technology and training to use it?

With the increasing number of AT solutions, Guyer and Uzeta (2009) expressed the importance of Disability Service Staff (DSS) providing adequate training to students who have minimal or no experience using AT. This question was answered through an analysis of responses given on the AT Needs Assessment.

At some institutions training may be provided solely by the DSO. However, to ensure a successful educational experience anyone who has consistent involvement with students should be able to assist them with using AT. The guide contains specific locations and departments where students may be able to seek training on how to use specific AT.

RQ 5. What technical training must DSOs provide to faculty?

According to Ahmad (2015), DSS must be able to provide continuous training and support for faculty to effectively integrate technology into the learning environment. This question was answered through an analysis of responses given on the AT Needs Assessment completed by the panel of experts.

Alkahtani (2013) affirmed teachers are not adequately trained to assist student with AT and therefore should receive training to increase their knowledge. Quantitative and qualitative data that addressed training needs for faculty were collected from experts. Various training recommendations were provided and are presented in the resource guide.

RQ 6. What are the guidelines that should be provided to institutions to ensure student success?

The resource guide was found valuable in terms of relevancy, effectiveness, ease of use, and timeliness. Following the publication of this dissertation, the guide will be distributed within the North Carolina Community College System. When implemented, it will result in best

possible service to students. It contains recommendations from the literature and from experts in the field.

Strength, Weakness, and Limitations

A strength of the research was the technique used to identify participants. Purposeful sampling was used to target a specific group of individuals. Participants were selected based their expertise in the field of disability services.

A weakness of the study was the sample size. A total of 10 DSS professionals participated in this research. Three served as a sub-group to pilot test and validate the instruments leaving seven to provide feedback for the actual guide. According to Habibi et al. (2014) Delphi studies have been conducted with fewer than 10 participants and emphasis should be placed on the topic covered.

There was one main limitation during this study. Some DSOs are staffed with one individual who is responsible for serving an entire institution. There were times when receiving feedback was prolonged due to work commitments.

Implications

According to Yssel, Pak, and Beilke (2016), support services and federal laws are reasons for the increasing number of students with disabilities attending post-secondary institutions. DSOs should be equipped with staff that is prepared and willing to serve this student population. As a result of a comprehensive literature review and research outcomes, it is evident that some DSS are being placed in positions with little or no previous training. Thus making it difficult for students with disabilities to obtain AT that is suited for them. In additional, faculty are left confused and frustrated as they are not prepared to adequately assist this student population. McCarthy, Quirke, and Treanor (2018) affirmed important roles of DSS are to ensure that

accommodations and AT provided to students are specific to their needs and to host campus-wide events announcing their presence. The DSO should also engage faculty to ensure they are creating curriculum that align with best practices relating to accessibility.

The goal was to create a resource that would aid DSS when providing specific AT and support to students with disabilities along with faculty. The guide created contains topics relating to federal mandated laws, AT solutions, training for students and faculty, along with outreach and awareness activities**.** It is to serve as an additional resource for DSS.

Recommendations

Future research could be conducted from the students' perspective. Specifically, to determine types of barriers students with disabilities may face when taking online courses and what type of resources they need to assist them. According to Coleman and Berge (2018), distance education is often seen as an appropriate outlet to provide education to students with disabilities; however, some students experience learning anxiety due to outdated AT and a lack of student-instructor interaction.

Additionally, research should extend to include faculty. This guide contains recommendations for faculty training from the perspective of DSS professionals. While this research study was needed to design and develop valuable guidance for DSS, continued research efforts from the perspective of faculty members could aid in producing a more specific resource that will better assist them when working with students. With faculty playing a crucial role in the success of students, it would be beneficial to seek their assistance regarding what is needed in terms of training or other resources. Sniatecki, Perry, and Snell (2015) conducted research to gain a better perspective on faculty attitudes and knowledge as they relate to college students

with disabilities. Results revealed faculty expressions of uncertainty about policies and procedures relevant to working with students with disabilities. Additionally, faculty were not fully aware of the campus resources available to assist them. Scott, Markle, Wessel, and Desmond (2016) suggested forming partnerships between DSOs and faculty will create a broader support structure for students with disabilities.

Summary

The research goal was to combine valuable guidance for DSS to use when providing specific AT for students. The guide covers mandated laws that protect individuals with disabilities, AT solutions for specific disabilities, training for students and faculty, along with activities for DSS to plan when attempting promote their services and reach out to students.

The research participants were 10 DSS professionals from various community colleges in North Carolina. Each expert is responsible for assisting students with disabilities at their institution. Their experience levels range from 7 to 20 plus years. Nine obtained Master's Degrees while one held a Bachelors.

Qualitative and quantitative methods were used to collect data. ADDIE, an instructional design method, was used to design and develop the guide. Three rounds of the Delphi technique was also used to obtain consensus on effectiveness, relevancy, and timeliness of the guide.

The content outline and initial survey instrument, AT Needs Assessment, were based on a thorough literature review. Two additional surveys were created to be used during rounds two and three of the study. During round one, panel members were asked to rate AT solutions, training for students and faculty, along with awareness activities according to frequency of use at

their institutions. Experts were also given the opportunity to provide additional information for each section of the survey. A prototype of the guide was developed based on the responses.

Round two began with participants reviewing the guide and providing feedback via the Design and Development survey that contained both closed and open-ended questions. Numerical responses indicated their satisfaction with the organization of the content, ease of use, and comprehension. The open-ended questions afforded experts the opportunity to provide specific feedback on each section and was used to update the guide.

Minimal revisions were needed. Changes to the guide included adding information relating to Section 508 of the Rehabilitation Act of 1973, listing specific types of cognitive disabilities DSS currently encounter, and providing a list of AT examples.

The revised guide was distributed to the panel for review along with the Implementation Survey. This form was similar to the one used during round two. Both closed and open-ended questions were asked. Numerical responses indicated their level satisfaction on whether the guide was beneficial when to them when working with students. Because revisions were needed, the panel was asked to rate the ease of use and comprehension level once again. Open-ended questions addressed the effectiveness, relevancy, and timeliness of the guide. At this point, no revisions were recommended and consensus was reached. The revised guide is presented as Appendix I.

Appendix A – Participant Invitation

NOVA SOUTHEASTERN UNIVERSITY
College of Engineering and Computing

3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-2000 • 800-541-6682, ext. 2000 • Fax: (954) 262-3915 • Web site: *www.cec.nova.edu*

Dear Research Participant,

My name is Brenda DeLee. I am a doctoral student at Nova Southeastern University engaged in a research project for the purpose of satisfying a requirement for a Doctor of Philosophy Degree. You have been identified as an expert relating to higher education disability support and I would like to invite you to participate.

The purpose of the study is to consolidate useful guidance for higher education Disability Support Staff to best serve students by producing a resource guide. The guide will cover topics related to, government mandated laws, awareness events and activities, AT solutions based on specific disabilities, and training for students and faculty.

If you agree to participate, you will be asked to review and test, or complete three surveys. Feedback from the initial survey will aid in the creation of guide while the latter surveys will focus on design, development, and implementation. Based on your expertise, I anticipate that each round should take approximately 30 minutes to complete. The maximum time from the beginning to the final round is approximately 15-20 weeks. However, if the responses are timely, the research time may be reduced.

All data collection relating to the research will take place via the Internet using an online survey tool. Collected data will not be identifiable and the results will be complied into a comprehensive format for you to review.

There is minimal risk involved in participating in this study. While there are no directs benefits for participation, you have the opportunity to enhance the knowledge of Higher Education Disability Support Staff who are new to the field.

There is not a cost associated with participation and your assistance is strictly voluntary. You have the right to refuse to participate and the right to withdraw at any time without questions.

Information obtained in this study is strictly confidential unless disclosure is required by law. All data will be stored in a secured location.

Thank you for considering this request. Please let me know by May 31, 2017 of your intentions. Upon acceptance, you will receive an informed consent letter with details about the study and for your review and signature.

If you have any questions or would like additional information about the study, please contact me using the information listed. Requesting additional information does not obligate you to participate.

Sincerely,

Brenda DeLee

Brenda DeLee

Principal Investigator

Brenda DeLee, Ed. S.
4564 Brave Avenue
Maiden, NC 28650
Phone: (843) 560-1848

Co-Investigator

Trudy Abramson, Ed.D.
3301 College Avenue
Fort Lauderdale, Florida 33314-7796

Appendix B – Consent Form

NOVA SOUTHEASTERN UNIVERSITY
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Consent Form for Participation in the Research Study Entitled, Assistive Technology Guidelines for Higher Education Disability Support Staff

Funding Source: None.

IRB protocol #:

Principal investigator
Brenda DeLee, Ed.S.
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Phone: (843) 560-1848

Co-investigator
Trudy Abramson, Ed.D.
3301 College Avenue
Fort Lauderdale, FL 33314-7796
Phone: (954) 262-2070

For questions/concerns about your research rights, contact:
Human Research Oversight Board (Institutional Review Board or IRB)
Nova Southeastern University
(954) 262-5369/Toll Free: 866-499-0790
IRB@nsu.nova.edu

What is the study about?

With the effective integration of assistive technology into the classroom environment and changing laws, students can have the provision of multiple means to complete their work with greater independence. Even though postsecondary institutions are increasing the services they provide to students needing accommodations, there is still a lack of focus on providing appropriate accommodations to address specific learning needs of individual students. The purpose of this study is to consolidate useful guidance for Disability Support Staff (DSS) to use when assisting students by producing a resource guide. The guide will cover topics related to, government mandated laws, awareness events and activities, AT solutions based on specific disabilities, and training for students and faculty. The intent of the guide is to serve as additional resource for DSS.

Why are you asking me?
Ten DSS are needed to participate in this research study. You are being asked because you have been identified as an expert in your field and are responsible for providing services to students

with disabilities.

What will I be doing if I agree to be in the study?
If you decide to volunteer, you will be participating as an expert panel member for an academic research study as a part of a dissertation initiative. The panel of experts will review and test evaluation instruments to be used during the study. A structured communication protocol (Delphi Method) will also be used to address a research problem through a minimum of three rounds of questioning administered as a survey which ends with a panel consensus. Round one will consist of answering questions that will provide a foundation for designing and developing the guide. Round two focuses on providing feedback relating to the layout and format of the guide while the final round concentrates on providing feedback relating to the relevance of the guide.

Based on your knowledge, I anticipate that each round should take approximately 30 minutes to complete. The maximum time from the beginning to the final round is approximately 15-20 weeks. However, if the responses are timely, the research time may be reduced.

The only potential complication would be related to compatibility between your computer and the online survey tool being used. In the event a problem occurs, please contact me immediately.

Is there any audio or video recording?
There is not audio or video recording associated with this research.

What are the dangers to me?
There may be some minimal risks in the activities of this study as it relates to participant confidentiality as data is entered online or through email communication. However, the likelihood of this risk occurring is extremely low as anonymity is my utmost priority. Continuous measures will take place to ensure data security. You will be notified immediately should security become an issue.

If you have any questions about the research, your research rights, or have a research-related injury, please contact Brenda DeLee, Principal Investigator at bd570@nova.edu or Dr. Trudy Abramson, Dissertation Chair at abramson@nova.edu. You may also contact the Institutional Review Board (IRB) at the numbers indicated above with questions as to your research rights.

Are there any benefits for taking part in this research study?
There are no direct benefits associated with this study.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study.

How will you keep my information private?
All information obtained in this study is strictly confidential unless disclosure is required by law. The IRB, regulatory agencies, and the Dissertation Chair may review research records. All collected data form this study will be stored in a secure location for a minimum of 36 months

from the end of this study to meet the requirement of the IRB.

What if I do not want to participate or I want to leave the study?
You have the right to leave this study at any time or refuse to participate. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of services you have a right to receive. If you choose to withdraw, any information collected about you **before** the date you leave the study will be kept in the research records for 36 months from the conclusion of the study and may be used as a part of the research.

Other Considerations:
If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you by the investigators.

Voluntary Consent by Participant:
By signing below, you indicate that

- this study has been explained to you
- you have read this document or it has been read to you
- your questions about this research study have been answered
- you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
- you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
- you are entitled to a copy of this form after you have read and signed it
- you voluntarily agree to participate in the study entitled "Assistive Technology Guidelines for Higher Education Disability Support Staff."

Participant's Signature: _____ Date: _____

Participant's Name: _____ Date: _____

Signature of Person Obtaining Consent: _____

Date: _____

Appendix C – AT Needs Assessment Survey

AT NEEDS ASSESSMENT

Welcome to My Survey

Thank you for volunteering to participate in this research study. The following questions are being asked in an effort to create a resource guide for Disability Support Staff in higher education to use when assisting students.

AT NEEDS ASSESSMENT

Section A - Awareness

1. Creating a culture of awareness is crucial to the success of students with disabilities. Listed below are events and activities which can serve as a means for making students aware of services provided. Please rank the following in the order of most hosted activities or events at your institution.

	Very Frequently	Frequently	Occassionally	Rarely	Very Rarely	Never
Provide local high schools with information	○	○	○	○	○	○
Reach out to families of students with disabilties	○	○	○	○	○	○
Provide training or workshops to secondary school personnel	○	○	○	○	○	○
Arrange campus visits for high school students	○	○	○	○	○	○
Create a student handbook	○	○	○	○	○	○
Send mailings and brochures	○	○	○	○	○	○
Provide information on the college's website	○	○	○	○	○	○
Partner with outside agencies such as Vocational Rehabilitation	○	○	○	○	○	○
Classroom Presentations	○	○	○	○	○	○

2. What other activities or events might be used to reach out to students?

3. What other outside agencies might you partner with to aid in serving students with disabilities?

AT NEEDS ASSESSMENT

Section B - Specific AT Solutions (Sensory)

4. Providing specific Assistive Technology (AT) is essential to student success. Listed below are AT solutions based on sensory disabilities. Please rank the following AT solutions in order of most used by students at your institutions.

	Very Frequently	Frequently	Occasionally	Rarely	Very Rarely	Never
Screen Reader Programs	○	○	○	○	○	○
Screen Enlargement	○	○	○	○	○	○
Voice Recognition Programs	○	○	○	○	○	○
Digital Textbooks	○	○	○	○	○	○
Enlarged Printed Textbooks	○	○	○	○	○	○
Digital Audio Recorders	○	○	○	○	○	○
Podcasts	○	○	○	○	○	○
Captioned Videos	○	○	○	○	○	○
Learning Management Systems	○	○	○	○	○	○

5. What other types of AT solutions might be used for students with sensory disabilities?

AT NEEDS ASSESSMENT

Section B - Specific AT Solutions (Cognitive)

6. Providing specific Assistive Technology (AT) is essential to student success. Listed below are AT solutions based on cognitive disabilities. Please rank the following AT solutions in order of most used by students at your institutions.

	Very Frequently	Frequently	Occassionally	Rarely	Very Rarely	Never
Electronic Organizers	○	○	○	○	○	○
Recorded Course Materials	○	○	○	○	○	○
Hand-held Scanners	○	○	○	○	○	○
E-readers	○	○	○	○	○	○
Digital Pens/Smart Pens	○	○	○	○	○	○
Use of graphics and illustrations in course content	○	○	○	○	○	○
Screen Reader Programs	○	○	○	○	○	○
Blogs and Wikis	○	○	○	○	○	○
Voice Recognition Programs	○	○	○	○	○	○
Mobile Devices (Ipads and Laptops)	○	○	○	○	○	○
Learning Management Systems	○	○	○	○	○	○

7. What other AT solutions might be used for students with cognitive disabilities?

AT NEEDS ASSESSMENT

Section B - Specific AT Solutions (Physical)

8. Providing specific Assistive Technology (AT) is essential to student success. Listed below are AT solutions based on physical disabilities. Please rank the following AT solutions in order of most used by students at your institutions.

	Very Frequently	Frequently	Occassionally	Rarely	Very Rarely	Never
Adjustable Tables	○	○	○	○	○	○
Ergonomic Chairs and Keyboards	○	○	○	○	○	○
Trackballs and Mouse Controls	○	○	○	○	○	○
Interactive White Boards	○	○	○	○	○	○
Voice Recognition Programs	○	○	○	○	○	○
Electronic Note Takers	○	○	○	○	○	○
Touch Screens	○	○	○	○	○	○
Learning Management Systems	○	○	○	○	○	○

9. What other types of AT solutions might be used for students with physical disabilities?

AT NEEDS ASSESSMENT

Section C - Student Training

10. To ensure success, student need to be supported when learning to use specific AT. Listed below are the more common AT solutions used by students. Please rank the following based on the frequency of training provided to students at your institution.

	Very Frequently	Frequently	Occasionally	Rarely	Very Rarely	Never
Voice Recognition Programs	○	○	○	○	○	○
Library Resources	○	○	○	○	○	○
E-textbooks	○	○	○	○	○	○
Digital Audio Recorders	○	○	○	○	○	○
Learning Management Systems	○	○	○	○	○	○
Adaptive Mice and Keyboards	○	○	○	○	○	○
Screen Magnification Software	○	○	○	○	○	○
Screen Reader Programs	○	○	○	○	○	○
Audio Textbooks	○	○	○	○	○	○
Assistive Listening Devices	○	○	○	○	○	○

11. With various on campus departments serving students with disabilities, where would students be able to seek training using specific AT if needed. Please provide a response.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Non Applicable
Disability Service Office	◯	◯	◯	◯	◯	◯
Student Services	◯	◯	◯	◯	◯	◯
Library	◯	◯	◯	◯	◯	◯
Learning Assistance Center	◯	◯	◯	◯	◯	◯
Information Technology Department	◯	◯	◯	◯	◯	◯
Faculty	◯	◯	◯	◯	◯	◯

12. Where else on campus might students be able to seek training using AT?

AT NEEDS ASSESSMENT

Section D - Faculty Training

13. Adequately trained faculty play a crucial role in student success. Listed below are areas in which faculty may receive training that may assist them when serving students with disabilities. Please rank the following areas of training in order of most provided at your institution.

	Very Frequently	Frequently	Occassionally	Rarely	Very Rarely	Never
Accessible Web Page Creation	○	○	○	○	○	○
Accessibility Laws	○	○	○	○	○	○
Software Training (voice recognition, screen reader programs)	○	○	○	○	○	○
Creating Accessible Audio and Video Files	○	○	○	○	○	○
Proper use of Learning Management System	○	○	○	○	○	○
Creating Accessible Documents	○	○	○	○	○	○
Social Media for Instruction	○	○	○	○	○	○
Incorporating Universal Design for Learning Principles	○	○	○	○	○	○
Hardware Training (Digital Audio Recorders, Interactive White Boards, Mouse Controls)	○	○	○	○	○	○

14. What additional areas might faculty receive training to aid students with disabilities?

Appendix D – Design and Development Survey

Design and Development Survey

After reviewing the Assistive Technologies Resource Guide, please complete the following 6question survey. Feel free to provide comments or recommendations for improvement.

1. Topic 1 - Introduction

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	N/A
The content in this section is organized.	○	○	○	○	○	○
The contents in this section are easy to read and comprehend.	○	○	○	○	○	○

Comments or Recommendations

2. Topic 2 - Assistive Technologies and Specific Disabilities

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	N/A
The content in this section is organized.	○	○	○	○	○	○
The contents in this section are easy to read and comprehend.	○	○	○	○	○	○

Comments or Recommendations

3. Topic 3 - Assistive Technology Training

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	N/A
The content in this section is organized.	○	○	○	○	○	○
The contents in this section are easy to read and comprehend.	○	○	○	○	○	○

Comments or Recommendations

4. Topic 4 - Outreach and Awareness

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	N/A
The content in this section is organized.	○	○	○	○	○	○
The contents in this section are easy to read and comprehend.	○	○	○	○	○	○

5. Is the necessary content in the guide? If no, what is missing?

6. What would you change about the guide to make it more appealing?

Comments or Recommendations

Appendix E – Implementation Survey

Implementation Survey

After reviewing the Assistive Technologies Resource Guide, please complete the following 6question survey. Feel free to provide comments or recommendations for improvement.

1. Topic 1 - Introduction

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	N/A
The contents in this section are easy to read and comprehend.						
I found the information in this section beneficial when assisting students with disabilities.	◯	◯	◯	◯	◯	◯
Overall, the information presented in this section is effective, relevant, and timely.	◯	◯	◯	◯	◯	◯

Comments or Recommendations

2. Topic 2 - Assistive Technologies and Specific Disabilities

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	N/A
The contents in this section are easy to read and comprehend.	◯	◯	◯	◯	◯	◯
I found the information in this section beneficial when assisting students with disabilities.	◯	◯	◯	◯	◯	◯
Overall, the information presented in this section is effective, relevant, and timely.						

Comments or Recommendations

3. Topic 3 - Assistive Technologies Training

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	N/A
The contents in this section are easy to read and comprehend.	◯	◯	◯	◯	◯	◯
I found the information in this section beneficial when assisting students with disabilities.	◯	◯	◯	◯	◯	◯
Overall, the information presented in this section is effective, relevant, and timely.	◯	◯	◯	◯	◯	◯

Comments or Recommendations

4. Topic 4 - Outreach and Awareness

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	N/A
The contents in this section are easy to read and comprehend.	◯	◯	◯	◯	◯	◯
I found the information in this section beneficial when assisting students with disabilities.	◯	◯	◯	◯	◯	◯
Overall, the information presented in this section is effective, relevant, and timely.						

Comments or Recommendations

5. Overall, I found the resource guide effective, relevant, and timely.

◯ Yes

◯ No

Comments or Recommendations

6. What would you add to make the guide more appealing?

Appendix F – Round One Participation

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Dear Research Participant,

Thank you again for agreeing to participate in Round 1 of this research study. This survey consists of 14 questions that will aid in developing and designing a resource guide for disability support staff in higher education to use when assisting students.

Once all responses have been compiled and analyzed, I will create the guide and forward it to you for review.

Please click on the following link to complete the survey. This survey will be available until November 30, 2017.

https://www.surveymonkey.com/r/KQBSRPZ

If you have any questions, please do not hesitate to call me at 843-560-1848.

Thank you,

Brenda DeLee
Doctoral Candidate
Nova Southeastern University
College of Engineering and Computing
Department of Information Systems
Home: 4564 Brave Ave.,
Maiden, NC 28650

Appendix G – Round Two Participation

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Dear Research Participant,

Thank you once again for agreeing to participate in this research study.

I am now asking that you review the 15-page resource guide and answer six questions for Round 2 of the study. All responses from round one were viewed, grouped, and placed in the guide according to the frequency of use.

As you review the Resource Guide, please keep in mind the following things:

- The guide is intended for Disability Support Staff who are responsible for serving students.
- Redundancy exists due to responses given.

Please click on the link below to rate the design of the guide. The survey will be available until June 8, 2018.

https://www.surveymonkey.com/r/B9PSF98

Thank you,

Brenda DeLee
Doctoral Candidate
Nova Southeastern University
College of Engineering and Computing
Department of Information Systems
Home: 4564 Brave Ave., Maiden, NC 28650
Phone: 843-560-1848

Appendix H– Round Three Participation

NOVA SOUTHEASTERN UNIVERSITY
NSU College of Engineering and Computing

3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-2000 • 800-541-6682, ext. 2000 • Fax: (954) 262-3915 • Web site: *www.cec.nova.edu*

Dear Research Participant,

Thank you again for your feedback during Round 2. This is the final round of the study. I am now requesting that you review the updated guide and respond to the six-question survey.

Updates include a brief list of assistive technologies, cognitive disabilities seen by Disability Support Staff, along with information regarding Section 508 of the Rehabilitation Act of 1973.

Below is the link for the survey. Once completed, I will compile the results and send the feedback to each individual. This link will be available until July 1, 2018.

https://www.surveymonkey.com/r/PNRFKGM

If you have any questions, please do not hesitate to contact me.

Thank you,

Brenda DeLee
Doctoral Candidate
Nova Southeastern University
College of Engineering and Computing
Department of Information Systems
Home: 4564 Brave Ave., Maiden, NC 28650
Phone: 843-560-1848

Appendix I – Assistive Technology Resource Guide

ASSISTIVE TECHNOLOGY RESOURCE GUIDE

Assistive Technology = Student Success

Table of Contents

Introduction

The purpose of this guide is to provide useful guidance for higher education Disability Support Staff (DSS) to best serve students with disabilities. This guide combines recommendations and information from many resources and is designed to assist DSS when identifying and providing specific Assistive Technologies (AT) along with creating training for faculty and students. Additionally, it offers various outreach events and activities that can aid in creating a culture of disability awareness at educational institutions.

What is a Disability?

The federal government defines disability according to the context in which it being used. The definition of a person with a disability is typically defined as someone who (1) has a physical or mental impairment that substantially limits one or more "major life activities," (2) has a record of such an impairment, or (3) is regarded as having such an impairment.
https://www.ada.gov/pubs/adastatute08.htm#12102

The American with Disabilities Act (ADA: https://adata.org/faq-search?keys=impairment&tid=All&tid_1=All) concluded a number of impairments should be considered as disabilities including: deafness, blindness, intellectual disability, missing limbs, mobility impairments, autism, cancer, cerebral palsy, diabetes, epilepsy, HIV infection, multiple sclerosis, muscular dystrophy, post-traumatic stress disorder, and schizophrenia.

According to DeLee (2015), The National Center on Accessible Educational Materials (AEM; http://aem.cast.org) grouped disabilities into three broad categories: sensory, physical, and cognitive.

Sensory disabilities are impairments related to seeing, listening, and communicating (Asselin, 2014). Physical disabilities are any impairments that limit the physical function of one or more limbs while cognitive

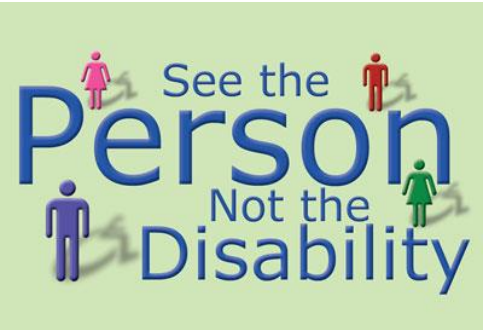

Photo Courtesy of Nyacyouth.org

disabilities affect an individual's memory and problem-solving skills.

Disability Support Staff

The primary point of contact for students with disabilities on postsecondary education campuses is typically the disability services office (DSO). The number of staff in these offices and their skill level varies from campus to campus. According to Gallego and Busch (2015), these offices are now common if not essential elements of student services and are responsible for assuring that students receive specific AT services and accommodations. To aid in student success, DSS collaborate with other departments on campus such as academics, the learning center, career services, information technology services, as well as the library.

Disability Laws

Congress has enacted several laws to ensure students with disabilities are given equal access to educational opportunities. These laws include the Americans with Disabilities Act 1990 (ADA), Rehabilitation Act of 1973 (Sections 504 and 508), Individuals with Disabilities Education Act (IDEA), and the Assistive Technology Act of 2004 (ATA).

ADA

The ADA prohibits discrimination against people with disabilities in several areas, including employment, transportation, public accommodations, communications and access to state and local government' programs and services. These regulations have afforded students equal opportunities to pursue higher education. Simon (2011) affirmed the ADA prohibits discriminatory actions which include:

- Denying qualified students equal opportunity to participate in programs and activities
- Providing aids and services that are not "equal to" or as "effective as" those provided to others
- Use methods of administration that result in discrimination

- Use eligibility criteria that screen out or tend to screen out individuals with disabilities
- Fail to provide reasonable accommodations

Section 504

Section 504, also part of the Rehabilitation Act, applies to secondary and postsecondary educational environments. According to Katsiyannis, Zhang, Landmark, and Reber (2009), Section 504 mandates that no qualified individual with a disability be "excluded from the participation in", be denied benefits of, or be subjected to discrimination under any program or activity receiving federal funding which includes all public and most private colleges and universities. In addition, institutions may not place quotas regarding admission of individual with disabilities nor can they be excluded from participating in or receiving benefits from academic research.

Section 508

Section 508, also part of the Rehabilitation Act, originally mandated that all electronic and information technology used by the federal government be accessible. A recent update of this law still applies mainly to federal agencies; however, colleges and universities are subject to compliance under Title II of the Higher Education Act. Title II protects individuals with disabilities from discrimination on the basis of disability in services, programs, and activities provided by state and local governments. (https://www.ada.gov/ada_title_II.htm)

IDEA

The IDEA was enacted to serve students with disabilities in secondary institutions. Under this mandate, students at the K-12 level are guaranteed services (Newman & Madaus, 2014). It is a law that makes available a free appropriate public education to eligible children with disabilities throughout the nation and ensures special education and related services to those children. https://sites.ed.gov/idea/about-idea/.

ATA

The Assistive Technology Act was designed to increase awareness of access to AT. The Department of Education (DOE; http://www2.ed.gov/programs/atsg/legislation.html) stated the purposes of the ATA are to:

3. Support state efforts to improve the provision of AT to individuals with disabilities through state programs and technology-related assistance.
4. Provide states with financial assistance that supports programs designed to maximize the ability of individuals with disability and to obtain AT devices and AT services.

What is Assistive Technology?

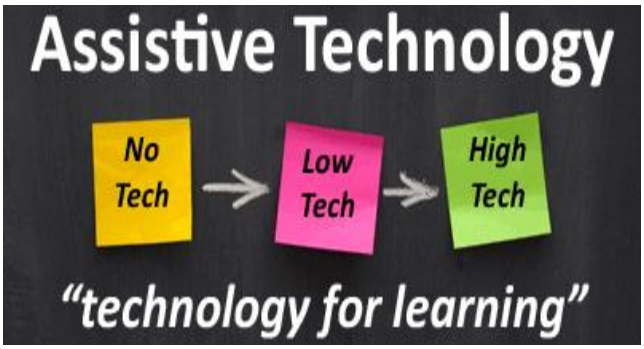

Photo from Orange Public Schools

Assistive Technology is an efficient way to enhance the learning process for many students with disabilities. For example, a student who has difficulty writing can use a speech recognition program to create needed documents. Additionally, a student who has been diagnosed with a vision disability can use a screen magnifier to increase the size of text and improve overall visibility. With effective integration of AT into the classroom environment, students can have the provision of multiple means to complete their work with greater independence (Ahmad, 2015). Each individual is unique and what is suitable for one may not be appropriate for another. The National Assistive Research Institute (NARI; http://natri.uky.edu/resources/fundamentals/defined.html) defined AT as a combination of *assistive* devices, which help people with disabilities perform a given task and *adaptive* devices which are used to change or modify the environment. The NARI suggests that AT be classified in four different categories including:

5. High tech – devices that incorporate sophisticated electronics or computers
6. Medium tech – mechanical devices such as wheelchairs
7. Low tech – adapted spoon handles or Velcro fasteners
8. No tech – physical therapy or occupational therapy

Specific Disabilities and Assistive Technology

Cognitive Disabilities

Photo Courtesy of Pintrest.com

There are at least two ways to diagnose cognitive disabilities: functionally or clinically. Clinical diagnoses of cognitive disabilities include autism, Down Syndrome, traumatic brain injury (TBI), and even dementia. https://www.disabled-world.com/disability/types/cognitive/. Additionally, psychological disabilities fall under this category. These disabilities include depression, anxiety, schizophrenia, and post-traumatic stress disorder.

Functional diagnosis ignores the medical or behavioral causes of the disability and instead focuses on the resulting abilities and challenges. Some of the main categories of functional cognitive disabilities include deficits or difficulties with: https://webaim.org/articles/cognitive/

- Memory – The ability to recall learned content.
- Problem-solving – To define a problem and identify or create a solution
- Attention – Focused and not easily distracted
- Reading, linguistic, and verbal comprehension – Difficulty understanding non-literal and non-existent text
- Math comprehension – Difficulty working with numbers and number processes
- Visual comprehension – Difficulty processing visual information

Educators must be careful not create accessibility issues as there may be times when specific instructional materials may not be compatible with all devices. Listed below are some specific AT solutions used for students who have cognitive disabilities.

Cognitive AT Solutions	***Descriptions***
Screen reader programs	Aide students who are blind or have visual impairments read text.
Recorded course materials	Course materials saved as audio or video formats and can viewed at a later date
Learning Management System	A tool or portal used to host online courses. (Examples: Blackboard, Moodle, Canvas, Brightspace and Desire 2 Learn)
Smart pens	Allow student to convert words into a digital format. Captures audio and you write.
Use of graphics and illustrations in course content	Detailed graphics and illustrations are used to allow for easier comprehension of course content.
Mobile devices	Handheld computers such as tablets, smartphones, and e-readers.
E-readers	Electronic devices used for reading e-books, e-journals, or other digital documents.
Voice Recognition programs	Programs that convert voice commands into text. Can be used as an alternative to typing.
Blogs and Wikis	Make course materials available for later use. Additionally, allow students to express their thoughts and feelings in an informal environment.

Sensory Disabilities

Sensory disabilities can affect any of the five senses including vision, hearing, smell touch, and taste. For educational purposes, it generally refers to a disability related to hearing, vision, or both hearing and vision. http://www.doe.virginia.gov/special_ed/disabilities/sensory_disabilities/index.shtml.

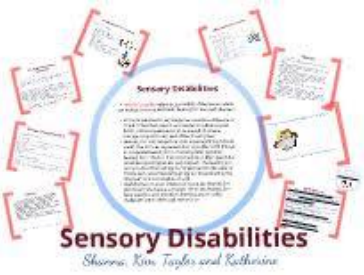

Photo Courtesy of Katie Breen

Hearing loss is typically described as slight, mild, moderate, severe, or profound. There are two main types of hearing loss.

- One happens when your inner ear or auditory nerve is damaged. This type is permanent.
- The other kind happens when sound waves cannot reach your inner ear due to ear wax build up, fluid or a punctured eardrum.

According to The American Foundation for the Blind (AFB; http://www.afb.org/info/living-with-vision-loss/eye-conditions/glossary-of-eye-conditions/low-vision-and-legal-blindness-terms-and-descriptions/1235#VisualImpairment), a visual impairment is a general term that describes a wide range of visual function, from low vision through total blindness. Visual impairments can be due to disease, trauma, or congenital or degenerative conditions. There are some different terms used to describe levels of vision disability. These terms include, 'Partially-Sighted,' 'Low-Vision,' 'Legally Blind,' and, 'Totally Blind.'

- Partially-Sighted means the person has some form of visual disability that may require special education.
- Low-Vision usually is used to refer to persons who experience a more severe loss of vision that is not necessarily limited to distance vision. Persons with low-vision may be unable to read a newspaper at an average distance with eyeglasses or contacts, and may need large print.
- Persons who are legally blind have less than 20/200 vision in their better eye, or a very limited field of vision.
- Persons who are totally blind and unable to see.

According to DeLee (2015), researchers such as Sobczak (2013) proposed a variety of methods or technologies that can be used to access information for those with sensory disabilities. These technologies include screen readers and magnifiers for visual impairments and assistive listening devices for individuals who experience hearing loss. Listed below are some specific AT solutions used for students who have sensory disabilities.

Sensory AT Solutions	***Descriptions***
Screen Reader Programs	Aide students who are blind or have visual impairments read text.
Digital textbooks or E-textbooks	Instructional materials provided in a digital format. Can be viewed on computer monitors or any compatible mobile devices.
Digital Audio Recorders	Devices used to record lectures. Example: Sony ICD-UX533
Captioned Videos	Adding subtitles to videos used in instruction. Provides accessibility for the hearing impaired.
Learning Management System	A tool or portal used to host online courses. (Examples: Blackboard, Moodle, Canvas, Brightspace, and Desire 2 Learn)
Screen Enlargement Software	Software used to magnify text or graphics on a computer monitor.
Enlarged Printed Textbooks	Students with low vision will benefit from textbooks with large print.
Voice Recognition Programs	Programs that convert voice commands into text. Used as an alternative to typing.
Podcasts	Digital or audio files that users can download and listen to at a later date
Smart pens	Allows student to convert words into a digital format.
Transcription services	The process of turning audio files into text. Example (Communication Access Real-time Translation - CART)
Note-takers	Individuals assigned to take notes for students with disabilities
Voice enhancers	Device that add amplification for those with speech impairments
Tactile graphics	Images with raised surfaces such as graphs or maps.
Braille	A writing system used by individuals who are visually impaired.

Physical Disabilities

Students with physical dishabilles have limited movement and functioning abilities. Some of the common disabilities include: cerebral palsy, spina bifida, muscular dystrophy, and multiple sclerosis. The disability can be mild or severe and may interfere with an individual's ability to perform daily activities such as writing, walking, or running.

Photo Courtesy of IBEW

For students with restricted mobility, using conventional assistive technologies such as voice recognition software or expanded keyboards is recommended (DeLee, 2015). Using these tools may assist students engage in educational activities independently and lessen the need for specialized educational support. Listed below are some specific AT solutions used for students who have physical disabilities.

Physical AT Solutions	***Descriptions***
Learning Management System	A tool or portal used to host online courses. (Examples: Blackboard, Moodle, Canvas, and Desire 2 Learn).
Adjustable Tables	Flexible tables that adjust to a specific height or width.
Voice Recognition Programs	Programs that convert voice commands into text. Used as an alternative to typing.
Trackballs and Mouse controls	Alternatives to a typical mouse that are used for individuals who have limited movement.
Ergonomic Chairs	Chairs that provide the right amount of comfort and support and help reduce back strain.
Ergonomic Keyboards	Keyboards that feature larger or smaller keys, alternative key configurations, or devices that can used with one hand.
Electronic Note takers	Digital alternatives to paper and pen. Portable devices for storing information.
Touch Screens	Screens that display text or graphics that make it easier for users to input instructions or make selections.
Interactive White boards	Allow users to interact with a computer or mobile device by touching the board with a stylus or finger.
SIP and Puff Controls	Devices used to send signals to a device using air pressure onto a tube or joystick.

Assistive Technology Training

Student Training

Difficulties arise when using technology as everyone's skills and capabilities vary. Students need to be supported in learning to use the technology to be able to successfully access it; otherwise, the results may prove to be worse than having no access at all (Ahmad, 2015). While some may be extremely familiar and possess excellent technical skills others may struggle to complete simple task such as opening a document or sending email. For AT to be beneficial students must be properly trained on its usage. Roberts, Crittenden, and Crittenden (2011) stated with distance education on the rise as an alternative to traditional education, institutions should increase their services and provide training to this sometimes-forgotten student population.

While some schools may have an office dedicated to serving students with disabilities, this student population should be able to receive assistance or training when using AT from other departments or individuals on campus such as:

- IT Department
- Student Services
- Library
- Learning Assistance Center
- Faculty

Listed below are some of the more common AT used in education which students may seek or require assistance.

AT Training for Students	*Descriptions*
E-text Books	Instructional materials provided in a digital format. Can be viewed on computer monitors or any compatible mobile devices.
Audio Textbooks	A recording of textbook content. Can be accessed by using a computer or any compatible mobile device. Audio books make it easier for students with dyslexia to comprehend instructional content.
Screen Reader Programs	Aide students who are blind or have visual impairments read text.
Audio Recorders	Using recorders in class provide students with equal access to the course content. Students can record lectures and listen at their own pace thus allowing them to focus more on class instruction.
Captioned Videos	Students who have hearing impairments benefit from videos that provide captioning.
Enlarged Printed Textbooks	Students with low vision will benefit from textbooks with large print.
Voice Recognition Programs	Programs that convert voice commands into text. Can be used as an alternative to typing.
Podcasts	Digital audio or video files to download and listen to later. Podcasts can be accessed on a computer or any compatible mobile device.
Smart Pens	Allows student to convert words into a digital format.
Note-takers	Individuals assigned to take notes for students with disabilities
Adaptive Keyboards	Keyboards with raised spaces between the keys or has specialized software thus allowing students to type less and achieve the same results.

Faculty Training

Faculty have the responsibility of ensuring the learning environment is accessible for all learners. Faculty play a crucial role in assisting students accomplish their educational goals. Ahmad (2015) and Katsiyanns et al. (2009) argued that it is the responsibility of all faculty to understand federal mandates regarding disability services.

According to Alkahtani (2013), it is essential that faculty know how to use AT such as computer software to enhance instruction, e-readers, digital pens, and other commonly used AT by students. Providing adequate training and support for faculty may alleviate some of the challenges and increase motivation and desire to teach and accommodate students with disabilities.

According to Ahmad (2015), a major challenge in the effective use of AT is the level of expertise and training educators have regarding the technology use and application. To make certain students receive equal access in the classroom, faculty must be trained in areas such as:

1. Mandated accessibility laws
2. Creating course materials in alternative formats
3. Assisting students when using specific AT

Training Topics	***Descriptions***
Creating accessible documents	Provide training on how to create PDF and Microsoft documents that are accessible and can be read by screen readers or other assistive technology devices.
Accessible Webpage creation	Web pages must be accessible to provide equal access to diverse populations. Instructors who create their own Web sites as required or supplemental course materials should be aware of how to create sites that meet the needs of every student.
Accessibility Laws	Federal mandated regulations that prohibit discrimination against people with disabilities.
Accessible Audio Files	Providing a text-based transcript of the recording.
Social Media	Digital platforms used to create and share information.
Universal Design for Learning	An educational framework used for curriculum development to ensure course materials as accessible by all individuals.

Training Topics	*Descriptions*
Usage of Learning of Management Systems	Provide training that show faculty how to: • Use features that allow students to have extended time on tests if needed. • Allow multiple attempts in case of technical issues • Create course materials that can be used with screen readers
Software Training	Provide training to faculty on software applications used by students with disabilities.
Hardware Training	Provide training to faculty on various hardware used by students with disabilities.
Online Training Modules	Create online training for faculty and staff relating to accessibility laws and other topics relating to working with students with disabilities.

Outreach and Awareness

Korbel, Lucia, Wenzel, and Anderson (2011) expressed the importance of making students aware of services offered at post-secondary institutions. Creating a culture of awareness on campus is vital to student success. When students arrive on campus they should know where to find services and how to request them. Additionally, it is equally important for faculty, staff, and other students to know how to interact with this student population.

Students with disabilities who use assistive technologies and other accommodations may demonstrate higher success. Disability awareness events and other activities can be used to increase awareness of AT and other services available and how to request them.

Activities	***Descriptions***
College's Website	Websites should be designed to provide information to individuals with diverse limitations Provide disability information on the college's website.
Collaborate with Secondary Institutions	Provide information to counselors Arrange campus visits Training and workshops
Create a student handbook	Can be used to describe the services offered at an institution and contain policies and procedures related to obtaining assistive technology and other accommodations.
Mailings and Brochures	Newsletters Flyers Posters
Reach out families	Family members could offer more insight to what is needed to aid students in their academic journey.
Classroom Presentations	Presenting in a classroom setting gives students who are present an opportunity to ask questions. Additionally, students will be able to identify who is responsible for providing disability services.

Activities	***Descriptions***
Work with Outside Agencies	North Carolina Services for the Blind Educational Institutions CART providers Transportation Services Autism Society Easter Seals Mental Health Agencies Vocational Rehabilitation North Carolina Assistive Technology Division
New Student Orientation	Session held to assist students in transitioning from one educational environment to another. Information relating to disability services can be one of many topics discussed.
Faculty and Staff Meetings	Can be used as a means to educate faculty and staff about the laws that focus on serving students with disabilities and serve as a question and answer session.
Course Syllabi	Provide faculty with written statements relating assistive technology and other services that are available to students and how to obtain them.
Faculty Representative	A faculty member designated to assisting incoming students with disabilities and act as a liaison between the Disability Services Office and faculty.
Parent Representative	A parent of a student with disabilities designated to assisting incoming students.

Examples of Assistive Technology

Screen Reading Software

1. JAWS – Job Access with Speech
2. NVDA – Non-Visual Desktop Access
3. COBRA
4. Dolphin Screen Reader
5. System Access
6. Zoom Text
7. iMax for Mac
8. Eye Pal
9. Word Talk
10. Kurzweil

Smart Pens

1. Sharper Image Bluetooth Digital Pen
2. Wacom INTUOS4/CINTIQ21 Grip Pen
3. New Livescribe Pulse Smartpen
4. Wacom Bamboo Ink Smart Stylus Pen for Surface Pro and Windows Ink
5. Smarson Pen The Smart PEN
6. Moleskine Smart Writing Set

E-book Readers

1. Amazon Kindle Oasis
2. Amazon Kindle Paperwhite
3. Amazon Kindle voyage
4. Kobo Aura H2O
5. Kobo Aura One
6. Kobo Clara HD
7. Barnes and Noble Nook GlowLight 3

Voice Recognition Software

1. Dragon Professional Individual v15
2. Dragon Anywhere
3. Google Docs Voice Typing
4. Braina Pro
5. Windows10 Speech Recognition
6. Nuance

Examples of Assistive Technology

Screen Magnification Programs

1. SuperNova Magnifier
2. MAGic
3. ZoomText
4. Virtual Magnifying Glass

Voice Amplifiers

1. The WinBridge Rechargable and Portable Voice Amplifier
2. The ETvalley Voice Amplifier
3. The Croover Rechargeable Voice Amplifier
4. The GHB voice Amplifier
5. The DinoFire Voice Amplifier

Mice and Trackballs

1. Kensington: Expert Mouse and SlimBlade
2. Traxsys: Roller Plus and Roller II
3. AbleNet: Wave
4. Logitech: Wireless Trackball and Marble

Ergonomic Keyboards

1. Kinesis Freestyle 2 with VIP
2. Key Ovation Goldtouch
3. Matias Ergo Pro
4. Kinesis Advantage 2
5. Logitech K350

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Appendix J – Institutional Review Board Approval Letter

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: **Brenda DeLee, Educational Specialist**
College of Engineering and Computing

From: **Ling Wang, Ph.D.,**
Center Representative, Institutional Review Board

Date: **February 16, 2017**

Re: **IRB #: 2017-109; Title, "Assistive Technology Guidelines for Higher Education Disability Support Staff"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt Category 2)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and Ling Wang, Ph.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, lifethreatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Gertrude Abramson, Ed.D.
Ling Wang, Ph.D.

Appendix K. – Quantitative Results for the AT Needs Assessment

Section A – Awareness Activities or Events

Number	Activity or Event	Average
1.	Provide information on college's website	5.0
2.	Provide local high schools with information	4.8
3.	Partner with outside agencies	4.6
4.	Arrange campus visits for high school students	3.8
5.	Send mailings and brochures	3.8
6.	Create a student handbook	3.2
7.	Classroom presentations	3.2
8.	Reach out to families of students with disabilities	3.0
9.	Provide training and workshops to secondary school personnel	2.80

Section B – AT for Sensory Disabilities

Number	AT for Sensory Disabilities	Average
1.	Learning Management Systems	4.8
2.	Captioned Videos	4.6
3.	Screen Reader Programs	4.4

4.	Digital Textbooks	4.2
5.	Screen Enlargement	4.0
6.	Digital Audio Recorders	4.0
7.	Enlarged Printed Textbooks	2.8
8.	Voice Recognition Programs	2.8

Section B – AT for Cognitive Disabilities

Number	**AT for Cognitive Disabilities**	**Average**
1.	Learning Management Systems	4.6
2.	Screen Reader Programs	4.4
3.	Recorded Course Materials	3.8
4.	Smart Pens	3.8
5.	Use of graphics and illustrations in course content	3.0
6.	Mobile Devices (iPads and Laptops)	3.0
7.	E-readers	2.6
8.	Voice Recognition Programs	2.2
9.	Electronic Organizers	2.2
10.	Blogs and Wikis	1.6
11.	Hand-held Scanners	1.4

Section B – AT for Physical Disabilities

Number	AT for Physical Disabilities	Average
1.	Learning Management Systems	4.4
2.	Adjustable Tables	4.2
3.	Ergonomic Chairs and Keyboards	3.6
4.	Touch Screens	3.0
5.	Trackballs and Mouse Controls	2.8
6.	Voice Recognition Programs	2.8
7.	Electronic Note Takers	2.8
8.	Interactive White Boards	2.4

Section C – Student Training

Number	AT training for students	Average
1.		
2.	Screen Reader Programs	4.4
3.	E-textbooks	4.4
4.	Digital Audio Recorders	4.2
5.	Audio Textbooks	4.0
6.	Learning Management Systems	4.0
7.	Screen Magnification Software	3.8
8.	Assistive Listening Devices	3.6
9.	Library Resources	3.6
10.	Voice Recognition Programs	2.8
11.	Adaptive Mice and Keyboards	2.4

Section C – Training Locations for Students

Number	Departments or Locations	Average
1.	Disability Services Office	4.6
2.	Student Services	3.2
3.	Information Technology Department	3.2
4.	Library	3.0
5.	Learning Assistance Center	3.0
6.	Faculty	2.4

Section D –Faculty Training

Number	Areas of faculty training	Average
1.	Creating accessible documents	4.4
2.	Creating accessible web pages	4.0
3.	Universal Design for Learning Principles	4.0
4.	Accessibility Laws	3.8
5.	Creating accessible audio and video files	3.8
6.	Proper use of learning management system	3.8
7.	Social Media for instruction	3.2
8.	Software training (Voice recognition and screen reader programs)	2.6
9.	Hardware Training (Digital audio recorders, Interactive White Boards, Mouse Controls)	2.6

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