Lost In The Cloud: The Experiences Of College Students With Visual Impairments In An Online Environment

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Online courses have become a necessity in education. Still, the online learning format, course design, and course management systems are not always conducive for learners with visual impairments. “A key concern is that faculty and individuals accountable for supporting and implementing e-learning within postsecondary institutions, in a rush to integrate technology into teaching, fail to think about the accessibility needs of students with various disabilities” (Fichten, 2009, p. 242).

This qualitative study aimed to describe and interpret the lived experiences of college students who are blind or visually impaired in an online environment. This study involved ten blind or low-vision students enrolled in online courses. Ten semi-structured, open-ended interviews were conducted, which provided a vivid description of the students’ lived experiences as they encountered barriers, faced complex course content, and benefited from best practices used by instructors in the online learning environment.

The following were the key findings related to the research questions. First, the study found the learning barriers experienced by the participants include course material in inaccessible formats, videos missing audio descriptions, and unavailable maps and diagrams. Second, the research participants stated math and foreign language courses present the most difficulty for students who are blind or visually impaired. Third, creating material in accessible formats, providing accommodations, good communication, and providing content in advance are best practices professors use in an online environment.
This research study aimed to apply the knowledge gained in perfecting and developing proactive interventions to reduce educational barriers for the visually impaired. My research supports a mutual understanding of accessibility needs between the campus community and students who are blind or have low vision. These findings would be applied to the following: (a) advising the university’s Disability Services for Students (DSS) office regarding the acquisition of support services, (b) developing strategies to better prepare faculty for teaching students who are blind or low vision, (c) assisting faculty in gaining a greater understanding of the most effective classroom pedagogy and dynamics in achieving academic success for students who are blind or visually impaired, and (d) hiring staff proficient in assistive technologies.

In addition, faculty who teach in an online learning environment could use the findings to make the environment more inclusive for those students who are blind or visually impaired by (a) establishing a level of comfort in communicating with the student concerning accessibility issues, (b) demonstrating a willingness to create accessible materials and use accessible textbooks and third-party vendors who champion accessibility, (c) encouraging unwilling students lacking confidence, who may be uncomfortable with self-advocating, to dare to try, and (d) being influential in helping foster interexchange of accessible materials and communication among all students (sighted, blind, or visually impaired).
LOST IN THE CLOUD: THE EXPERIENCES OF COLLEGE STUDENTS WITH VISUAL IMPAIRMENTS IN AN ONLINE ENVIRONMENT

by

Gwen A. Bostic

A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy Educational Leadership, Research, and Technology Western Michigan University April 2022

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I would like to begin by acknowledging my mother, Barbara J. Carr, who took me to class with her when she was completing her graduate work and unknowingly instilled in me the dream of one day obtaining my Ph.D. Although she is not here physically to celebrate my accomplishment, I know she would be proud.

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CHAPTER  I

INTRODUCTION

Section 504 of the Rehabilitation Act bars discrimination because of a disability in all institutions receiving federal funding, including public and most private schools, colleges, and universities. With the support of this law, 30.3% or 1,151,500 people who identify as having a visual impairment (blind, low vision) received college credits/associate degrees during 2016 (National Federation of the Blind, 2016). As those students enrolled in higher education institutions, they may have had experience with an online learning environment and online course shells.

Online courses have become a necessity in education. Still, the online learning format, course design, and course management systems are not always conducive for learners with visual impairments. “A key concern is that faculty and individuals accountable for supporting and implementing E-learning within postsecondary institutions, in a rush to integrate technology into teaching, fail to think about the accessibility needs of students with various disabilities” (Fichten, 2009, p. 242). In addition, students who are visually impaired may experience limited academic support given a faculty member’s lack of experience in preparing accessible material, poor communication between faculty and students, or misguided attempts by students to avoid being a burden to the instructor by seeking course accommodations. For students with visual impairments to succeed in college, they should seek “appropriate assistance and advocate for their needs” (Farmer, 2015, p. 145). The facts are, they may not always do so. Students who are visually impaired are looking to become active contributors to society and assets to their community by obtaining advanced degrees. Still, as they gain higher education and access online learning, they may encounter barriers that hinder achieving their goals.
Background

In the United States, there are distinct categories of visual impairment: partially sighted, low vision, legally blind, and blind. Visually impaired is an applicable term to describe those whose decreased visual function interferes with their ability to perform activities of daily living, such as reading, driving, and watching television. Partially sighted is defined as limited vision in one or both eyes. Low vision is defined as having 20/70 or poorer vision in the eye that sees better, but there is no improvement with glasses or contacts. Legally blind means vision is corrected to 20/200 in the better-seeing eye; note, if glasses can update the vision to 20/20, the person is not considered legally blind. The definition of totally blind is a total loss of sight.

According to the National Center for Biotechnology Information (2020), total blindness includes a complete lack of light perception, documented as no light perception (NLP). No matter what category a visually impaired person falls within, many in this population focus on obtaining education in the post-secondary environment.

Students who identify with a visual impairment want to become independent adults as they move on to college but may need accommodations to help them achieve this goal. According to Allsop (2005), “it is important to recognize that some college students with learning disabilities continue to need services similar to those that they required at the secondary level” (p. 104). So, although they have left high school, students with visual impairments need accommodations to be successful. When entering higher education, they must understand it is their responsibility to initiate requests for services in the postsecondary environment. Many fail to do this because they “recognize their lack of self-advocacy skills as a barrier to success and admit that they cannot communicate their needs for support and accommodations effectively” (Mytkowicz, 2012, p. 347). Indeed, “Section 504 allows postsecondary institutions to require
students who are requesting services based on a disability to submit documentation that verifies the nature and extent of the disability” (Madaus, 2006, p. 13).

University support services should make sure they have considered the following areas when addressing the issue of support and accommodations for visually impaired or blind students:

…accessibility of needed hardware and software necessary in labs and student work areas; administrative support and funding for the purchase of adaptive technologies and disability services staffing and training; awareness and knowledge about adaptive technologies among students with disabilities; reliable and compatible hardware and software; the cost of adaptive technologies and their upgrades; acquiring alternate format course materials; technical problems connecting to websites and course management systems; increased faculty awareness and support for students who use adaptive technologies; accessibility of adapted audio and video clips; ergonomic issues poor with course content, PowerPoint and data projection during in-class lectures; the need for technology/software required for home access; training of professors on how to make E-learning accessible. (Fichten, 2010, p. 138).

Students with visual impairments are therefore expected to “contact the Office for Students with Disabilities (OSD), self-identify as a student with a disability, provide documentation of their disability and the accommodations needed, self-advocate to their instructors, and participate in the services that will support their academic progress” (Hadley, 2011, p.77). But even after they have done so, they may still encounter a “postsecondary environment that provides limited external structure and places greater demands on their internal capacity to organize goal-directed behavior” (Parker 2009, p. 204).
If requested with the proper documentation, support services and accommodations must be considered and provided as long as they are “reasonable, don’t fundamentally alter the nature of the program or impose an undue hardship on the organization” (Womack, 2017, p. 495). A student with a visual impairment would request an accommodation and fall within a learning disability category. A learning disability is defined as “a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written that may manifest itself in the imperfect ability to listen, speak, read, write, spell or do mathematic equations” (American Speech-Language-Hearing Association, 2020, “Specific Learning Disability” section, para. 2). Learning disabilities range from mild to severe and fall within thirteen categories: autism, blindness, deafness, emotional disturbance, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, other health impairment, specific learning disability, speech or language impairment, traumatic brain injury and visual impairment.

“Although academic success is not guaranteed to any college student, a lack of supports may be considered a form of exclusion for some students with disabilities since without needed supports they may not have the same access to a post-secondary education as their non-disabled peers” (Graves, 2011, p. 318). Students with visual impairments should actively seek support in their quest to attain academic success. This is crucial in a higher learning environment where it is easy to fall behind in completing course assignments and readings. Examples of needed supports in online courses would be software and hardware assistance, accessing course content (notes and materials), and establishing communication with the professor and other students (discussions). Support also may be needed in operating adaptive technologies with the course
software. Research suggests that “students with learning disabilities are less comfortable than their nondisabled peers with learning technologies” (Korbel, 2011, p. 38).

As students with visual impairments enter college, they are inundated with choices. One of these choices is course format. No longer are these students limited to the traditional face-to-face classroom. Some may choose to enroll in online courses or find that a given course is only offered in an online format. The identifying feature of such online courses is the instructor and student may be separated by time and physical space. Online learning has gained in popularity due to the growth of technology and because it provides students access to course material at any time, and they can work at their own pace. The format of these courses may be hybrid, where there are traditional face-to-face meetings and online synchronous class sessions (i.e., instruction conducted in real-time meetings), or the system may be structured asynchronous online. In either case, a student with a visual impairment may need more contact with the instructor to overcome learning barriers encountered when working in the online course environment.

Instructors assigned to teach an online course should be comfortable in this environment. “Some professors lack the technical expertise, course-management skills, or time to provide quality instruction online. This results in poor online instructional delivery and causes some students, especially those with special needs, to struggle to be successful” (Simoncelli, 2008, p. 58). Instructors with online teaching assignments should complete online teaching training to assist them with course design and provide more insight into this area. When creating a curriculum, instructors teaching in an online environment should consider the “what, how and why of learning through multiple means of representation, expression, and engagement” (Graves, 2011, p. 319). This will allow them to take a proactive approach to their course design. Suppose instructors do not think ahead and instead take a reactive approach. In that case, this can “result
in barriers to access that would not exist if accessibility and usability were considered during the early stages of development” (Hollins, 2013, p. 608). A reliable resource for any instructor in this area is the Web Content Accessibility Guidelines (WCAG) developed by the World Wide Web Consortium (Babu, 2007). Indeed, “instructors should actively manage their online course by conducting continual reviews and updates to accommodate students with learning disabilities” (Keeler, 2007, p. 73). Yet, the extent to which this is occurring, especially in a rush to online teaching during the current pandemic, is still not known. Nor have the voices of visually impaired students in such situations been captured.

Problem Statement

Researchable Problem

All students want to start their college careers on a level playing field. Those with visual impairments wish to leave the labels, discrimination, and bias associated with their visual impairment back in the K12 environment and receive equal treatment with their peers. But what they discover when they enter higher education is “faculty and staff who are not familiar with disability concerns, lack of access to textbooks in alternative formats and their limited self-advocacy skills” (Hong, 2015, p. 210). Attention should be given to the lived experiences of college students with visual impairments enrolled in online courses and the barriers they encounter to help them reach their educational goals.

Studies Addressing the Problem

Many studies about students with visual impairments in higher education have focused on accommodations. Many of them addressed why students either elected to or did not receive accommodations for their courses. When students were selected to receive accommodations, they were given adaptive equipment and technology, course notes, and most often granted
extended test time or alternative formats (Graves et al., 2011; Newman et al., 2015). Other studies identified why college students with visual impairments elected not to receive accommodations. The reasons given were limited ability to explain or defend their needs, faculty perceptions (judgmental, lower expectations), not wanting to be treated differently, and the quality of support services (Barnard-Brak et al., 2010; Hong, 2015).

Another set of studies about students with visual impairments in higher education has focused on online course content management systems and online courses. The online course content management system is a communication meeting point for students and teachers, and it houses the online course’s material (Lagarto, 2013). The research found that the more accessible and usable the content management system is, the better academic success students with visual impairments have (Babu et al., 2007). Research also found that the lack of technical expertise, lack of ability to adapt to online instruction, and being unprepared to create accessible material results in poor online instructional course delivery and causes students with special needs to struggle to be successful (Simoncelli, 2008; Stone et al., 2019; Whitburn 2014).

Yet another set of studies about students with visual impairments in higher education focused on self-advocacy. These studies found college students with visual impairments must become less dependent on parents and become persistent, advocates for their needs, become constructivist learners, build support systems, and develop their strategies to compensate when they encounter barriers (Farmer, 2015; Hollins et al., 2013; Howland, 2002; Stewart, 2010).

Literature Deficiency Statement

Although a few studies have been conducted on students with visual impairments and online courses (e.g., Kumar et al., 2015; Lowe et al., 2016), none focus on the lived experience of students with visual impairments in an online environment as a major theme. Research is
abundant regarding accommodations (Barnard-Brak et al., 2010; Graves et al., 2011; Hong, 2015; Newman & Madaus, 2015; Womack, 2017). There is also much research on online course content (Babu et al., 2007; Lagarto 2013; Simoncelli, 2008; Stone et al., 2019; Whitburn 2014). In addition, a growing body of literature reveals the importance of college students with visual impairments employing self-advocacy (Farmer, 2015; Hollins et al., 2013; Howland, 2002; Stewart, 2010).

However, little research exists that explores the lived experience of students with visual impairments in an online environment and the barriers they encounter. While the literature supports the idea that a college education is beneficial to this population, data on the lived experience of students with visual impairments in an online environment is seriously lacking. According to Fuller et al. (2004), “despite growing interest in issues of inclusion, the voice of disabled students themselves has hardly been heard” (p. 303). Indeed, the voices of college students with visual impairments discussing their lived experiences in an online course environment have yet to be heard.

Significance of Study

There has been a growing movement of inclusivity for persons with disabilities on university campuses. This involves the proper design of physical space and the quality of learning experiences they gain access to in higher education (Lourens et al., 2016). Research has revealed that “nearly one-half of college students with disabilities seek personal counseling services and suggested that the types of issues related to their transition and adjustment can be quite different from the problems presented by the nondisabled population” (Paul, 2000, p. 200). Capturing the voices of such students is significant because students with disabilities are overlooked and are a marginalized student population in the higher education culture.
Secondly, the significance of this study is identified in the fact that online “education options create learning opportunities for everyone if accessibility considerations are made in the design process. According to Frank (2019), when the support of students with visual impairments is reactive rather than anticipatory there are inconsistencies in the delivery of the assistance (p. 5). This inconsistency then imposes “needless barriers to equal participation in academics and careers for potential students with disabilities” (Burgstahler, 2004, p. 244). If online courses are designed to be inclusive of all learners taking into consideration, there may be students with disabilities who do not wish to self-disclose than all students are helped. Removing barriers allows students with disabilities to contribute and creates an educational community open to all students.

Thirdly, this study is key because students with visual impairments and others “labeled with learning disabilities need the opportunity to gather of their own accord, share experience, discover an identity, and find a collective voice with which to turn outward and claim their place as equal citizens in the democracy” (Denhart, 2008, p. 495). No matter how advanced the available technologies are, how supportive the school personnel is, or how articulate the policies that protect human rights are, there will be no improvement for individuals if they do not take the initiative and follow through when they find their needs are not being met (Kim-Rupnow, 2001). Additional research data will provide more information that students with disabilities can use to claim their place in the education landscape so that their needs are not an afterthought.

Finally, such research is also essential to the Disability Services for Students office within higher education institutions. This office is a liaison for the campus community and between students and staff by providing “education and advocacy” (Myers & Bastian, 2010, p. 266). It includes faculty and staff training regarding disability issues and supports students.
Additional research would assist disability services personnel in providing the appropriate accommodations and explaining procedures for implementing these accommodations for students. To this end, my proposed study will add to the limited literature on the lived experiences of college students with visual impairments in an online environment.

Purpose Statement

The purpose of my qualitative study is to describe and interpret the experiences of college students with visual impairments in an online environment. The resulting themes can assist in creating promising practices to follow when trying to limit barriers in online education for students with visual impairments and give a voice to a historically marginalized student population.

Research Question

The overarching research question is: What are the experiences of college students with visual impairments enrolled in an online course? For this study, the following research questions further guide my investigation.

1. What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?
2. What type of course content presents the most difficulty for college students with visual impairments enrolled in online courses?
3. What do such students voice as the best practices used by instructors of online courses to assist them with their learning?
Conceptual Framework and Narrative

A conceptual framework consists of the “ideas and beliefs that the researcher holds about the phenomena studied” (Maxwell, 2013, p. 39). It provides direction to a study and represents what the researcher believes is occurring in the study. My study explores the lived experiences of college students with visual impairments enrolled in an online course. The goal is to understand what is seen as a barrier when addressing specific factors influencing college students with visual impairments in an online system, including course format, course content, and instructors. A graphical representation of my conceptual framework can be seen in Figure 1.

*Figure 1*
*Conceptual Framework for Bostic (2021) Study*
To begin this conceptual framework narrative, let us start with the *who*. In this study, college students with visual impairments enrolled in online courses and the learning barriers in this environment.

As these students enter college, they may register for online classes. Online courses can be designed in two different *course formats: synchronous and asynchronous*, as described by Coy et al. (2014) and Graves et al. (2011). The synchronous format schedules the students and faculty online simultaneously, whereas the asynchronous design allows students to view a recording of instructions at their convenience.

Once enrolled in the online course, students encounter *course content*. The course system can present barriers when it is formatted incorrectly and has images without alternative text or confusing tables, as Massengale et al. (2016) mentioned.

After encountering inaccessible content, the student may contact the *instructor*. The instructor can discuss the barriers met and how the student can overcome the obstacles by providing accommodations and collaborating with other trained professional staff. The instructors could conceivably become a barrier depending on their knowledge of accessibility and internal bias, as Ginsberg et al., (2008).

The base of my framework consists of the Self-determination Theory (Friederichs et al., 2016), Section 504 of the Rehabilitation Act of 1973, and the Social Model (Denhart, 2008). During the 1990s, the *Self-determination Theory* became popular among those in higher education disability services. It focuses on human motivation and an individual understanding their strengths and limitations. This theory is based on the notion of helping an individual with a disability to participate in goal-directed, self-regulated behavior as defined by Rigby et al.
This theory assists with setting goals, identifying motivation, and recognizing limitations, so barriers are not confused with skill deficits.

The second element of my framework’s base is Section 504 of the Rehabilitation Act of 1973. This is a civil rights law that prohibits discrimination based on disability. According to West et al. (1993), “This law prohibits discrimination based on disabling conditions by programs and activities receiving or benefiting from federal financial assistance” (p. 456). Section 504 Subpart E of the Rehabilitation Act of 1973 involves all aspects of post-secondary education, including admission, recruitment, treatment of students, academic adjustment, housing, financial and employment assistance, and non-academic services. It supports the student with a visual impairment when self-advocating for accommodations and accessible online course content as discussed in (Weis et al., 2016). It undergirds the student’s right to receive as barrier-free education as possible.

The third element of my base is the Social Model. The Social Model views disability as a normal part of life, not an abnormality, and rejects the argument that persons with disabilities are flawed. Referencing this model assists the student with a visual impairment when guiding online course instructors toward focusing on their different means of accessing online course material rather than focusing on their deficit, as mentioned in Burgstahler (2017). It strengthens the argument that having a visual impairment is not the problem. Inaccessible course material is the problem and creates barriers.

Methods Overview

To address my research questions, I will conduct a qualitative study using interviews of 10 visually impaired students currently enrolled in or who have taken online courses at a four-year university in the Midwest. I will analyze the data using an inductive approach. This will
allow me to “discover patterns, themes and categories” within the data gathered on the experiences of students with visual impairment enrolled in online courses (Marshall, 2016, p. 222). I present more details of the research design in Chapter 3.

Chapter 1 Closure

There have been tremendous victories for students with disabilities in higher education, but there is still room for improvement. Although societal views have improved and laws have been passed with institutions adhering to those laws, there is still a need for more information on the lived experiences of college students with visual impairments enrolled in online courses. Chapter 2 provides a comprehensive look at studies related to college students with visual impairments and online learning, including learning barriers experienced by college students with visual impairments within asynchronous and partially synchronous courses, best practices used by facilitators of an online course, difficulties with types of course content (ex: math, science, philosophy; humanities/social science vs. natural science) and what makes an online course satisfactory for a student with a visual impairment.
CHAPTER II
LITERATURE REVIEW

After reviewing numerous databases with the assistance of a research librarian, it was determined there is limited research on the experiences of college students with visual impairments in an online learning environment, which supports the need to conduct this study. As a result, I aimed my literature review on two essential topics connected to my research questions, and this review is organized to present these important topics. The first topic focuses on college students with visual impairments and their experiences in higher education. The second topic concentrates on online learning and aspects of it such as learning barriers experienced within asynchronous and partially synchronous courses, best practices used by instructors of an online course when addressing the needs of students with visual impairments, and the difficulties with such course content types faced by college students with visual impairments.

College Students with Visual Impairments

As noted, there is limited research on college students with visual impairments and how they fare within higher education institutions; what has been done reveals struggles.

One key study in this area, Lourens and Swartz (2016), involved in-depth interviews with 15 visually impaired students at one university to explore their day-to-day lives. The results revealed that students felt their “horizon of possibilities shrink when accessing unfamiliar areas” on campus (p. 242). This was because they may not be aware that something exists. After all, they cannot see it, or they may not have direct access to supplemental course materials because they may not be able to search for them directly or the material is not in an accessible format. In addition, these feelings surface if they are using campus resources like a computer lab, and the
lab computer does not have screen reader software installed. Subsequently, this option is closed to them, limiting their independence, and invoking their need to ask for assistance. Bhardwaj’s (2018) study declared it is the responsibility of the university to equip individuals with the competencies needed to succeed while at their institutions and beyond. But to achieve these goals, the institutions must understand the needs of the students with visual impairments. Subsequently, the library, labs, and other information centers should be equipped with technology and trained support staff to meet their needs. Some of the main concerns of students using campus facilities are the lack of staff training in accessibility (assistive tools and technology), and the use of technology/devices that have not been tested for use by students with visual impairments. Displaying an understanding of the information needs of students with visual impairments would help provide relevant resources and allow them to play an active role in society and improve their socialization to their environment.

Students with visual impairments have not only difficulty with the intellectual environment in higher education but also the physical environment of the university campus and how campuses are not designed with them in mind, i.e., the physical challenges of walking alone and the difficulty of finding classrooms when there are last-minute changes to class locations. Kose and Vasant’s research (2018) addressed this need for physical independence by introducing a social walking path support system. This system incorporates artificial intelligence, beacons, and mobile devices to guide students through campus while safely accessing campus buildings, classrooms, and returning to campus housing. The system’s design allowed adjusting to constantly changing environments, ensuring a safe experience and increased self-confidence. Negotiating their surroundings safely gives college students with visual impairment the freedom to socialize with others on campus.
The ability to socialize alleviates feelings of loneliness. Many students experience loneliness while attending college because it may be their first time leaving family and home for an extended period. According to a study conducted by Kong et al. (2020), loneliness scores for college students with visual impairments were high. Factors that may affect students with visual impairments and increase their feelings of loneliness are societal bias, limited primary choice, separate teaching models, and separate teaching management models. Another factor that could affect the loneliness of students with visual impairments is self-identity. Students need to identify where they fit on the continuum between disability and normalcy.

When trying to make this identification, Almog (2018) maintains certain factors may be considered, such as (a) the confirmation “I am just like others, others are just like me,” (b) the effect of environmental barriers, (c) conflict between independence and dependence, (d) impairment effects, (e) social interactions and their importance, (f) the need for self-disclosure, and (g) internal and external forces that helped students throughout their academic journeys. As college students with visual impairments continue to define their identity, they may conclude that this label of disability is social oppression realizing that society should adapt to them, as stated in a study by Bishop and Rhind (2011). Higher education institutions need to remove and eliminate barriers instead of the student trying to adapt and identify in an environment that has not fully considered his needs. Barriers found in higher education include negative attitudes displayed by key individuals who interact closely with students, institutional barriers which do not value diversity and inclusion, and environmental barriers such as inaccessible buildings and classrooms. Removing barriers allows students to be regarded as individuals and not identified by a disability (Bishop & Rhind, 2011, p. 178). Roy and MacKay’s (2002) study also revealed how society’s treatment affects students. Others' misperceptions and negative feedback can flaw
people’s social experiences with low vision. The person with low vision can move between seeing and not seeing, depending on the situation and other variables. This ability to move back and forth may also affect the student’s ability to define self. Roy and McKay, in this study, also reviewed locus-of-control results, which were highly external, and concluded that people who are blind feel less in control of their lives than sighted individuals.

The desire to be treated as an individual is stated by students with visual impairments as why they do not self-disclose with Disability Services for Students (DSS) and try to remain invisible by blending in with their peers (Correa-Torres et al., 2018; Grimes et al., 2019; Yssel et al., 2016). Not self-disclosing to DSS displays the student’s desire to view learning challenges as individual and personal responsibilities. It requires the individual to study the problem (barrier) and find a solution. This desire also provides a means to alleviate the fear that self-disclosure would result in embarrassment and social stigmas. Additionally, it satisfies the student’s desire to control their identity at the university. A study conducted by Lourens and Swartz (2016) revealed the social stigmas experienced by students with visual impairments on campus. These findings described the students feeling that sometimes they needed to hide their impairment, or parts of it, to conform and gain acceptance with their nondisabled peers. The stares of their fellow students said to them they were only being recognized for their differentness. They did not want others to focus on their impairment because they did not want to be treated differently. Still, if they blended in too well, they would encounter interference with needed accommodations. “Visually impaired students are statistically less likely to complete their studies as a result of academic failure, lack of support or withdrawal due to insufficient guidance” (Bishop & Rhind, 2011, p. 178). If students choose not to disclose, then instructors are not required to provide accommodations. College students with visual impairments are willing to limit their access to
support for the chance to be treated in the same manner as their peers. This need for acceptance at the cost of support could affect their grades and graduation and lead to stress.

In Lee and Oh’s (2017) research which surveyed 103 students to study academic stress on depressive symptoms among E-learning students with visual impairments, academic stress was characterized by exhaustion, cynicism, and academic inefficacy. It was measured by the Maslach Burnout Inventory-Student Survey (MBI-SS). Perceived stress was identified as the level to which circumstances in one's life are considered stressful, and it was measured with Perceived Stress Scale-10 (PSS-10). Depressive symptoms were categorized as depressed mood, decreased or increased appetite, insomnia, and others. Depressive symptoms were assessed by the Center for Epidemiologic Studies Depression Scale (CES-D). The researchers found E-learning students with visual impairments experience high levels of academic stress and they may notice the stressors more intensely, and eventually they are more likely to have high risk depressive symptoms. They may notice the stressors more intensely, and eventually, they are more likely to have high-risk depressive symptoms. Other findings include the need to identify what academic resources are available for those feeling stress; establish reasonable accommodations in E-learning settings and special online assistance services; offer a pre-college orientation program and a training program for better adaptation and usage of the E-learning materials and technologies and senior students' successful experiences and knowledge should be shared among students with visual impairments.

The amount of reading material and how it is accessed by students with visual impairments has also been studied in higher education. Lourens and Swartz’s (2016) research revealed the strain reading has on college students with a visual impairment. In their study of 15 visually impaired students at one university, it was found blind students who used braille found
such reading to be very time-consuming since they could not visually scan through an article or book or to *speed up* gathering information like they could increase the rate in the text to speech software. In addition, the study also found after long sessions of such reading, visually impaired students experienced strain on their eyes and back pain from how they were sitting. Even though Lourens and Swartz’s (2016) research found reading using braille time-consuming, Stepien-Bernabe et al.’s (2019) study found that using braille to read scientific passages led to better comprehension than reading aloud through text to speech devices. Paper, braille was often helpful in reading charts and tables for math and science courses (D’Andrea, 2012). Whether using braille or other assistive technology, the student must have choices and as many tools as possible at their disposal to become efficient in gathering information and completing course assignments.

Although students may use braille or text-to-speech devices to help them succeed in the classroom, students participating in Osborne’s (2019) research mentioned other barriers that hindered their higher education success. As part of Osborne’s study, 105 students (4 were blind or visually impaired) responded to a survey focusing on classroom experiences. More than 50% of the students disagreed with three statements mentioned in the study: ‘I am warned in advance when an activity may not be inclusive;’ ‘my needs are considered when academic activities are being arranged;’ and ‘staff in my department are well informed about preparing inclusive materials.’ Another theme found in the study is the disbelief and ignorance of a students’ disability found in the academic setting. Students were concerned about the lack of support they believed was a barrier to their success. This study also mentioned students’ hesitancy to disclose a need for and receive accommodations for fear of being characterized as receiving an unfair advantage. Osborne’s study mirrored other studies concerning students with visual impairments.
in higher education. The author recommended the need to display more respect toward students with disabilities and to do more to facilitate inclusive learning experiences that meet their needs. Primary means to promote inclusive learning experiences are establishing a positive dialog with students and listening to their needs and requests for accommodations (Myers & Bastian, 2010). In addition, consideration should also be given to what Information Communication Technology (ICT) works well for the student. When adapting ICTs, consulting with the student allows adopting the proper solutions (Inico & Prabakaran, 2018; Simui et al., 2017).

Online Learning and Students with Visual Impairments

The second topic within this literature review involves online learning and aspects of it, such as challenges in accessing course content, best practices used to support students with visual impairments and supporting different course content to make it accessible for college students with visual impairments.

Challenges in Accessing Course Content

Research has revealed challenges for students with visual impairments enrolled in online courses. Challenges are found in all aspects of online courses such as (a) accessibility, (b) use and design of the system, (c) preparing PowerPoint slides for course presentations, (d) access to pictures, graphics, figures, and diagrams with alternative text, (e) completing online forms, (f) guides to using computer camera, (g) access to accessible content when using scanned documents, and (h) videos missing audio descriptions. In addition, for those students who use screen magnifiers, only a tiny portion of a web page is seen at a time, sometimes causing the user to lose orientation on the page layout. While students with visual impairments are spending valuable time finding ways to meet and overcome these challenges, they appreciate their help from other sighted students and professors (Gill et al., 2017; Kharade & Peese, 2012).
Although students with visual impairments are receiving assistance in meeting the challenges they encounter, Richardson’s (2015) study of 1724 blind or partially sighted students at the Open University in the United Kingdom revealed students who identify with only a visual impairment as a disability were less likely to complete and pass their course modules than non-disabled students. Still, they were just as likely to receive good grades on the modules that they passed. Students with visual impairment plus another disability were less likely to complete their modules, less likely to pass the modules they met, and less likely to receive good grades on the modules they gave compared to non-disabled students. Students with visual impairments were more likely than students with no disabilities to study modules in the arts or education and less likely to study business, law, or science modules.

Another study that revealed challenges in accessing course content is that of Massengale and Vasquez (2016), who analyzed qualitative data from one course taught in the College of Education by six professors and found 13 types of challenges for students with disabilities in online courses. No specific disability types were named in the study. The challenges found included tables without headers, images with no alternative text, content that opened in a popup window, problematic links, confusing tables, small text, empty lists, incorrect heading order, suspicious alternative text, using JavaScript language, links with links, missing alternative text and incompatibility with screen readers.

Similarly, Majoko (2018) also found challenges within online courses for visually impaired students. Using a qualitative research approach employing semi-structured interviews, the participants (n = 17), including 14 males and three females, described the barriers to participation in higher education. In this study, participants included the lecturers as barriers and not just the environment. In describing the challenges, the researchers found 14 of the
participants thought the lecturers’ perception of them and the lecturers’ failure to meet their needs interfered with their ability to participate in learning. In addition, lecturers’ low expectations of students with disabilities and their demeaning behavior lowered students’ self-esteem and limited their participation in learning. Seven participants in the study stated they felt a lack of access to lecture handouts and notes before presentation in the course also interfered with their participation in learning. Another barrier in education noted in this study was the lack of students using assistive devices because of their peers and lecturers’ overprotective behavior and their need to maintain the natural educational environment. Finally, refusal to extend due dates for assignments and lack of alternative forms of assessment for assignments and examinations were also listed as barriers in student learning.

Best Practices Used to Support Students with Visual Impairments

A fair amount of research focuses on how best to support students with visual impairments within a higher education setting. Some focus on traditional classroom settings, while some include issues related to accessing materials online, whether as resources posted for a traditional face-to-face course or one that involves online teaching.

Kharade and Peese (2012) study divided best practices into two groups that emphasized instructor and student responsibilities. Best practices for online instructors include placing course content in separate file folders as Word documents that, if necessary, are sent through email to make sure the material is accessible. The Word documents should also be accessible formatted with headings, numbered lists, and meaningful link text. When using Chat and matching quizzes or exam questions, assistive technology users have difficulties with these features, and their use should be avoided. Chat can be replaced with an asynchronous feature such as discussions and matching questions replaced with other question formats such as fill in the blank. If possible,
timed assessments (quizzes and/or exams) should be avoided. If this is not possible, extended
time to complete submissions is necessary. Instead of using PDFs, replace them with Word
documents. PDFs have accessibility issues, especially if they are not tagged, providing a logical
structure for presenting the content through assistive technology. Instructors should talk to
students about their accessibility concerns to ensure their accommodation needs are met. This
may require the instructor to go through training and work with an accessibility specialist to
ensure they use accessible technology in their courses and develop accessible material. To assist
instructors with their accessibility needs, students should back up their work if there are
accessibility issues in submitting work according to due dates. In addition, college students with
visual impairments should keep their assistive technology up to date to ensure it is compatible
with the E-learning system.

Other research which focused on accessible materials includes Holt et al.’s. (2019) study
on creating accessible materials either in audible or tactile formats. They explained that tactile
graphics use patterns or raised dots to characterize graphical information found in textbooks and
other course materials. A blind student can feel the pattern, like reading braille. They also
mentioned that instructors need to be aware that everything is written on the board also needs to
be communicated orally, such as parentheses, exponents, and other mathematical symbols. It was
also stated that it would be helpful to provide a copy of sample equations and diagrams ahead of
time.

Putnam et al.’s (2016) research also revealed essential student support. This study
included 18 interviews with professors and their experiences with teaching courses and topics
related to accessible computing (i.e., using computers to access online resources). In one
interview, an instructor described how she tried to make accessibility topics personally
meaningful for students by including an activity where students interacted with websites using a screen reader. After this activity, speakers who were blind demonstrated how to use a screen reader. Other methods stated in the interviews for teaching accessibility were evaluating a product or website, integrating research and case studies, reflective papers, online resources, field trips, and videos/movies.

Focusing on the general design issues, a positive instructional environment through the use of Universal Design for Learning (UDL) principles emphasized Griful-Freixenet et al.’s (2017) study’s goal. The goal of the study was to explore if UDL principles effectively address the needs of students with disabilities. A total of 10 students participated in the survey, with one identifying as having a visual impairment. The UDL principle of multiple means of engagement was fundamental. Students stated a positive instructional climate with open communication lines, frequent, timely, and specific feedback, and cooperative learning exercises and group discussions were ideal. Students also indicated a need to feel supported in their environment as essential in their learning engagement.

Data also revealed the need for additional time for students and faculty training. Oswal and Meloncon’s (2014) research revealed the need to provide students with extra time to complete assignments and provide material in various formats. Oswal and Meloncon (2014) conducted two surveys of technical and professional communication instructors. One survey focused on instructors who taught fully online courses, and the other concentrated on instructors who taught hybrid courses. The researchers found that instructors lacked the knowledge and resources to study students with disabilities properly adequately and the technologies needed to accommodate the disabilities. They wanted more training to understand accessibility issues and
proficiency in using assistive technology. It was also suggested that faculty with disabilities be recruited to help build accessibility capacity in online courses.

Oswal and Hewett’s (2013) research also discussed teaching writing online to students with visual impairments and pointed out proactive steps instructors can take to make sure their textbooks and material are accessible. To evaluate books for accessibility, they mentioned going to a computer with adaptive technology and checking to see if the pages can be accessed using an OCR (optical character recognition) program. Oswal and Hewett stated that instructors should know what adaptive technologies are available for students, which will help with planning alternative or modifying assignments. Connecting with the student as soon as possible to learn about their technology use, note-taking, and study skills helps with reducing problems during the semester. In addition, simple fixes include providing meaningful text descriptions with photographs, pictures, and graphics and providing text descriptions for visual content when using videos in courses. Oswal and Hewett also reviewed how asynchronous discussions are favorable to blind students. They can use text to voice technologies, review reading materials before commenting, and revise their response before submitting it to the discussion area.

Although students with visual impairments are often receiving support, Bhardway and Kumar’s (2017) study revealed there continue to be significant constraints faced by them. Those constraints are inaccessibility of the college notice board; lack of accessibility to existing facilities and resources; lack of assistive technology facilities and unavailability of readers and writers; websites need to be developed according to standards so that they are compatible with assistive technologies and can be read correctly, and unavailability of suitable infrastructure in institutions. These concerns reveal that best practices regarding students with visual impairments were not occurring for this study.
Some best practices for students in STEM include having strong graphics literacy skills. Strong graphics literacy skills are defined as having the ability to accurately use the information to complete tasks (for instance, comparing two bar graphs by locating and comparing the values of their two heights). Teachers should promote manipulatives to improve students’ understanding of graphics. Examples of practical manipulatives include 3-D models such as a cube and making a paper cone triangle for students to rotate when working on rotation problems. According to Hasper et al. (2015), tactile literacy is a tool that will assist students with visual impairments in pursuing higher levels of postsecondary education in STEM fields.

Most students find multiple methods (visual, tactual, or auditory) for accessing information unbelievably valuable. In Rosenblaum’s (2018) study of students with visual impairments, it was found they have trained themselves to use a variety of strategies to offset the absence of visual information. It was also found that students must spend focused time understanding the content. A method to accomplish this is to have students say or write down what information they need to solve a problem and help them focus on what to look for in the graphic. Several students need instructions on searching for information (from top to bottom, left to right, or sections to whole). In addition, they need to develop their process for analyzing a graphic and make sure they can use it to generalize across similar graphics. Their strategy must be consistent. Students could draw on graphics or create a means to solidify their analyzing processes. As students become familiar with analyzing graphics, teachers must adjust their teaching styles to students' particular learning needs. It is also important for teachers to support instruction by modeling how to work through a graphic and then giving students a problem to solve and observing their process for solving it.
Best practices for science courses must include safety measures. Wedler et. al., (2014) study found it is important before students start any experiment there should be an overview of the experiment and time to practice various lab techniques. In addition, students must be thoroughly informed about the properties and safety information for each chemical they are working with before beginning each experiment. Laboratory rooms should be arranged in an order that makes it easy for a student with visual impairments to find sinks, trash cans, and other waste containers without help. When students need to use large volumes of liquid, instructors should measure and place them at workstations using assorted sizes and shapes of glass containers to distinguish between liquids. This also allows students to navigate the lab independently. For experiments that rely on smell to determine changes, fans can be placed next to flasks blowing vapors in a distance that a student can detect within the perimeter of the workspace. All necessary items should be capped, labeled (braille or print) and placed in a central location.

Supporting Different Course Content

Few research studies focused on college students with visual impairments' difficulties with different course content, mainly STEM material and some potential ways to address such issues. Students with visual impairments have significant challenges in math because of the difficulty of the notational language, which is inaccessible when only presented visually. Other challenges faced were acquiring accessible content, the capability to navigate through complicated algebraic equations, the skill to execute calculations while manipulating variables, and the capacity to complete assignments and take tests in an understandable format. Learning mathematics may reduce students with visual impairments self-esteem because of encountering
all these challenges. This may also lead to faster resignation from solving mathematic equations that the student with visual impairments considers difficult (Spinczyk et al., 2019).

Visually impaired students have trouble interpreting equations and graphs because of the need to concentrate and process sensory information. To address this issue, Erhardt and Shuman’s (2015) study recommended (a) retyping the equations into LaTeX, (b) printing all images using an embosser (for tactile format), (c) collecting all course examples to distribute to the student to study independently, and (d) collaborating with an assistant/tutor on homework and projects. The tutor should know the material (not needing to search for solutions) and give helpful tips quickly. Another recommendation is to use Wikki Stix. These are thin pieces of metal covered in wax and are used to create graphs. The Wikki Stix can be used in conjunction with braille graph paper. The raised dots on the paper are used to create squares that Wikki Stix sticks to and can demonstrate shifts in demand and supply, for example, in economic courses (Naples 2017; Spindler 2005).

Focusing on learning math, Mackowski et al.’s (2018) research was conducted among a group of 20 students with visual impairments (eight were blind, and twelve were low vision). The students were randomly assigned, with 10 in the control group (four blind and six low vision) and 10 in the experimental group (four blind and six low vision). The researchers focused on decomposing a mathematical exercise into a sequence of elementary sub-exercises and determining if this helped understand the equation. It was found that alternative descriptions are helpful for low-vision students. Regardless of the complexity of the math equation, the level of understanding is higher with alternative structural descriptions. The study also revealed that putting a mathematical exercise into a sequence of elementary sub-exercises and providing alternative descriptions is immensely helpful for blind and low vision students who use screen
magnifiers with additional voice functions. Another way to support math content is for instructors to provide complete descriptions of what is on the board. Instead of using vague references like here or there, instructors must use a verbal strategy called naming to identify areas found on graphs.

Additional math support is the Nemeth Braille Code for Mathematics and Science Notation. Abraham Nemeth created the code to transcribe math symbols. It provides a system that will allow technical literature to be presented and read in Braille. The Nemeth Braille Code conveys an impression to the braille reader of the printed text. Numerous blind students are untrained mathematically, lacking the skill to read or write the braille code of mathematics. Without the ability to read and write the mathematical symbols which represent concepts, students with visual impairments have difficulty achieving competence in mathematics. When using the Nemeth Code, the lesson content appears on the braille display one line at a time. The student can read the braille math on the display while listening to how it is spoken. The explanation describes the rules controlling the use of certain classes of symbols. This allows the student to review the answer as often as necessary and choose a specific explanation area to study (Kapperman & Sticken 2002).

Still, another math support is Process-Driven Math. Process-Driven Math is an auditory method of math instruction and assessment created at Auburn University. This math support includes the student and a person that is the student’s reader-scribe. The reader scribe discloses the algebraic expression in layers. The numbers, variables, and operation symbols are hidden and supplied in chunks as the student indicates his readiness to receive them. Process Driven Math is interactive and gives control of the release of information to the student. When simplifying the problem, the student methodically translates the equation in recorded steps to make every
decision available for the student’s review. This guards a student’s working memory against being overburdened, allowing more focus on the strategies needed to solve math problems successfully. Students with visual impairments have trouble 
chunking. Chunking involves taking a quick glance to review the structure of an equation and then breaking down the problem into smaller units. This is difficult for students who have visual impairments because the math expressions are displayed linearly when they are converted to braille, making chunking difficult and overburdening working memory. One limitation of the Process-Driven Math method is its labor-intensive process where the student is dependent on the skill of the reader-scribe to work through extended problems (Gulley et al., 2017).

Stone et al.’s (2019) research described how math instructors could make their course and course material more accessible. The study revealed that instructors can verbally express graphs and diagrams shown on their slides or drawn on the whiteboard; be explicit about what is offered and how it is interpreted; provide examples for each concept that use a small set of numbers that can thus be kept in working memory; allow the blind, visually impaired student to use a computer text editor to store and refer to numbers from a word problem, equations, and intermediate calculations, which in turn provides unlimited storage and can be searched electronically in an efficient manner; provide accessible learning materials; provide alternative text for any pictures; avoid using screenshots of output (make sure it is accessible with a screen reader); consider the accessibility of markup languages like LaTeX, MathML, and HTML for the display of output; and convert formula sheets to tactile versions if the student is comfortable with mathematical Braille materials or provide a digital file that is screen reader-friendly. One of the best solutions was to write out the formula and then describe it in plain English.
Focusing on learning science, Lahaav et al.’s (2018) study involved 20 blind participants randomly assigned to two experimental groups with 10 participants in each group. The first experimental group (Group 1) studied through the CC1-based textbook. The group included nine males, nine members who were congenitally blind, and three had residual vision (light perception). Eight were undergraduate students, and two worked in a factory. The second experimental group (Group 2) studied through the CC1, with embedded NetLogo L2C interactions. This group included four males, eight members who were congenitally blind, and four had residual vision. The researchers used audio streams to assist the participants in integrating them into a scientific concept. The participants heard the visual scenario and used them to learn and understand complex scientific phenomena. It was found that the participants who studied with the L2C interactions had a better understanding of science content when compared to those who studied using only the CC1-based textbook. This research supports checking using accessible materials enables students who are blind to learn independently and just as well as their sighted peers. An array of topics in chemistry requires students to construct, explain, and manipulate two-dimensional (2D) and three-dimensional (3D) models of molecular structures. Without proper assistive technology that allows students to use other senses than vision, students with visual impairments find difficulty with developing spatial ability, which is necessary for success in chemistry courses. Accessibility guidelines recommend using tactile graphics for visual presentations of spatial relationships. Tactile graphics communicate non-textual information to visually impaired people (Smith et al., 2020).

Holt et al.’s (2019) work focused on creating an accessible physics curriculum for a blind physics major student and involved a blind physics undergraduate student, and a blind Ph.D. chemist and consultant on STEM accessibility. Topics mentioned for creating an inclusive and
accessible curriculum were accessibility to class meetings, seating arrangements, and accessible course materials. When exploring designing accessible class meetings, the authors suggested having an in-class assistant and a tutor outside of class to assist the student with the material. The suggestion of an in-class assistant would ensure all class materials are accessible and fill the traditional role of a course tutor. The authors also stated the use of assistive technologies should be considered as part of seating arrangements by providing table and chair rather than the connected tablet top to chair arrangement. A final thought on making class meetings accessible was to remember to notify students of changes to classrooms as soon as possible to plan a new route if necessary.

Chapter 2 Closure

While this literature review is concise, it incorporates all information that could be found focused on research related to blind or visually impaired students with higher education and contains source material supplied by a university research librarian. Despite the brevity, the research covering these topics is relevant to our times. Studying this topic is essential in advancing the role of diversity and inclusion on college campuses. This chapter presented literature on two significant issues connected to my research questions. The first topic covered college students with visual impairments. The second topic involved online learning and aspects of it, such as learning barriers experienced within asynchronous and partially synchronous courses, best practices used by instructors of an online course when addressing the needs of students with visual impairments, and the difficulties with course content types faced by college students with visual impairments.

Missing from this body of literature are studies on the experiences of college students with visual impairments enrolled in online courses and how different course types present
barriers. “An honest evaluation of these barriers could help higher education administrators improve their service delivery and programmatic support for students with disabilities” (Hong, 2015, p. 221). During this period, during a pandemic, courses abound online, and there is limited ability to take classes face-to-face. Not having the choice and being forced into an online environment has caused a significant challenge for students with visual disabilities. My research seeks to reveal the experiences of college students who are blind or visually impaired with an array of course content when online is the only course format available.

Subsequently, Chapter 3 describes the research design, illustrating how I collected and analyzed data on the lived experiences of visually impaired college students enrolled in online courses to add to the knowledge base. There is a gap in the literature where this is concerned, and my study seeks to fill this gap.
CHAPTER III

METHODS

The purpose of my qualitative study is to describe and interpret the lived experiences of college students with visual impairments in an online environment and the barriers they encounter. The data were collected through individual semi-structured interviews using open-ended questions. The data were analyzed using an inductive process of a coding scheme to identify significant statements, themes, events, and significant points.

The overarching research question was: What are the lived experiences of college students with visual impairments enrolled in an online course? For this study, the following research questions further guided my investigation:

1. What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?
2. What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments?
3. What do such students voice as the best practices used by instructors of online courses to assist them with their learning?
Research Design, Approach, and Rationale

My study used a qualitative approach to research the topic. A qualitative study was chosen because it “describes the common meaning for several individuals of their lived experiences of a concept or a phenomenon” (Creswell, 2013, p. 76). According to Marshall (2016), a qualitative study will “explore, describe and analyze” individual lived experiences (p. 25). Using this definition, my study fits perfectly with this approach because it examined the lived experiences of college students with visual impairments enrolled in online courses.

Merriam and Tisdell (2016) state qualitative research is grounded in the belief that people construct knowledge as they “engage in and make meaning of an activity, experience or phenomenon” (p. 23). A feature of this research is “individuals construct reality in interaction with their social worlds” (p. 24). Merriam and Tisdell (2016) also say the purpose of qualitative research is to “understand how people make sense of their lives and experiences” (p. 24). It is a methodology that involves the researcher and participants in a descriptive and interpretative process. The emphasis of qualitative studies is experience and interpretation. This methodology seemed the most suited for studying college students enrolled in online courses with visual impairments.

Data for this research study was collected through individual interviews. Those interviews allowed me to hear and record participants’ stories. According to Patton (2002), the purpose of a qualitative interview is to capture how those that are being interviewed view their world. My goal in this study was to learn the participants’ thoughts and expectations and capture their experiences, that is, how they functioned in the online learning environment (Patton, 2002). In this research, I wanted to have the participants express their personal opinions, feelings, and experiences regarding learning online as a student who is blind or visually impaired. An
interview was chosen because it offered interactions that provided social and cultural accounts of
the desired phenomenon (Merriam, 1998). I wanted these interviews to move from questions and
answers to become conversations - conversations with a purpose (Dexter, 1970). All the
participants had a unique story to tell about their experiences, and I wanted to hear their story
and share it with others. Because of privacy concerns, I did not choose other data collection
methods because I could not observe thoughts, feelings, or interactions with course material
because of privacy concerns.

As a researcher, I sought to understand how people create meanings attached to their
experiences. To understand, I asked questions that allowed me to enter their world and learn
about their experiences through the interview process.

Reflections on My Identity

As the researcher, I have experience with online instructors and students using assistive
technology. I have consulted with instructors designing online classes to provide access to and
the correct formatting of content, quizzes, and the university’s learning management system for
those students who have a documented disability. I have also consulted with students when their
assistive technology does not work with third-party software incorporated in courses or with the
university’s E-learning system.

In addition, I am a certified professional in accessibility core competencies. This means I
have built a foundation that consists of broad, cross-disciplinary conceptual knowledge about
disabilities, accessibility and universal design, and accessibility-related standards, laws, and
management strategies.

Since I have assisted both instructors and students with the technology on campus, I
know what can and cannot be done, the software available, and who to contact for additional
assistance. I also know the time and effort needed to adopt a course for accessibility and meet accommodation requirements. I am also biased in desiring to give voice to an underrepresented population who desire the same opportunities granted to their peers (Creswell 2013). As part of two underrepresented populations (women, African Americans), I know what it feels like to be considered less than or not equipped to comprehend or complete coursework. I can identify with their aspiration to function in any learning environment they choose and not be limited because they cannot change a characteristic.

My perspective of this study is that it is a worthwhile inquiry that needs to be done to enhance all students' learning experience, not just those with a disability. Other students may be helped through alternative methods of presenting content, various teaching strategies, and a range of ways of demonstrating understanding. I will use the findings to suggest promising practices to instructors looking for methods to enhance their courses for visually impaired students.

Population, Sample, and Setting

The participants selected for this study were registered as students with visual impairments with disability services at a college in a Midwest state. These students were enrolled in or had completed an online course. The format of the online course was either partially synchronous or asynchronous.

I contacted the disability services department (DSS) at a Midwestern college to start participant recruitment. This department is where students self-disclose their disability and register for accommodations. I asked the department director if an invitation letter could be sent on my behalf to potential participants. The number of potential participants was 39 students who had listed blindness or some other visual impairment as their primary disability. This letter
introduced me as the researcher, outlined the purpose and goals of the study, explained the sample criteria, and included an invitation to contact me if interested in participating in the study. The letter clarified that participants must be currently registered or have enrolled in an online course. It also explained the length of time commitment (1-1.5 hours), provided confidentiality to ensure privacy, and explained to participants that they could withdraw from the study at any time. If they agreed to participate in the study, they were individually interviewed.

I received six participants from this effort. The director also sent a letter on my behalf to all directors of disability services at colleges in the Midwest who subscribed to a dedicated listserv. This garnered zero participants. Using the snowball method, I received two more participants. One of my research participants invited me to a braille class to recruit more students. Out of that class of six, three students agreed to participate, two had already completed an interview, and one had previously declined to take part in the study. Two of the three potential participants who agreed to participate scheduled times and completed an interview. In total, ten interviews were completed, and saturation was reached.

Creswell (2013) states a qualitative study provides an “understanding of a phenomenon experienced by several individuals” (p. 82). Several is more than two but not a considerable number, so 10 was chosen as an adequate sampling. A sample with a minimum of 10 participants would provide me with "experience in planning and structuring interviews, conducting and partially transcribing them, and generating quotes" to support my study. Also, considering the length of time this type of research takes, the difficulty of gaining access to groups, and the difficulty in transcribing interviews, this number provided an adequate sample (Baker & Edwards, 2012, p.10).
Since each participant needed to meet a specific set of conditions, criterion sampling was the primary sampling strategy for this study (Creswell & Poth, 2018). If this strategy didn’t provide the minimum number of participants, I employed the snowball method, where existing participants recruited additional participants to increase the sample size (Creswell & Poth, 2018). The Participation Invitation Letter for Recruitment is in Appendix A.

**Instrumentation**

Data from interviews were collected to go deeper below the surface, trying to understand the essence of learning barriers in an online experience for students who are visually impaired. Interview questions focused on issues that addressed the research questions and provided demographic information. The questions contained specific prompts to help support and guide the conversation. The interview instrument was designed to “forge a common understanding” of the phenomenon (Creswell 2013). The questions were used to discover common themes among the participants’ experiences so that the essence of the online experience for students with visual impairment was discussed.

I selected this type of interview approach because it would help me capture the information I wanted because of its strengths. Typically, qualitative studies using interviews as part of the research design utilize open-ended comments and questions. In my research study, I created a series of questions “aimed at evoking a comprehensive account of the person’s experience of the phenomenon” (Moustakas, 1994, p. 114). Since a qualitative study attempts to capture the lived experiences of individuals, this method was the best way to document the participant’s experiences in their own words. The Interview script is found in Appendix B.
Data Collection Procedures

Gaining access to a site “requires time, patience, and sensitivity to the rhythms and norms of a group” (Marshall, 2016, p. 122). To help gain access to recruit my participants, I had a telephone conversation with the director of DSS outlining the research project. Establishing communication with the director assisted me with identifying and establishing a rapport with the potential participant group. Marshall (2016) says, “the energy that comes from a researcher’s high level of personal interest is infectious and useful for gaining access” (p. 120). Once the director was exposed to my genuine interest in the group, the energy I brought to the study, and the need for this study, that helped build a rapport, which helped establish a safe environment for the participants to participate in the study.

Discussions were held with the director and department staff to define the best way to establish rapport with the study’s desired population. A letter was sent to students with visual impairments outlining the study. For those who expressed interest, an introductory meeting was held via WebEx to explain the purpose, request participation, ease tensions and answer any questions the students presented.

Data collection for this study included interviews designed to explore students with visual impairments lived experiences enrolled in online courses at a college or university. An interview script was used to ensure that the same fundamental questions were used with each participant. The script provided topics or subject areas for me to explore, probe, or even ask more questions, which would “illuminate” the phenomenon (Patton, 2002). The strength of using a script was that it brought a consistent and systematic approach to the interview, providing more complete data and descriptions to analyze.
The interviews were conducted one-on-one, designed with semi-structured, open-ended questions, used inductive probing, and felt like a conversation, so that question order was flexible, depending on the conversation’s flow. Each participant was scheduled for 60-90-minute intervals, and the interviews took place using WebEx. Each interview was recorded and transcribed. There were no follow-up interviews conducted for clarification. Clarification was established during the interview process by both me (the researcher) and the participants asking further questions when something was said that we did not understand. Although each interview was recorded, I kept handwritten notes to identify essential comments, organize prompts and follow-up questions, and flag any personal thoughts or emotions to ensure that they did not influence the analysis or reporting of the data. This also served as a backup record in case of technical difficulties with the recording.

Data Collection Planning: HSIRB

To gain permission from the HSIRB, I presented my research study in a reduced format via the HSIRB application and protocol. Since the participants in this study were members of a protected population, I explained why I needed to use these subjects. Since the topic of this study was to describe and interpret the shared experiences of students with visual impairment at an institution of higher learning enrolled in online courses, the unique population of students with visual impairment was needed to supply the data and complete the research. This population was used because they fit the study criteria.

I explained that I would email a recruitment letter to all students registered with Disability Services who have self-disclosed as blind or visually impaired. This letter explained the purpose of the research, how their participation was voluntary, and informed them that they could stop participating in the study at any time without any repercussions. In addition, once the
potential participant responded to the recruitment letter, they were asked to review an Informed Consent letter which stated I would schedule a time to meet via WebEx to review the letter and answer any questions from potential participants; after reading, if they agreed to participate, the interview and observations immediately began. Before the discussion started, I reiterated that the participant agreed to allow the answers provided for this research study by participating in the interview. Before release, I tested the letter to ensure it was compatible with screen readers (JAWS, NVDA, and Voiceover). The Informed Consent Document is found in Appendix C.

I informed the HSIRB that I would maintain confidentiality. No actual student or school name was used. Students’ names were coded and identified as Student 001, 002, etc., to ensure confidentiality. There was little risk of physical, social, or emotional harm being inflicted on the students. I took precautions to avoid placing the participants at risk. I also attached a sample of my interview script explaining that students would answer questions, and those answers would receive a code upon my review.

I also explained the benefits of my research, which included noting that this study would help instructors better design online courses to be inclusive of all learners, so that all students are helped. Also, collecting this research data would provide more information that students with disabilities could use to claim their place in the education landscape, so that their needs were not an afterthought.

Data Collection

This section offers additional detail on collection data, ensuring trustworthiness in this process, and storing my data.
Collecting Data

Data for this research study was collected through individual interviews of 10 participants. I interviewed participants to hear and record their stories.

Trustworthiness in Collecting Data

Trustworthiness is tied to interpretations of the qualitative data. According to Marshall (2016), “decisions at the proposal stage of the research forecast what the researcher intends to do during the implementation of the study, thereby demonstrating how the study design will likely ensure that the data and their interpretations will be sound and appear credible” (p. 47). Creswell (2013) thinks of trustworthiness in terms of “accuracy” of the research (p. 250). When I collected the data for my research, I ensured trustworthiness by engaging the research participants with a rich, thick description of the research process. I engaged the participants by building trust with them. I emphasized that I wanted to use the information they gave me to provide a voice to other students with visual impairment who were considering enrolling in online courses. I checked to make sure I did not distort the data and focused on information relevant to the purpose of the study by having the participants review my findings. In addition, when presenting the research, I described the interviews in rich detail so that the reader could transfer the information to a more familiar setting and understand a few characteristics of the students’ learning experience and its possible similarity to their own experiences.

I also completed the required Collaborative Institutional Training Initiative (CITI Program) modules and the optional modules specific to working with vulnerable populations. This added a level of trustworthiness to the study.
Storing Data

All interview data were transcribed and stored on password-protected computer files. A master list of information containing identifying information was password protected and kept “separate from the interview and observation files” (Creswell, 2013, p. 175).

Data Analysis

I used inductive data analysis for my research. This allowed me to discover “patterns, themes, and categories” within the data gathered on the experiences of students with visual impairment enrolled in online courses (Marshall, 2016, p. 222).

I chose this type of data analysis because of the ease of use and the low cost to conduct this type of data analysis (Creswell, 2013). The participants were vested in the research because it was their story, so I requested they review it to make sure I captured the essence and meaning of their experience.

Analysis Steps

I conducted my data analysis in three major steps: organization, interpretation, and representation. The first step of organization required me to read the data, make notes and create initial codes. The coding process consisted of examining the data line by line for significant statements, events, experiences, or emotions that described the experiences of college students with visual impairments in an online environment. I moved from the initial codes to further divide the data into themes and units according to firsthand experiences and the need to express the essence of experiencing an online course and being a student who is visually impaired.

Organizing the initial codes into themes until no new themes emerged was crucial. There were codes in the transcript, but I also included nonverbal codes from notes taken during the interviews. I used these nonverbal codes to help write the analysis results. In addition to coding, I
also wrote memos in the margins of the transcripts and notes to help interpret data and track the development of codes and themes. “Memos are short phrases, ideas, or key concepts that occur to the reader” (Creswell & Poth, 2018, p. 188).

Interpreting the data required answering what and how. Since this was a qualitative study, I needed to analyze and describe what happened (Creswell, 2013). What happened to students with visual impairment enrolled in online courses when they encountered a learning barrier?

After organizing and interpreting the data, I formatted the data in tables, charts, and figures to present a visual representation of the material. This put the words in a picture form to provide a clearer understanding of the issue. I chose these steps because they provided a clear structure for analyzing and presenting the data. According to Marshall, “qualitative data are exceedingly complex and not readily convertible into standard measurable units” (Marshall, 2016, p. 216). Creating structure for analyzing the data helped to ensure that it was interpreted correctly.

Trustworthiness in Data Analysis

To ensure trustworthiness in data analysis, I used different procedures. One procedure involved asking an individual unfamiliar with my study to recode a portion of the data to see if we stated the same findings. The individual I selected to participate in this procedure was familiar with disability services and students with disabilities in higher education. The second procedure was used as member checking. This involved “sharing data and interpretations with participants” (Marshall, 2016, p. 46). I summarized my interview analysis requesting that participants correct my thinking, provide a reaction to my summary, and add any additional input they deemed necessary. By using member checking, I would be “soliciting the participants’ views of the credibility of the finding and interpretations” (Creswell, 2013, p. 252). I thought this was the best form of trustworthiness because those who gave the actual data were putting their
stamp of approval on the final product. I thought it was essential to get the participants’ consent because, as a preliminary qualitative study, I was trying to give a voice to an underrepresented population. I wanted to make sure that what I said represented that population’s true feelings, experiences, and what they wanted to be projected to others. The third procedure I used to ensure trustworthiness was peer debriefing. “Debriefing is a format for learner-centered feedback” (Ha, 2020, p.1). This allowed me to discuss my findings with a professional/expert in the field while improving my knowledge, skills, and attitudes in this area. It encouraged “constructive discussion and collaboration” between me and subject matter experts (p.6).

To summarize my data analysis, I included a crosswalk table to demonstrate relationships between my research questions, observational and interview data, and how I categorized and interpreted the data.

Table 1

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Source</th>
<th>Data Analysis Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?</td>
<td>Interview Protocol Q. 2, 6, 7</td>
<td>Categorizing and interpreting interviews and observations</td>
</tr>
<tr>
<td>What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments?</td>
<td>Interview Protocol Q. 4, 6, 7</td>
<td>Categorizing and interpreting interviews and observations</td>
</tr>
<tr>
<td>What do such students voice as the best practices used by instructors of online courses to assist them with their learning?</td>
<td>Interview Protocol Q. 1, 3, 5, 7</td>
<td>Categorizing and interpreting interviews and observations</td>
</tr>
</tbody>
</table>
Limitations and Delimitations

All research studies come with limitations. One limitation of my study was the focus on one institution in a specific geographic location. This limited the ability to generalize research findings across different institutions and areas of the country. Another limitation was the small sample size of participants, limiting the ability to generalize the research findings. A third limitation found in the research study was interviews were conducted once, limiting the amount of information presented by the participant at that specific point in time. Yet another limitation was the data was self-reported. Self-reported data may allow bias, misinterpretation, and inadequate personal assessment to become part of the research. A final limitation involved requesting the participants to recall information from past experiences. Although research participants were currently registered with Disability Services for Students, they might have recalled experiences from previous semester courses. In these cases, memory may have been reduced, biased or incomplete depending on the experience.

The delimitations represented boundaries I set for the study. They narrowed the scope of my study and are those things I chose not to include in my study. I did not study traditional face-to-face courses because I wanted to know how online course formats presented barriers for visually impaired college students. This study delimited its scope to only a few participants and their experiences in that setting. This study did not include numerous sites or hundreds of participant responses to an interview. It was specific to one site and a specific group of participants. I only studied college students with visual impairments because I wanted to give a voice to this unique population of students. The setting directly involved visually impaired college students, which excluded their sighted peers enrolled in face-to-face courses. The
purpose of studying college students with visual impairments was to add to the current literature a new body of information regarding the experience of these students.

Chapter 3 Closure

This qualitative study aims to describe and interpret the shared experiences of college students with disabilities. Specifically, college students with visual impairments enrolled in online courses to find themes in their online experiences. This research assists disability services personnel and educators in providing the appropriate accommodations and explaining procedures for implementing these accommodations to students. It also promotes online course design ideas so that courses are inclusive of all learners and all students are equally served. The collection of this research data provides more information that students with disabilities can use to claim their place in the education landscape so that their needs are not an afterthought.

This qualitative study used semi-structured interviews to gather information about the learning barriers encountered by college students with visual impairments enrolled in an online course. Interviews were the primary methods of data collection and interview transcripts were analyzed using an inductive process to identify significant codes and themes.
CHAPTER IV
PARTICIPANT PROFILES

Chapter 4 provides individual profiles of the study participants. The purpose is to expound on the lived experiences of blind or visually impaired students enrolled in the online course environment.

All the participants were blind or visually impaired and enrolled in an online college course. A majority of the participants had been diagnosed with a visual disability in their youth. The majority were also graduate students majoring in the health and human services field. All participants stated they typically accessed online courses from home, and six of the 10 participants had only taken online courses at one institution.

During the interview, the participants described their background and personal experiences in the online environment, key factors for success, physical barriers, best practices, barriers with course content, effects of the pandemic, and the E-learning platform. Pseudonyms were used to protect the identities of the participants.

Stu001

Background

Stu001 is an undergraduate student with a degenerative eye disease that caused a visual impairment beginning in middle school. Stu001’s major area of study is biology. Since Stu001 still has some sight, the dominant assistive technology used were ZoomText, Magic, Windows Magnifier, and other distance magnifiers. Student001 takes pictures of content with a phone to enlarge for viewing, sometimes wears bi-optic glasses, and records lectures. Stu001 has received training with JAWS when asked about assistive technology skill level but prefers to use magnification and be innovative with finding solutions to complete coursework. Stu001 asks for
disability services if having difficulty with a course. Stu001 has enrolled in online classes at more than one higher education institution.

Most often, Stu001 is at home when accessing courses, but pre-pandemic would use the campus library to access courses to have a mock school environment. To achieve separation of school and home, when the college campus went to fully remote learning, Stu001 remained in an on-campus apartment because of access to a desk and counter space where she would not have access at her permanent residence.

Experience Questions

*Key factors for success in online learning*

When asked to describe key factors which lead to success in an online environment, Stu001 stated “putting in a lot of time and energy” as the most significant key factor. She said stated, “having early access to PowerPoint slides as opposed to instructors sharing their screen or posting handwritten documents, receiving decently sized clear pictures, and access to documents that the screen reader can read” were crucial factors for success. Another key factor was formatting PDFs to read the screen reader software. Stu001 explained strategies she used to achieve success were reading the syllabus and using E-learning to explore what was read, such as quizzes and their dates of availability, reviewing material that would be relevant for the upcoming days, and asking many questions. Stu001 prioritized what assignments to complete first based on point value.

Stu001 feels any warning signs that a class may have accessibility issues starts with the accommodation talk with the instructor. Stu001 states, “After having been in college for 9/10 years, I feel comfortable with having the ability to read a professor. If the initial feeling is not good, then this is indicative the semester is going to be difficult.” If the outcome of the
interaction is to talk her out of taking a class or dropping the class, then there will be accessibility issues with the course. Although other professors may not understand how to accommodate Stu001, they will ask a litany of questions to understand and meet her needs.

*Learning barriers*

When asked about learning barriers in the online environment, Stu001 discussed using the lockdown browser for testing. This was a barrier because whatever magnification she was using when activating the lockdown browser was also the magnification that had to be maintained. The magnification could not be adjusted by zooming in or out. Therefore, if Stu001 was not at the correct level of magnification, then there was difficulty reading the material. Another barrier she encountered was color in PowerPoint presentations because of colorblindness. If an instructor used a pointer or drawing tool in a specific color, then Stu001 cannot see the highlighting or what the instructor is trying to draw attention to in the material.

Stu001 feels instructors want to do the best they can when she brings the barriers to their attention but will ask DSS instead of asking her what she needs. Stu001 discussed the obstacles found in an asynchronous course compared to a partially synchronous approach. Although asynchronous courses help with schedule planning because everything is up from day one, including prerecorded lectures, students are left on their own to answer any questions about the material. On the other hand, partially synchronous courses are slow in posting material, but students learn more because they have more time with the professor, and “other students ask questions that you don’t think of yourself.”

Stu001 uses specific strategies to overcome these barriers, such as talking to the professor during office hours (for assistance with converting files or receiving explanations about images). Stu001 will stubbornly struggle to solve accessibility issues before contacting academic
departments that provide practical help with getting, for instance, large print handouts. Other strategies used are taking advantage of office hours and getting required books in a digital format.

Type of course that provides the most barriers and best practices used by instructors

When asked about what type of course provides the most barriers, Stu001 stated physics because of the need to listen to tables being read. Having to listen to numbers that may have immeasurable factors can become tedious. Stu001 tries to avoid courses that will cause accessibility issues.

Stu001 considers best practices for an online course include having effective communication with the student and providing accessible content upfront. If a video is used in the course, it should be descriptive and include an audio description of images.

Satisfactory online course for student

Stu001 discussed what makes an online course satisfactory and that discussion centered around effective communication, accessible content, and her passion for the subject. Stu001 enrolls in online courses because of their virtual nature, and at times, they’re the only option. In addition, she prefers not to walk to class physically, and online courses suffice. Stu001 would suggest labs be either exclusively online or exclusively in person, but not a combination of both. She recommends scheduling excess time for the completion of tasks. In addition, Stu001 could not avail herself of colorful videos, see visual changes during chemical experiments, or view proper use of lab equipment with the online labs. The instructor “did a lot of hand-holding throughout the course.” Stu001 didn’t learn anything because “everyone had the same data, and there was no wiggle room with answers.” The instructor assisted; the students were expected to supply the correct answer based on teacher input - no matter how that input was given.
Taking an online course during a pandemic

When asked what effect has taking online courses during the pandemic had on you, Stu001 stated, “I’m in a worn-out mental state because of being stuck at home, stuck around the same people, and had roommate issues. It has also had a physical effect because of spending too much time at the computer.” To compensate for this, Stu001 bought a sit and stand desk.

After the interview, Stu001 expressed overall happiness with the online learning environment and believed instructors do “a pretty exceptional job.” One suggestion on improvement was to add a line to the email sent at the start of the semester that says you can find your course on…. and have a generalized descriptive post on E-learning describing how to use it. The post must be very descriptive and include an audio description. Stu001 also believes having access to the BSBP (Bureau of Services for Blind Persons) counselor helps with answering questions and being successful.

Stu002

Background

Stu002 is an undergraduate transfer student who is legally blind in one eye due to a congenital disability. Assistive technology used by Stu002 is enlarged print along with sitting in the front of the class. Stu002 only uses magnification software to enlarge documents when reading. Stu002 has only taken online courses at one institution and usually accesses courses in her on-campus apartment.

Experience Questions

Key factors for success in online learning

In describing key factors which lead to success in an online environment, Stu002’s reply to this question was “successful time management and having more time to complete things.”
When first accessing a course, Stu002 looks at the different components in the syllabus and prioritizes completing assignments by the due date. She writes what’s due in a planner and reviews the week before deciding what needs to be completed. This process has eliminated issues with courses and accommodations. Stu002 feels the professors provide requested accommodations and have not seen any warning signs that a class will have accessibility issues.

**Learning barriers**

Stu002 has faced no barriers in the online environment. She feels she has “better performance online than in-person” because of the ability to work at her own pace and manage her schedule while working a job. In addition, Stu002 feels professors are lenient but not as lenient as when the institution first went entirely online. She does sometimes request help from the tutoring department, meeting with them on Teams or a video call.

**Type of course has most barriers and best practices used by instructors**

Foreign language class content presented in an online environment seemed more difficult for Stu002, but the issues were discussed with the instructor, who saw the student putting in effort and provided assistance with the materials.

When asked about best practices used by instructors in the online environment, Stu002 responded “give slideshow handouts before the lecture and in large print.”

**Satisfactory online course for student**

Stu002 went on to discuss what makes an online course satisfactory, stating “having a professor be there to help you out, the prompt answer to email, good interaction with the professor and having a good relationship with the professor” as good indicators. Stu002 chooses to enroll in online courses because it allows her to learn at her own pace and manage time for work.
Taking an online course during a pandemic

Stu002 found that taking online courses during the pandemic did not change how she functioned academically. She chose to access classes from her apartment, followed a set schedule, and used Pulse (Brightspace/D2L mobile application) to get alerts for due dates of assignments.

After the interview, Stu002 expressed overall happiness with the online learning environment and thought the institution provided good accommodations. Stu002 admitted that having the opportunity to learn E-learning before trying to access courses would be helpful, although she learned E-learning independently.

Stu003

Background

Stu003 is a graduate student who only sees light and dark and has been blind since birth. Assistive Technology used by Stu003 is JAWS, NVDA, Voiceover with an iPhone, and Braille note (braille computer). Stu003’s assistive technology skill level is proficient but recognizes barriers in how screen readers manage different content. Therefore, Stu003 reviews material using both JAWS and NVDA. Stu003 has taken online courses at more than one institution of higher learning and usually accesses her studies from home.

Experience Questions

Key factors for success in online learning

Key factors for success for Stu003 are using assistive technology to access everything, reaching out to professors or classmates for clarification, and using academic skills that have made her successful in in-person classes. For Stu003, partially synchronous courses feel like she is in an in-person class. Therefore, when first reviewing material for a partially synchronous
course, Stu003 would explore the course homepage, find content links, modules and activities, review assignments, drop box and quizzes, and discussions. Stu003 prioritizes tasks by the due date but found this was more difficult when she had more online courses.

One of the warning signs that a class may have accessibility issues is “file formats that don’t work with assistive technology.” If Stu003 can’t access the file using the Braille computer, iPhone, or converting to OCR (optical character recognition), she will seek external help.

*Learning barriers*

Stu003 found most barriers with in-person courses that had online components. It seemed “the instructor focused more on in-person activities than online components.” Stu003 employed the strategies listed above (use the Braille computer and iPhone, convert to OCR, and reach out for external help). Part of reaching out for external help included getting help from departments. For instance, when Stu003 had accessibility issues with Google documents, she made a phone call and with sighted assistance, she was able to turn on screen reader support and make the document accessible.

*Type of course has most barriers and best practices used by instructors*

Stu003 believes more accommodations are needed for courses with more visual content, which is the type of course content that presents the most barriers. For example, content that uses tables causes problems with the screen reader software reading it correctly. Therefore, instructors must consider that visually-impaired students need information presented in a certain way and think about this in advance, not at the last minute.

Instructors’ best practices in an online environment include using accessible content and videos that clearly explain content. Screen readers can’t read pictures and diagrams, which were part of Stu003’s course material and would be used on a test. Her instructor found a video that
explained the inaccessible content, posted the video for everyone, and helped all students in the course. When evaluated on this material, Stu003 passed the written test. Still, she wanted to further demonstrate to her instructor that she had reviewed the video and gathered information from it. Student 003 believes best practices vary according to course content.

*Satisfactory online course for student*

When asked why she would enroll in an online course, Stu003 responded, “to not overload me. I need to have the option available to take the course anytime and anywhere. Sometimes it is the only option available, and I am not ready to return to campus because of Covid.” When asked what she would change to make a previous course satisfactory, Stu003 responded, “I would prefer it to be asynchronous because of scheduling but need partially synchronous courses to help with clarification.”

*Taking an online course during a pandemic*

Stu003 found that taking online courses during the pandemic made it hard to get a sense of the total capacity of people in the class because she was not going into a specific space and “did not know people are around you.” It was hard to know if people were missing and felt like people speaking were the only people in the class. This made Stu003 participate more because it sounded like fewer people were present, and she needed to participate more. “In the college environment, you are constantly around people and going from place to place. There is social interaction and movement.” Stu003 missed the interaction and movement. The only social interaction she had throughout the day was getting online, whereas, when on the college campus, “you see people in your dorm, you see people on the way to class, you see people in the cafeteria, you walk around more and get more physical activity.” Stu003 missed those interactions. Stu003 also attended a virtual convention that consisted of meetings and little else
during this time. She had participated in this convention pre-Covid and missed the camaraderie of being with other attendees. During our discussion, Stu003 stated, “Blindness offers a different perspective on online courses because there is less of a difference in not seeing people.” Stu003 can’t see where everybody is in person or online. There is less of a challenge to adjust because for her, “the visual aspects did not change as they did for other people.”

After the interview, Stu003 wanted to discuss topics that we had not covered, namely accessing student housing through the student portal. Currently, in the student portal, the housing map is visually color-coded. Stu003 thought ideally, there would be menus that students could select beyond, “do you want to live in a residence hall or apartment?” Stu003 imagined an option that would allow you to open a menu that would ask, ‘do you want to live in this neighborhood?’ or be able to narrow choices by neighborhood, by building, or by floor. It would tell you, “Okay, there are so many rooms available on this floor - in this building. Pick one! Or it could be configured like Google Maps, which has a satellite view, or you could turn on the screen reader support and have the basic view.” Stu003 thought providing options would be helpful.

An additional comment from Stu003 about E-learning was, “you want to respect all people’s preferences and skill levels.” Those who have not taken an online course would benefit from an introductory E-learning course, but it should be optional.

Stu004

Background

Stu004 is a blind graduate student but did not get the diagnosis until age six. Stu004 uses the following assistive technology: JAWS, Voiceover, verbal notes on the phone (iPhone), an iPad to read books in digital format, and receives extra time as an accommodation. Stu004’s skill
level with assistive technology is high because he has used it all his life. Stu004 has taken online courses at more than one higher learning institution and usually access courses at home or his office during his lunch period.

Experience Questions

*Key factors for success in online learning*

Key factors which make Stu004 successful in an online environment are receiving accommodations, having access to accessible content on E-learning, communicating with professors what “I can do,” and receiving textbooks that are available in Braille books and can download on the computer. He also finds communicating with Disability Services for Students helpful.

Stu004 explores a course using key commands to get to know the format, reviews course content, and if Word documents or PDFs are not accessible from within the platform, he will download them on the computer to read. He spends one hour a night working on each class, so prioritizing completing assignments is not difficult. While taking two classes a semester, using three to four hours a week to review the course content, and reserving one day a week for a break or catch-up work, Stu004 is highly organized and excellent with time management. He puts all important dates in his phone and sets a one-week notice when assignments are due.

When asked what the warning signs were that a course will have accessibility issues, Stu004 replied, “The professor doesn’t understand the accessibility needs of the student, the video transcript lacks time markers, some hyperlinks don’t work with screen readers, and PowerPoints lack transcripts.” If a class uses Webex instead of Zoom, Stu004 prefers Zoom because it is more accessible, with the key commands transferable between Mac and Windows computer systems. Stu004 also discusses online tests as warning signs of accessibility issues. Completing short answer questions requires the student to type answers in Word and then paste
them into the answer box. In addition, he maintains matching questions pose a difficulty for assistive technology users.

Learning barriers

Stu004 stated that one of the significant learning barriers is “knowing where things are in E-learning.” Every instructor lays out their course differently, so learning how to navigate the website, E-learning, and use Webex presents learning barriers. Strategies Stu004 uses to address the obstacles are contacting AIRA, reaching out to friends or family for assistance, and “keep clicking through until I figure it out.” Stu004 states if he “is determined to figure something out, he will do it.” Other help Stu004 receives when addressing barriers comes from instructors who get back quickly with answers to questions. The student advisor is good with assisting, and Disability Services for Students also offers good support. Since Stu004 doesn’t live on campus, there are limitations on accessing resources, but it finds the librarians incredible. Online libraries are not as accessible, but the librarians help navigate and find other solutions. Stu004 lives in a different time zone, so professors’ office hours are during the workday while he is on the road and has limited Wi-Fi to connect and ask for assistance. Stu004 hasn’t seen any barriers in partly synchronous and asynchronous courses because professors are incredibly good with supporting his needed accommodations.

Type of course that has the most barriers, and best practices instructors use.

Stu004 feels the course content that causes the most barriers are math and science because of the numbers and formulas. Screen readers are not the best at reading numbers since this content is very visual and sometimes requires tactile objects and sighted assistance to help with understanding the information. “Some scientific information needs a verbal reader.” Stu004 also thinks English can be a barrier because “when instructors highlight mistakes or provide
written feedback, this doesn’t help because a screen reader can’t read it.” When he brought these issues to the professor, the professor stayed after class to help him learn the content.

Stu004 thinks some best practices instructors use in the online environment are understanding his need for understanding and allowing extra time accessing material and responding to query emails in an adequate time frame.

**Satisfactory online course for student**

What makes an online course satisfactory for Stu004 is videos with printed text, PowerPoints in an accessible format (*Word document*) laid out, no matching questions in the test (*replace with multiple-choice, T/F, short or long answers*), and great professors. Stu004 chooses to enroll in online courses because sometimes that is the only option. It is easier to access tests and content because students can complete work at their own pace and concentrate on lessons as long as needed. Stu004 would make the online course satisfactory in the tests and formatting documents.

*Taking an online course during a pandemic*

Stu004 hasn’t been affected by taking online courses during the pandemic because of adequate access to data and information to carry out tasks. After the interview, Stu004 felt overall experience in the online environment was good. He identified only one instructor that was poor in responding. Stu004 felt that having an E-learning course would benefit those with little knowledge of the learning management system or screen reader software.

Stu005

**Background**

Stu005 is a graduate student born with color blindness and light sensitivity and is legally blind. The assistive technologies used by Stu005 are magnifiers to enlarge the page, such as
ZoomText, Microsoft Narrator, audiobooks, or applications that can read a book. She does not use JAWS or Voiceover and feels very skillful with ZoomText. Stu005 has only taken online courses at one higher learning institution and usually access classes from home because she has more control over her environment.

Experience Questions

*Key factors for success in online learning*

Stu005 feels key factors that provide success in the online environment are advocating for accommodations, using adaptable software, and utilizing the calendar. Stu005 reviews the syllabus, inserts dates on the calendar, reviews E-learning content, and drop box assignments when first accessing a course. She prioritizes tasks by what is due first.

Stu005 feels warning signs that a class will have accessibility issues are excessive amounts of reading involving PDFs that are not accessible and cause eye fatigue very quickly (*since they take longer to read*) and having required books because she “can’t skim through the book and must read the entire book.”

*Learning barriers*

Stu005 discussed learning barriers found in online courses are the inability to find books in a proper format. What’s been helpful is using Bookshare, online textbooks associated with other homework that links to inaccessible material and navigating through E-learning. Strategies used by Stu005 to overcome these barriers are getting assistance from disability services for students, talking with the professor, and converting the information sent into different formats, such as converting PDFs to Word documents. When seeking assistance to overcome these barriers, other departments besides disability services for students were not contacted because Stu005 did not know other resources were available. She did state that BSBP (Bureau of Services for Blind Persons) was helpful with training on adaptive technology.
Stu005 finds asynchronous courses more difficult because they seem to have more “busy work to read.” In partially synchronous or in-person lessons, professors provide alternative ways of getting course material through PowerPoint, lectures, or just reviewing material one on one.

**Type of course has most barriers and best practices used by instructors**

Stu005 finds the most challenging course content to be those that are reading heavy such as history and English. When discussing barriers with instructors, “some work well while others don’t want to work but do the bare minimum to get you through the class. I had to advocate for myself.” Stu005 believes students need strong advocacy skills.

Stu005 believes best practices used by instructors are having electronic versions of the material, accessible PDFs, Word documents, and PowerPoints. In addition, allowing students to access material ahead of time will assist them in following along, especially since screen sharing is hard to follow.

**Satisfactory online course for student**

Stu005 believes what makes an online course satisfactory. Specifically, a partially synchronous approach is having dialog and discussions with others. Also, having electronic materials available is a must. Stu005 chooses to enroll in online classes because “this removes the need to find a ride to campus.” Instructional strategies Stu005 would change based on previous online course experience would be teachers lessening the reading load, being more realistic, and recognizing students have more than that one class. “Instructors need to understand that they don’t need to give busy work.”

**Taking an online during a pandemic**

Stu005 did not take courses during the pandemic. She has just returned to school. After the interview, Stu005 stated her feelings about online learning are neutral. It is not her preferred
method of learning, but she can benefit from it. She is glad online was available, especially
during a pandemic, to complete her degree. Stu005 would have preferred to use Zoom rather
than Webex as the platform because she used Zoom with previous employment. Another point
Stu005 made involved E-learning and how having a course describing how to use it would be
beneficial, although she prefers to poke around to learn how to use the software herself. Stu005
feels this class should highlight important things or provide step-by-step guides as resources.

Stu006

Background

Stu006 is a graduate student who is blind, has no light perception, and was not diagnosed
until a teenager. The assistive technology used by Stu006 is JAWS and NVDA, but she prefers
NVDA because she is more fluent and efficient with it. On the other hand, NVDA doesn’t work
with statistical software, which Stu006 needs to conduct research. Instead, she uses JAWS for
working with specialized software. Stu006 also uses a braille display for tasks that require
precision literacy – *writing and citing and exactly writing what she means*. When asked about
skill level with assistive technology, Stu006 states she is a certified technology specialist able to
teach assistive technology to others. Stu006 is very proficient in knowing what software can do
and where to look to make it perform correctly. She usually accesses courses at home and has
taken online courses at more than one institution of higher learning.

Experience Questions

*Key factors for success in online learning*

Stu006 explained that one key factor for her success is that the online environment allows
her more straightforward navigation of frustrating things. For instance, flexing the speaking
speed of the screen reader will enable Stu006 to maneuver easy tasks quickly. It frees up time for
other more complex jobs. There’s no waiting before moving on because something is not accessible. Stu006 stated, “I’m not getting flustered. I can do the extra five steps to make it accessible and am more able to stay engaged in class.” Another key factor is knowing the platform, how pieces work, being able to “navigate on an automatic level rather than trying to think about how someone said it was laid out.”

When first accessing a course, Stu006 reviews the modules listed in E-learning; examines the syllabus and the course downloads for easy access without signing in in the future. Stu006 continues exploring the course and downloads the agenda, proceeds to the assessments’ menu, checks for quizzes, and drop box assignments to determine if there is a quiz every week or assignments to submit. While reviewing the different menus, Stu006 is also determining the layout of the course. “Do I just follow the module where everything is on one page, or do I have to go to another page?” Suppose Stu006 must access different pages to submit assignments or gather information. In that case, she will subscribe to receive notifications or reminders that a project is due or a quiz owing date is coming. Stu006 maps out each course as a classroom. If all activities for a module are contained within the module, then that is a classroom where you remain in your seat and complete assignments. If the layout requires going out to different areas of E-learning to access or submit coursework, that is viewed as requiring visits to stations (discussion, drop box, or quiz station).

Stu006 prioritizes assignments beginning with “what is in front of me?” Further on in the discussion, she states, “I do what I like, do what I perceive I have all the resources for and do those things that have accessibility issues because I have scheduled time to complete complex things, but in reality, I do what’s due now.”
When asked what are warning signs a course will have accessibility issues, Stu006 stated, “Opening something that should be a document, but instead, it is a scan.” A scan is a picture that screen reader software cannot read, making it inaccessible. Another sign is when asking for accessibility but being told, “you don’t need it because…” In this case, Stu006 will find a human reader or use other connections or resources.

Learning barriers

The primary learning barrier Stu006 focused on was videos. “Those videos that say watch this, and then the demonstration goes to movie music.” These videos present barriers because the music makes it nearly impossible to discern the natural world in the video (i.e., movement), and there is little to no chance of figuring out what is going on. “If there is no audio description or there is nothing to describe what the student should get out of the video, no context to pull from, then I get nothing out of listening to the video.”

The strategies Stu006 uses to overcome barriers are utilizing the technology help desk, AIRA, sighted humans, and classmates (finds out sighted students can’t do it either) to provide context if having accessibility problems or an all-student problem. Once Stu006 can distinguish between an accessibility problem and a student/user problem, applying the right strategy to solve the problem is assured. For instance, the student is having difficulty with a quiz. Is it because the student doesn’t navigate it, or is the quiz not accessible? “You must know the problem, and you can't fix a problem if you haven't identified what it is.”

Stu006 receives help from different departments when having accessibility issues. Stu006 will contact disability services for students, the ADA coordinator, and Institutional Equity for assistance and has set the tone that solicited requests are reasonable and will be heard.

Stu006 has had experience with both forms of online classes when asked about asynchronous and partially synchronous courses. Stu006 feels asynchronous courses have greater
accessibility because all content is there. He states, “I can interact with it at my speed; go at my own pace. A partially synchronous course with other students can look at information and find an untagged diagram. I may not know what it says and what to do and not be able to solve this issue when all this is happening. Whereas, if that same discussion is happening asynchronously, and I’m asked my thoughts about the diagram on page 389, I can photocopy the diagram from page 389 onto some swell paper, run it through a toaster (PIAF (Pictures in a Flash) - a conveyor under a heater and use a special kind of paper where black on paper gets hot, puffs up and creates a tactile diagram. It is beneficial with graphs or diagrams. I can look at it tactically and find out what the graph is, come back to the E-learning site, discuss asynchronously on the discussion board with everyone, and be part of that and not have it just sail past me. Because, oh, I had to get paper, use a photocopier, or use a toaster located in the building, which means I need to do it on one of the days that I'm on campus. I can’t do that due to the twelve extra steps it causes me in a real-time moment, but I can do that before I return the next day to make my posts. I can’t leverage that type of tool in a partially synchronous course.”

Type of course has most barriers and best practices used by instructors

Stu006 finds math and foreign language content to present the most obstacles. Math equations require a different braille code, and computers do not manage it well. If an instructor writes an equation on a whiteboard that is not accessible, it is just a picture.

Historically foreign language has included many gestures and a lot of facial expressions inferring something from context. Stu006 feels blindness takes away that context and “compensatory strategies for I don’t know the word are things that can only be used in a visual space, such as pointing to a thing or inferring from another person’s facial expression.” Although
screen readers can read words in a different language, “if it is reading in an off accent, then the learner who is blind or visually impaired is learning to listen in the wrong way.”

Stu006 felt best practices start with consistency. Instructors should be consistent in their naming conventions because if not, it is hard for the blind or visually impaired student to predict where you’re going or what is coming next. If the student can expect and go through the course as efficiently as a sighted person can skim, inconsistency makes it hard to predict the class’s direction. Subtle differences in labels can make the experience efficient. A different name to start each module (1 week, 2 week instead of Week 1, Week 2, Week 3) makes it easier to find course material. Sometimes things may be accessible but not equitable because the student can’t be as efficient as sighted classmates. Another best practice mentioned is for the instructor to insert page breaks instead of blank lines because the student hears blank lines multiple times then thinks there may be more to read at the end of the document. Stu006 believes consistency and predictability are two of the best practices an instructor can use.

*Satisfactory online course for student*

What makes an online course satisfactory for Stu006 is “did I learn things I wanted to learn, *i.e.*, new knowledge, new skills, applicable skills, skills I will use again?” Another good indication for Stu006 was, “can I do it in a way that doesn’t seem harder than it had to be?” If a course is made hard by accessibility issues, that detracts from satisfaction. Also, if Stu006 feels disrespected in class, that detracts from satisfaction. Stu006 is sensitive to disrespect tied to disability and disrespect toward classmates.

Stu006 chooses to enroll in online courses because it saves 15-20 hours per week in commute time. Online makes for a minuscule commute. Often, Stu006 feels she can get the same experience from home that she would have gained going into the classroom. “Content must
match the modality, and online does best at letting people go at their own pace and meet back up to share.” Stu006 chooses online because she wants to go faster (listen to a speech at double time), hear certain parts more quickly, and stop and go slower for details that may take five extra steps. Stu006 does not want the next student watching while completing those five extra steps. The privacy of accommodations is happening out of other people’s line of sight in online courses, and “respect of peers still intact because they did not watch me struggle.” In addition, navigating online space makes it much easier to “jump on three classes rather than having to take a bus to campus, go to a building, find a room, go to another building, find a professor’s office and turn in something, especially being a non-driver.”

Stu006 would change an online course to make it more satisfactory: to produce sure lectures added something more than readings offered, provide accessible content, and give examples demonstrating the content. If the instructor requires students to assess a skill, then describe what the person is doing, what the assessor is doing, and how the person is being evaluated. Stu006 also feels there should be more flexibility and an authentic connection to the world.

Taking an online course during a pandemic

Stu006 has school-age children at home, works from home, and takes classes from home. The children are doing online work and need a computer. She states, “There is stress on time, not enough technology in the household, and the children need a quiet space to read, think, absorb or study. There are not enough hours in the day to get everything completed. The entire family is always in the house. Countering these demands brought on by the pandemic was the bigger problem, more so than the online class.”
After the interview, Stu006 wanted to discuss the skills it takes to access an online class and whose responsibility is to learn or teach the skills to an incoming student who is blind or has low vision. “The student may know how to use JAWS or Braille display, but do they know how to access complex webpages with forms, buttons, and links?” The university may need to offer a prior assessment that allows the student to explore a web page before being admitted to making sure that the student can use their assistive technology in conjunction with the school’s primary systems.”

Although Stu006 was unclear on whose responsibility it is to ensure the student has the technical literacy skills to access an online class, it is essential to know if the student has the skills before enrolling in one. Suppose the university decided to design a self-registration course on using E-learning. In that case, it should be built to deliver content that addresses several needs and makes it available for all students. Stu006 thinks the course should be built according to a universal design for learning which considers diverse needs and provides students with a safe place to practice and assess their deficiencies before enrolling in an online course. Stu006 also suggested using ticket tracking to determine what the help desk calls on and build out that particular module. This information could be shared with classes and the online resource area. Stu006 suggests the university use multiple modes of distribution to reach all people who need it. This suggestion would allow the exploration of the student’s skill set without the university teaching the student how to use JAWS.

Stu007

Background

Stu007 started losing vision in 2015 as an adult and does not feel trained enough to succeed with technology at the university. Stu007 has returned to BSBP (Bureau of Services for Blind Persons) to receive additional training in the desire to complete the remaining six or seven
courses before meeting the requirements for a bachelor’s degree. Stu007 is considered low vision and still possesses a degree of usable vision. Assistive technology used by Stu007 is Dragon Naturally Speaking and ZoomText for magnification because she needs a screen-reader and talks to text. When asked about skill level with assistive technology, Stu007 replied, “I’m not where I want to be. Dragon and ZoomText don’t work well together. Certain details I’m not able to see. Dragon hears ZoomText and me talking, which doesn’t work well together. There is always another obstacle to overcome and not get discouraged.” Stu007 has only taken online courses at one institution of higher learning and usually accesses courses from home because, as she puts it, “I don’t need to schedule a ride. For more independence, all that is needed is to open the computer.”

Experience Questions

*Key factors for success in online learning*

The key factor that makes Stu007 successful in an online environment is working from home because she needs to use a lot of equipment. This also allows her to continue being responsible: *taking care of her family and parents and working from home.*

When first accessing a course, Stu007 explores the course by going into E-learning and reviewing the welcome page to find out what’s needed, like a required textbook she will need to get electronically. Stu007 then reviews the course schedule to determine what is needed and how often she needs to turn in assignments. Stu007 informs the instructor she is not a traditional student and has a disability. Stu007 says, “I put that out there, so they understand if I need extra time, they know it takes me longer to do things.”

When it comes to prioritizing completing assignments, Stu007 looks at the schedule to see what is due first and what requires the most work. She only takes two classes at a time, so she won’t fall behind and doesn’t wait until the last minute to start working on assignments.
The most significant warning sign that there will be accessibility issues with a course is having videos without audio descriptions. Stu007 makes sure to contact the instructor if she finds inaccessible material.

Learning barriers

A learning barrier for Stu007 is “when course material is not as accessible as I think it should be or want it to be. I called the helpdesk and asked for assistance. Over the phone, people can’t see what you’re doing. I feel lost and say, I quit. I’m not physically in front of someone, so they can guide me on what I’m doing. Instead, I’m using screen share; people are not always as patient or accommodating. They get frustrated. You can hear it in their voice.” Another strategy used by Stu007 when encountering learning barriers: calling family members for assistance. Stu007 says, “I know how to do this but must learn how to use computers differently.”

When seeking help from different departments, Stu007 relies on disability services for students. There are times disability services for students “didn’t know what I needed, or how I needed it. Trying to get help is a learning experience. I couldn’t express what was going on, and I didn’t want to feel like a bother or feel defeated when I couldn’t do something.” BSBP has taught Stu007 to use the Victor reader, which records speech so the user can go back to notes and relisten to what was said.

Stu007 has only taken asynchronous online courses. She has no additional information regarding learning barriers found in asynchronous and partially synchronous courses.

The type of course has the most barriers, and best practices instructors use.

When describing the content barrier, Stu007 used a nutrition course as an example. The nutrition course used third-party software that she couldn’t use independently. Stu007 needed someone to help her. She tried to discuss the difficulties with the instructor. Still, she cautioned
the instructor, “if you don't know what it's like to have a disability, whether it's visual or hearing or mobility, you really don't know how to help that person. Sometimes that person doesn't even know how to help themselves. It's like, I don't know what I need to figure that out. It is like job training, where I'm trying to figure out how to navigate the class… how to make the class work for me. So, I think once you know and understand whatever your strengths and weaknesses are, you're better able to communicate them to the individuals from whom you are seeking assistance and support.”

In answering the question concerning best practices used by instructors, Stu007 referred to patience, understanding that the student has a disability, being accommodating, and staying in contact (communication) because “playing catch up with a disability is nearly impossible.”

Satisfactory online course for student

An excellent online course for Stu007 entails taking a quiz, seeing the results right away, and knowing there is a second chance to do it again if needed. Other things that make an online course satisfactory are the ability to “work at my leisure, have flexibility, and submit a paper that is date stamped, assuring it was received and turned in on time.” To make a class more satisfactory, Stu007 would reduce the amount of student work. “Instructors should remember this is not the only class I’m taking.”

Taking an online course during a pandemic

The student did not answer this question because she did not enroll in courses during the pandemic. After the interview, Stu007 wanted to discuss having a pre-class to assist in mastering E-learning which would be beneficial. Stu007 feels a class would be better because there is a “barrier to learning on your own, if you don’t know what you are doing.” She feels the university and students need to work together on delivering technical skills for student success. Stu007 also
feels “people in DSS need to be well versed in distinct areas – not everybody learns the same, not everybody has the same disability.” She also thinks the university should be diverse in its hiring. “Are people with disabilities just in DSS, or are they in billing and financial aid?”

Stu008

Background

Stu008 is a graduate student with limited peripheral vision and no central vision. He has little more than light and dark detection, no color vision, and limited vision. Stu008 was diagnosed in 5th grade with a hereditary eye disease. The assistive technology used by Stu008 is JAWS and ZoomText. She also utilizes phone apps such as Ai Squared and Aira. Stu008. She states her skill level has dramatically improved, and she is continually learning and accumulating skills. Stu008 states she usually accesses her online courses from home and has only taken online courses at one institution of higher learning.

Experience Questions

Key factors for success in online learning

Stu008 feels a key factor for her success has accessible platforms which work with the technology being used. She went on to say, “Webex is not accessible. Each teacher sets up their room differently, and it is hard trying to figure out why it is not working.”

Stu008 begins exploring a course by examining its regions. She will go to each area to see what’s there. After exploring the areas, Stu008 prioritizes completing assignments by making lists of what’s due for what course for that week. She further prioritizes due dates within that week. Stu008 considers the following warning signs that a course will have accessibility problems. “When teachers do things to make the format visually pretty, this causes headaches when it comes to accessibility.” Other warning signs include using Excel, flipping Word
documents to landscape, using distinct types of PDFs *(but they are an image)*, and using animated videos that “don’t allow students to pick up the content needed because there is nothing descriptive, just hearing music.”

**Learning barriers**

The most prominent learning barrier for Stu008 is being able to access things. She finds PowerPoint not accessible and buttons to use other software not labeled. There are times when Stu008 thinks teachers can be a barrier. When trying to address an obstacle, she has a vicious cycle between the instructor and DSS. A process in which “DSS says it’s the teacher’s responsibility, but the teacher says that it is the job of DDS.” Stu008 feels that people “don’t think through things to make services all-inclusive. They don’t seem to want to make things all-inclusive for the disabled but will for other areas that are political hotspots.”

Strategies used by Stu008 to overcome these barriers are “advocating for self, knowing those people at the university that I know I can count on and can help with the problem.” Stu008 has received help from different departments on campus when attempting to overcome barriers, including DSS, and sometimes going over the professor’s head and contacting the department chair or dean of the college.

When looking at barriers in asynchronous and partially synchronous online courses, Stu008 pointed out the Webex platform. She always had issues with breakout rooms in her partially synchronous courses. Stu008 was always left in the main lobby. Another issue found in the partially synchronous course was people talking over others. The asynchronous course displayed a loss of personal contact… no connection with classmates.
Type of course has the most barriers, and best practices instructors use.

Stu008 thinks that maps are the type of course content that presents the most barriers. She was enrolled in a course using numerous maps. “There was an instructor that had been teaching the course for years, but when he retired, nobody knew where the tactile stuff was.” In addition, using videos “where the innuendos are not verbalized is difficult to understand but having a teacher who is expressive verbally is helpful.”

Stu008 listed best practices as providing students with alternative formats for content download in E-learning (A11y), emailing items separately (Word format), and providing students with content early.

Satisfactory online course for student

An excellent online course for Stu008 consists of having everything laid out in the course shell, so it is easy to use and understandable. All documents are in an accessible format, and videos have audio descriptions and captions. In addition, “teachers are familiar with the platform and setting it up because, if not, this makes it difficult for those with an added challenge. Keep things clean and simple.”

Stu008 enrolls in an online course only if she can’t do it in person. To avoid an online course, Stu008 will set up a schedule in paratransit during non-peak times. She said, “I choose transportation challenges over the challenges of taking an online course. There is a real struggle when the only communication is email, and the teacher doesn’t respond to email. Online feels like, here, go teach yourself.” Stu008 goes on to explain that although she may be completing the reading assignments, “how do I know that I’m gleaning what the instructor wants me to glean when there is no instructor content?”

Stu008 feels she would replace the lack of personal connection to make former online courses more satisfactory. She feels you could still use Webex but also need that person-to-
A person connection. Stu008 disagrees with the attitude of *I loaded the course shell, but you are on your own*. She feels there should always be a personal connection and interaction between teacher and students within the video platform.

*Taking an online course during a pandemic*

Stu008 would prefer in-person learning. She’s felt isolated, and her guide dog has become a house pet because of not being worked. She says, “He is not as good because he has slacked.” By not constantly using his skills, he is starting to lose them. Stu008 also feels like the online platform during this time “feels like a bunch of busy work and is more time-consuming.”

After the interview, Stu008 was asked whether the university should teach incoming blind or low vision students assistive technology skills. Stu008 feels students should have basic knowledge of how to use assistive technology. They need to know how to connect basic knowledge to essential systems at the university. The university might need to teach those advanced-level skills like converting a document. If students were to go through orientation, they would need “someone who knows assistive technology needs and really knows technology to teach the course. Also, the course must be very descriptive and must have audio descriptions.”

Stu009

**Background**

Stu009 is a graduate student with a congenital eye disorder and is considered legally blind. The assistive technology he uses is JAWS Fusion, iPad and iPhone colors inverted, Voiceover, magnifying text, Follet reader, Voice Dream reader application, and National Library Service (NLS) Book share. Stu009 considers his skill level as being highly proficient. He usually accesses his courses from home and has only taken online courses at one institution of higher
learning. Stu009 always accesses courses at home, but he doesn’t waste downtime and will access classes on campus during breaks in classes.

Experience Questions

Key factors for success in online learning

Stu009 feels the key factors that make him successful are – drive and determination and not letting anything slow him down. Stu009 usually explores a course on his iPad because of its ease of use. He becomes familiar with the course layout, finds the syllabus, and skims it. He also locates the course schedule to know when assignments are due. Stu009 accesses modules based on execution priority and prioritizes projects by “what’s due when.”

Stu009 hasn’t had a class with accessibility issues that he hasn’t found workarounds to solve the problems. He thinks most instructors are more than forthcoming in getting accessibility to everyone. Stu009 thinks E-learning has ease of accessibility, and there are different format options with D2L.

Learning barriers

One learning barrier Stu009 finds is that textbooks are not available in digital format, and sometimes, it takes DSS a lot of time to get the books ready. There was an incident when he was trying to get a textbook, and by the sixth week of class, he had not received it. Stu006 emailed the university president and got the book the next day. Because of this situation, DSS rewrote the policy and now will scan a book to PDF to get the material to the student faster.

The strategies Stu009 uses to overcome barriers are to self-advocate, improvise, adapt, and overcome. All his courses have been asynchronous, so he has nothing to compare with partially synchronous courses.
Type of course has most barriers and best practices used by instructors

Another barrier question in the interview involved Stu009 discussing what course content presents the most obstacles for visually impaired students. He does not find barriers in his courses.

Stu009 feels best practices used by instructors are evident. Students are provided thorough and well-written syllabi outlining expectations of students and instructor, given clearly defined due dates on assigned readings, provided high-level questions that facilitate discussions while advocating free and lateral thinking – thus, opening students’ horizons.

Satisfactory online course for student

Along with what he stated above, Stu009 finds transparent, open lines of communication with the instructor, responsiveness from the instructor, where if he reaches out, he expects contact promptly, and a proficiency in the subject matter in tandem make a course satisfactory. Stu009 is not satisfied with just getting by. “I want to be the best I can be. That is why I email drafts and get feedback.”

Stu009 chooses to enroll in online courses because they are expected or only available online. He will also take online courses because they may be interesting and allow him to take classes whenever, wherever - that work well with his schedule.

Changes Stu009 would make in previous online courses to make them satisfactory are incorporate self-pacing guides so the student can work faster and complete work sooner. Also, he would place E-learning system notification alerts on selected applications that would synchronize with the calendar.

Taking an online during a pandemic

When asked about taking online courses during the pandemic, Stu009 replied, “It is one less day I must go to class and expose myself to positive Covid cases. I have a high-risk child,
and with Covid conditions as they are, I have anxiety about going to class in person. I can knock out requirements and not worry about exposure. I am also concerned because my guide dog hasn’t worked regularly for 18 months. Being in public, being around other dogs on a harness, and being around other guide dogs’ handlers in class, I worry would my dog obey? Was my dog detraining because of spending too much time being a dog and not being a guide dog?

After the interview, Stu009 stated it would be nice to have an E-learning orientation course, but when he “gets something new, he wants to play with it first and then read instructions.” Stu009 has a favorable impression of online courses, “instructors willing to adapt and modify, instructors above average in that regard. Some instructors go above and beyond to make things accessible.”

The one thing that Stu009 thinks can be improved is having an application that can synchronize the E-learning calendar with other calendars. He wonders, “Why don’t we have an app? Why do we need a third-party application to synchronize the calendar?”

Stu010

Background

Stu010 is a graduate student diagnosed at two and a half years old with low vision. The assistive technology she uses is JAWS, Voiceover, and Mantis Q40 braille display. Stu010 described her skill level with assistive technology as advanced. She has only enrolled in online classes at one institution and usually accesses her lessons from her campus apartment.
Experience Questions

*Key factors for success in online learning*

Key factors which make Stu010 successful online are having accessible materials or obtaining them in an accessible format and sharing good communication with professors *(diagrams and pictures that instructors can describe).*

Stu010 first accesses a course by checking the homepage and content to see if she can navigate headings and tabbing. She prioritizes completing assignments by module. “I will do all week, ones at the same time, and set aside a separate day to do online work because of lots of reading and video.”

Stu010 says warning signs that a class has accessibility issues are PDFs that don’t have a Word option. The alternative format works 95% of the time. Another indication is if the teacher says she is working on getting class accessible and may not have everything accessible when the semester starts.

*Learning barriers*

Learning barriers experienced by Stu010 center around communication. Many times, it is hard to keep up with reading and assignments. Announcements are put on E-learning, but she doesn’t always receive them.

Strategies used by Stu010 to address barriers include contacting professors and letting them know something is wrong or there is a problem with a document. She will send the document through RoboBraille to put in HTML or get campus departments to address barriers by calling departments to let them know about the issue.

Stu010 found barriers in asynchronous courses because they “don’t get instruction from professors. A big barrier is office hours and how hard it is to schedule with JAWS. It is difficult to schedule office hours to get help.”
Type of course has the most barriers, and best practices instructors use.

Stu010 finds that quizzes are the type of content that provide barriers because she may not receive ample time because of communication problems, and instructors may not have her accommodation letter. Stu010 feels that best practices used by instructors include formatting content differently if there is a problem and having good communication. Stu010 says she “always has the cell phone numbers of her instructors so that she can contact them.”

Satisfactory online course for student

An excellent online course for Stu010 will have all material easily accessible. Stu010 enrolls in online classes because they are not offered in person. She would rather have an in-person course. Stu010 would make previous online courses satisfactory by changing videos that don’t have descriptions. She feels just having words on the screen detracts from the benefit of the video.

Taking an online course during a pandemic

Stu010 thinks taking online courses during the pandemic caused difficulties in some content areas. She “did not get as much information out of the course because she needed supplemental material for context to understand some material she read.” She did not know the material, which affected her grades. It also affected her service animal in that “it takes a lot for her to get focused, and she sniffs everything now.”

After the interview, Stu010 commented that E-learning training should be an option for orientation. It should include a list of commands and instructions on accessing things on E-learning. She thinks there should still be a separate resource outside of the training for E-learning information.

Stu010 feels good and bad about online learning. She is appreciative she could continue her education but acknowledges she learns better in class with a professor. Stu010 thinks if she is
paying for a class, then “the teacher should have to have some lecture component that students can interact with in some way.” There should be Webex shortcuts that explain how to access things on Webex, and this should be included in the packet because “people don’t know commands.” Still, if the students come to campus, they are responsible for knowing the technology.

Chapter 4 Closure

All ten participants shared unique and interesting stories about their experience as blind or visually impaired students enrolled in online courses. Next, in Chapter 5, I discuss the themes and sub-themes discovered using inductive analysis of the research data.
CHAPTER V
DATA ANALYSIS AND FINDINGS

This study engaged a sample of 10 blind or visually impaired college students who have been enrolled in online courses to examine the following overarching question and sub-questions:

What are the lived experiences of college students with visual impairments enrolled in an online course?

1. What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?

2. What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments?

3. What do such students voice as the best practices used by instructors of online courses to assist them with their learning?

Once a participant agreed to participate in the study, I set a time and day to conduct the interview using the Webex web conferencing platform. An interview protocol (Appendix D) was used to conduct standardized open-ended interviews (Patton, 2002). The protocol included a description of the purpose of the research, the process, procedures for gaining consent, and the questions to be asked.

At the beginning of the interview, I again reviewed the participant consent form and reminded the participants by continuing to speak with me; they were giving their consent to have the information they provided used in the research study.

During the interviews, I followed the interview script. To ensure the confidentiality of participants, I assigned a pseudonym to each participant according to the following scheme:
“Stu00…” I audio-taped each interview; then, I assigned the pseudonym to protect confidentiality and anonymity in the transcription of each interview. Additionally, I redacted all identifying information from the transcripts to maintain anonymity and confidentiality. Any participant quotes used by me were identified by using the “Stu00…” pseudonym.

Member Checking, Recoding, and Peer Debriefing

Lincoln and Guba (1985) considered member checking to be “the most key technique for establishing credibility” (p. 314) when conducting qualitative studies. Participants were allowed to review the questions to clarify something said or add more information. Member checking was performed after the interview to ensure I captured what the participant shared about their experiences in an online learning environment.

An assistive technology specialist was recruited to review the interview transcript for themes and subthemes to see if the same themes were discovered and additional themes that I did not find. To be considered a theme, the data had to be relevant to the research questions and provided some form by at least three participants. The following themes were found by the accessibility professional (a) attending multiple institutions, (b) communicating with instructors and organizing priorities are keys for success, (c) desiring an overview and instructions for E-learning (d) converting own content in some cases, (e) providing audio descriptions (f) using Zoom (more accessible) over Webex. The accessibility professional and I agreed with the themes noted except for two – converting our content and preferring Zoom over Webex. In both instances, two of the 10 participants mentioned converting content into an accessible format and choosing the Zoom platform over the Webex platform because of the accessibility and familiarity with the software. Since only two participants mentioned these topics, they did not meet the criteria and were not considered themes for the study.
Peer debriefing is another validation technique used in this research study. To perform peer debriefing, I took the data analysis and findings to the director of DSS and asked her to review the findings and ask questions about the study. I also asked the key question of voice. Did this research bring a collective voice to the underrepresented group I was researching? Do the findings add to the body of literature relative to the lived experiences of college students who are blind or visually impaired enrolled in an online learning environment? The director thought the information captured would help secure resources to support the educational needs of this often-overlooked population of college students.

Discovering Themes and Sub-themes

Following the collection of data from the interviews of each participant, each recording transcript was printed. The Webex platform automatically generated transcripts. I read the transcripts numerous times to understand what the participants had to say about being a blind or visually impaired student in the online learning environment.

The first series of the process included identifying significant words, statements, or phrases that explained what the participants experienced. This material was then coded with a description of what the states represented, such as an action, impact, or result. After identifying and coding the material, it was placed in a codebook. For example, multiple students stated good communication as a best practice used by instructors teaching online. Each time communication was mentioned, I coded it in the codebook as an action. I reviewed the codes, and the codes were reviewed by a professional in the accessibility field. The purpose of this was to assist in the validation process.

In the next round of the process, I looked for repeated words and common expressions of the participants in the codebook. As I identified these items, I clustered these items into themes.
These themes became the basis for describing what the participants experienced. The data analysis process established seven themes. These themes were about learning barriers, complex course content, and best practices instructors use in online courses. There were subthemes associated with each of these themes.

Participant Characteristics and Profiles

The background characteristics I collected about the participants portray a diverse sample relative to (a) visual acuity, (b) class standing, and (c) whether they have taken online courses at more than one institution. Of the 10 participants, 7 (70%) were blind, 8 (80%) were graduate students, and 6 (60%) had only taken online courses at one institution of higher learning. Table 2 offers demographic information on the 10 participants, including a description of whether they are blind or visually impaired, gender, class standing, college, and whether they have taken online courses at more than one institution.

Table 2

Participant background data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Blind/Visually Impaired</th>
<th>Gender</th>
<th>Class Standing</th>
<th>College</th>
<th>Taken online courses at more than one institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>S001</td>
<td>VI</td>
<td>F</td>
<td>Undergraduate</td>
<td>Arts &amp; Science</td>
<td>Yes</td>
</tr>
<tr>
<td>S002</td>
<td>VI (legally blind one eye)</td>
<td>F</td>
<td>Undergraduate</td>
<td>Arts &amp; Science</td>
<td>No</td>
</tr>
<tr>
<td>S003</td>
<td>Blind</td>
<td>F</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>Yes</td>
</tr>
<tr>
<td>S004</td>
<td>Blind</td>
<td>M</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>Yes</td>
</tr>
<tr>
<td>S005</td>
<td>Legally Blind</td>
<td>F</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>No</td>
</tr>
<tr>
<td>ID</td>
<td>Impairment</td>
<td>Gender</td>
<td>Status</td>
<td>Field of Study</td>
<td>Service Access</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>--------</td>
<td>------------</td>
<td>---------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>S006</td>
<td>Blind</td>
<td>F</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>Yes</td>
</tr>
<tr>
<td>S007</td>
<td>VI</td>
<td>F</td>
<td>Undergraduate</td>
<td>General Studies</td>
<td>No</td>
</tr>
<tr>
<td>S008</td>
<td>VI</td>
<td>F</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>No</td>
</tr>
<tr>
<td>S009</td>
<td>Legally Blind</td>
<td>M</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>No</td>
</tr>
<tr>
<td>S010</td>
<td>Blind</td>
<td>F</td>
<td>Grad Student</td>
<td>Health &amp; Human Services</td>
<td>No</td>
</tr>
</tbody>
</table>

All 10 participants were current blind or visually impaired students and enrolled in an online course at a Midwestern university. The interviews revealed several background traits related to when diagnosed with a visual impairment, assistive technology skill level, class standing, the field of study, where they have enrolled in online courses, and where they usually access their courses.

Most of the participants were born blind or visually impaired and were diagnosed before becoming adults. Participants reported being diagnosed at birth or as they entered school. In total, nine participants reported being diagnosed before they reached adulthood. A majority indicated that their assistive technology skill level was proficient or higher, with five stating their level as high. Since their youth, most participants employed assistive technology and were comfortable using it.

In addition, a majority of the participants were graduate students. Seven of the ten participants had already received their undergraduate degrees and were in graduate school. The data indicated seven of the ten participants were interested in the health and human services field. Six of the participants had taken online courses from one institution. All ten students
commented that they access their courses from home. Stu005 stated she usually accesses classes from home because she “has more control” over her environment. Stu007 commented she usually accesses courses from home because “I don’t need to schedule a ride, for more independence all that is needed is to open the computer.”

I utilized an inductive approach to analyze the data. Patton (2015) described the qualitative inductive analysis as “generating new concepts, explanations, results, and/or theories from the specific data of a qualitative study” (p. 541). I found patterns by searching the transcriptions for recurring words or themes. As I began to find enough similar wording in the transcriptions, this became the basis for the themes described in this chapter and helped me recognize the “findings emerging out of the data” (Patton, 2015, p. 542).

Findings

Findings on Research Question 1 on Learning Barriers Experienced by College Students with Visual Impairments

Many research participants focused on the inaccessible course material, presenting the most learning barriers in answering this question. As far as finding barriers in asynchronous courses that are not in synchronous courses, participants stated there was less communication with professors in asynchronous courses, which was a barrier to their learning. They found this was a barrier because of their limited ability to ask questions and hear their peers’ questions, which they might not think to ask themselves. A summary of the findings include:

Finding 1. Course material is created in inaccessible file formats.
Finding 2. Video used in courses needs audio descriptions.
Finding 3. Inaccessible maps and diagrams.
For Finding 1: *Course material is created in inaccessible file formats.* Interviews disclosed that blind or visually impaired students constantly struggle to get material in a form that is accessible to them and where they do not need to use multiple steps to make it accessible for them. Data related to this finding were included in subtheme 1.1: *Not having access to course materials in a proper format.* Participants stated PDFs, scans of documents, lack of audio descriptions for videos, and inaccessible textbooks as examples of unavailable course content. Stu003, 004, 005, 006, 009, and 010 all mentioned course material in unavailable file formats as a barrier.

Table 3

Sub-theme 1.1 Inaccessible course material - file formats

<table>
<thead>
<tr>
<th>Student</th>
<th>Type of inaccessible course material</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu003</td>
<td>File formats</td>
<td>“File formats that don’t work with assistive technology”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“PowerPoints lack transcripts”</td>
</tr>
<tr>
<td>Stu004</td>
<td>PowerPoint transcripts</td>
<td>“PDFs that don’t have a Word option”</td>
</tr>
<tr>
<td>Stu010</td>
<td>PDFs</td>
<td>“Excessive amounts of reading involving PDFs that are not accessible”</td>
</tr>
<tr>
<td>Stu005</td>
<td>PDFs</td>
<td>“Opening something that should be a document but instead it is a scan. A scan is a picture that screen reader software cannot read, making it inaccessible.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Documents</td>
<td>“The inability to find books in a decent format”</td>
</tr>
<tr>
<td>Stu005</td>
<td>Inaccessible books</td>
<td>“Textbooks are not available in digital format, and sometimes it takes DSS a lot of time to get the books ready.”</td>
</tr>
</tbody>
</table>
For Finding 2: *Video used in courses need audio descriptions.* Interviews revealed that students do not gather information from videos documenting behaviors or showing objects in the environment but lack audio descriptions. Data related to this finding were included in subtheme 1.2: *Inaccessible course material - video.* Stu008 stated animated videos “don’t allow me to get the content needed because there is nothing descriptive, just hearing music.” Stu004, 006, 007, 008, and 010 all mentioned the lack of audio descriptions for videos as a barrier.

Table 4
Sub-theme 1.2 Inaccessible course material – video

<table>
<thead>
<tr>
<th>Student</th>
<th>Type of inaccessible course material</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu004</td>
<td>Video transcripts</td>
<td>“Video transcript lacks time markers.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Videos and documents</td>
<td>“Those videos that say watch this and then the demonstration goes to movie music makes it inaccessible.”</td>
</tr>
<tr>
<td>Stu007</td>
<td>Videos</td>
<td>“Material not as accessible as I think it should be or want it to be, for instance, having videos without audio description.”</td>
</tr>
<tr>
<td>Stu008</td>
<td>Videos</td>
<td>“Using animated videos that don’t allow me to get the content needed because there is nothing descriptive, just hearing music.”</td>
</tr>
<tr>
<td>Stu010</td>
<td>Videos</td>
<td>“Videos that don’t have descriptions”</td>
</tr>
</tbody>
</table>

For Finding 3: *Inaccessible maps and diagrams.* Interviews disclosed students could not access or correctly identify content contained in maps or diagrams. Data related to this barrier were included in Subtheme 1.3: *Inaccessible maps and diagrams.* Stu006 stated, “I may find a diagram untagged and not know what it says and what to do and not be able to solve this issue at
the time all this is happening.” Stu003, 006, 008, and 010 all mentioned the lack of accessible maps and diagrams as a barrier.

Table 5

<table>
<thead>
<tr>
<th>Student</th>
<th>Type of inaccessible course material</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu003</td>
<td>Diagrams</td>
<td>“Screen readers can’t read pictures and diagrams.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Diagram</td>
<td>“I may find a diagram untagged and not know what it says and what to do.”</td>
</tr>
<tr>
<td>Stu008</td>
<td>Maps</td>
<td>“Enrolled in a course that had a lot of content using maps. There was an instructor that had been teaching the course for years, but when he retired, nobody knew where the tactile stuff was”</td>
</tr>
<tr>
<td>Stu010</td>
<td>Diagrams</td>
<td>“Diagrams and pictures that instructor can describe”</td>
</tr>
</tbody>
</table>

Findings on Research Question 2 on Course Content Presenting the Most Difficulty

The answers to this question varied, with students stating content heavy on visual content, causing the most difficulty. Specific types of courses named were math and foreign language. Data related to this finding were included in Theme 2: Course Content. Stu003, 004, and 006 all mentioned math as course content which presented the most difficulty. A summary of the findings include:

Finding 1. Math – need different braille code to read information and/or verbal reader.

Finding 2. Foreign Language – words must be pronounced with the correct accent.

For Finding 1: Math. Interviews disclosed students had difficulty with this material. Stu003, 004, and 006 found math content difficult because of the numbers and formulas and because math equations require a different braille code which causes difficulty for computers.
Data related to this finding were included in Subtheme 2.1: Math. For example, Stu004 stated in the interview, “some scientific information needs a verbal reader.”

Table 6

Sub-theme 2.1 Course content – math

<table>
<thead>
<tr>
<th>Student</th>
<th>Difficult Course Content</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu003</td>
<td>Math</td>
<td>“Content that uses tables causes problems with the screen reader software reading it correctly.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Math</td>
<td>“Screen readers are not the best at reading numbers since this content is very visual and sometimes requires tactile objects and sighted assistance to help with understanding the information.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Math</td>
<td>“Math equations require a different braille code, and computers do not manage it well. If an instructor writes an equation on a whiteboard, that is not accessible because it is just a picture.”</td>
</tr>
</tbody>
</table>

For Finding 2: Foreign Language. Interviews revealed that blind or visually impaired students have difficulty learning a foreign language online. Data related to this finding were included in Subtheme 2.2: Foreign language. Language includes many gestures and facial expressions which allow a person to infer something from the context. During the interview process, it was stated by Stu006, “screen readers can read words in different languages. The voice speaking those words must use the correct accent, so the blind or visually impaired listener is not learning to speak the language incorrectly.” Stu002 and Stu006 also mentioned foreign language as course content which presented the most difficulty.
Table 7

Sub-theme 2.2 Course content – foreign language

<table>
<thead>
<tr>
<th>Student</th>
<th>Difficult Course Content</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu002</td>
<td>Foreign Language</td>
<td>“Foreign language class content presented in an online environment seemed more difficult.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Foreign Language</td>
<td>“Although screen readers can read words in a different language “if it is reading in an off accent, then the blind or visually impaired learner is learning to listen in the wrong way.”</td>
</tr>
</tbody>
</table>

Findings on Research Question 3 on Best Practices Used by Instructors of Online Courses

The participants shared what they thought best practices instructors used in online courses in the interviews. The best practices mentioned were accessible formats, complying with accommodation requests, excellent communication (most often mentioned), and receiving course material in advance. The expression of this finding was included in Theme 3: Best Practices. A summary of the findings include:

Finding 1. Accessible formats – material can be accessed and read by students independently.

Finding 2. Accommodations – students receive accommodations designated by DSS.

Finding 3. Excellent communication between instructor and student.

Finding 4. Receive course material in advance of use in the course session.

For Finding 1: Accessible formats. The data revealed best practices used by instructors are centered around accessibility. Research participants stated, in some form, obtaining properly formatted, accessible material as being essential success factors—four of the 10 participants
mentioned accessible material when discussing best practices. Stu001, 004, 008, and 010 all mentioned having course material in an accessible format as a best practice.

Table 8

Sub-theme 3.1 Best Practices – Accessible material

<table>
<thead>
<tr>
<th>Student</th>
<th>Key Factor</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu001</td>
<td>Accessible</td>
<td>“PDFs formatted so the screen reader software can read them.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Accessible</td>
<td>“Having access to accessible content on E-learning.”</td>
</tr>
<tr>
<td>Stu008</td>
<td>Accessible</td>
<td>“Accessible platforms which work with the technology being used.”</td>
</tr>
<tr>
<td>Stu010</td>
<td>Accessible</td>
<td>“Having accessible materials or can get them in an accessible format.”</td>
</tr>
</tbody>
</table>

For Finding 2: Accommodations. The data also revealed that best practices include accommodations. Research participants state that discussing and receiving accommodations with their instructors were important. Four of the 10 participants mentioned concessions when talking about best practices. Accessible formats can also be considered accommodations, such as large print books. Stu006 states, “The privacy of accommodations is happening out of other people’s line of sight in online courses and “respect of peers still intact because they did not watch me struggle.” Stu002, 004, and 008 all mentioned instructors providing designated accommodations as a best practice.

Table 9

Sub-theme 3.2 Best Practices – Receiving Accommodations

<table>
<thead>
<tr>
<th>Student</th>
<th>Key Factor</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu002</td>
<td>Accommodation</td>
<td>“Having more time to complete things and get material in large print.”</td>
</tr>
</tbody>
</table>
For Finding 3: Good communication. The research from this study found good communication is not necessarily just speaking with students but also responding to email in an appropriate timeframe. Four of the 10 participants felt effective communication used by the instructor to reach students was a best practice. Stu001, 004, 007, and 010 mentioned having good communication as a best practice.

Table 10

Sub-theme 3.3 Best Practices – good communication

<table>
<thead>
<tr>
<th>Student</th>
<th>Best Practice</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu001</td>
<td>Communication</td>
<td>“Best practices for an online course include having good communication with the student.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Communication</td>
<td>“Responding to emails about questions in an adequate time frame.”</td>
</tr>
<tr>
<td>Stu007</td>
<td>Communication</td>
<td>“Staying in contact (communications) because playing catch up with a disability is nearly impossible.”</td>
</tr>
<tr>
<td>Stu010</td>
<td>Communication</td>
<td>“Having good communication.”</td>
</tr>
</tbody>
</table>

For Finding 4: Getting material in advance. The research from this study found receiving content before the class session allows students to make sure it is accessible, and they can review
and be ready to contribute as effectively as their peers. Stu001, 002, and 008 all mentioned having course material in advance as a best practice.

Table 11

Sub-theme 3.4 Best Practices – get material in advance

<table>
<thead>
<tr>
<th>Student</th>
<th>Best Practice</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu001</td>
<td>Provide content upfront</td>
<td>“Providing accessible content upfront, having access to PowerPoint slides early as opposed to instructors sharing their screen or posting handwritten documents.”</td>
</tr>
<tr>
<td>Stu002</td>
<td>Provide content before</td>
<td>“Give slideshow handouts before the lecture”</td>
</tr>
<tr>
<td>Stu008</td>
<td>Provide content early</td>
<td>“Providing students with content early”</td>
</tr>
</tbody>
</table>

Other Findings

Other findings surfaced from the research, which was not part of the research questions.

A summary of these findings include:

Finding 1. Enroll in an online course for flexibility
Finding 2. Need of an overview of E-learning (learning management system)
Finding 3. Guide/Service dog detrains because of lack of use during pandemic
Finding 4. The best practice used by students – utilize prompts for due dates

For Finding 1: *Flexibility*. Half of the participants reported they enrolled in online courses because they provided flexibility. Other reasons provided by participants as to why they enroll in online courses include it being the only option available and not being ready to return to campus because of the Covid-19 pandemic. Stu002, 003, 004, 006, and 009 all mentioned having flexibility as a reason for enrolling in online courses.
Table 12

Sub-theme 4.1 Online course flexibility

<table>
<thead>
<tr>
<th>Student</th>
<th>Why online course</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu002</td>
<td>Own pace</td>
<td>“Learn at your own pace.”</td>
</tr>
<tr>
<td>Stu003</td>
<td>Anytime, anywhere</td>
<td>“To not overload me, I need to have the option available to take the course anytime and anywhere.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Own pace</td>
<td>“It is easier to access tests and content because I can complete at my own pace.”</td>
</tr>
<tr>
<td>Stu006</td>
<td>Own pace</td>
<td>“Wants to go faster (listen to a speech at double time), can hear certain parts faster and then stop and go slower for parts that may take five extra steps.”</td>
</tr>
<tr>
<td>Stu009</td>
<td>Whenever, wherever</td>
<td>“Allows me the option to take classes whenever, wherever.”</td>
</tr>
</tbody>
</table>

For Finding 2: E-learning courses. Nine of the participants reported having a course that provided training on E-learning (Learning Management System (LMS)) would have been helpful. Two of the participants shared their thoughts on how the course should be designed:

Stu006 shared that the university may need to offer a prior assessment that allows the student to explore a web page before being admitted, making sure that “the student can use their assistive technology in conjunction with the school’s primary systems.” The university should design a self-registration class and explain how to use E-learning. It should be built to deliver content that addresses many needs and make it available for all students. Stu006 thinks the course should be built according to a universal design for learning that considers diverse needs
and provides students with a safe place to practice and figure out what they do not know before enrolling in an online course.

Stu007 shared her feelings about having the university and students work together to ensure incoming blind or visually impaired students have the needed technical skills to succeed. Stu007 thought this E-learning course could screen for that skill. Stu001, 003, 004, 005, 006, 007, 008, 009, and 010 all mentioned having E-learning course material would be helpful for students who are blind or visually impaired.

Table 13

Sub-theme 4.2 E-learning introduction course

<table>
<thead>
<tr>
<th>Student</th>
<th>Is an E-learning course useful?</th>
<th>Student comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu001</td>
<td>Yes</td>
<td>“A generalized descriptive post on E-learning describing how to use E-learning. The post must be very descriptive and include the audio description.”</td>
</tr>
<tr>
<td>Stu003</td>
<td>Yes</td>
<td>“Those who have not taken an online course would benefit from an introductory course to E-learning but should have the option to take or not because you want to respect all people’s preferences and skill levels.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Yes</td>
<td>“For those with little knowledge of the learning management system or screen reader software.”</td>
</tr>
<tr>
<td>Stu005</td>
<td>Yes</td>
<td>“Having a course describing how to use it would be beneficial, although I prefer to poke around. It should have important things to note or step-by-step guides as resources to it.”</td>
</tr>
</tbody>
</table>
| Stu006  | Yes                           | “Design a class that was self-registration on how to use E-
learning than it should be built to deliver content that addresses many needs and make it available for all students... built according to universal design for learning which considers different types of needs and provides students with a safe place to practice and figure out what they do not know before enrolling in an online course.

Stu007  Yes  “Having a pre-class to assist in learning E-learning would be beneficial.”

Stu008  Yes  “Need someone who knows assistive technology needs and knows technology to teach the course. Also, the course must be very descriptive and must have audio descriptions.”

Stu009  Yes  “It would be nice to have an E-learning orientation.”

Stu010  Yes  “E-learning training should be an option for orientation. It should include a list of commands and how to access things on E-learning. Also, there should still be a separate resource outside of the training for E-learning information.”

For Finding 3: Covid-19 pandemic guide dogs detrained. All the participants who used a guide/service dog noticed their dog losing skill sets because they were not working during the pandemic shutdown. As I interviewed participants about the effects of the Covid-19 pandemic on their academic life, comments given by those with guide/service dogs included that the dogs were not as sharp as before the pandemic. It would take longer for the dog to focus on the task, and the guide dog handler would sometimes become nervous about taking the dog around many
people because of the uncertainty of how the dog would react. Most said their guide dogs were acting more like a house pet than a service dog, and they were becoming detrained because of limited use. They were not being used as much due to quarantine. This was a topic that I did not expect to encounter. I searched and could not find peer-reviewed articles on this topic. Stu008, 009, and 010 all mentioned their guide dog detraining due to not being used during the Covid-19 pandemic.

Table 14

Sub-theme 4.3 Effect of Pandemic – guide dog

<table>
<thead>
<tr>
<th>Student</th>
<th>Effect of Pandemic</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu008</td>
<td>Guide dog detrained</td>
<td>“Guide dog has become a house pet because of not being worked. He is not as good because he has slacked by not constantly using his skills; he is starting to lose them.”</td>
</tr>
<tr>
<td>Stu009</td>
<td>Guide dog detrained</td>
<td>“Spending too much time being a dog and not being a guide dog.”</td>
</tr>
<tr>
<td>Stu010</td>
<td>Guide dog detrained</td>
<td>“It takes a lot for her to get focused, and she sniffs everything now.”</td>
</tr>
</tbody>
</table>

For Finding 4: *Best practice by students – utilize tools for due dates.* Four participants reported using different tools to remind them of due dates and organize themselves. Stu009 suggested having an application synchronizing the E-learning calendar with other calendars. He wondered, “why don’t we have an app? Why do we need a third-party application to synchronize the calendar?”

Stu002, 004, 005, and 008 all mentioned using tools to remember due dates for assignments.
Table 15

Sub-theme 4.4 Best practice by students – utilize tools for due dates.

<table>
<thead>
<tr>
<th>Student</th>
<th>Tools for due dates</th>
<th>Student Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stu002</td>
<td>Pulse</td>
<td>“I use the mobile app to get alerts for due dates of assignments.”</td>
</tr>
<tr>
<td>Stu004</td>
<td>Phone</td>
<td>“I put all important dates in my phone to get one week’s notice for when things are due.”</td>
</tr>
<tr>
<td>Stu005</td>
<td>Calendar</td>
<td>“Insert dates on the calendar.”</td>
</tr>
<tr>
<td>Stu008</td>
<td>List</td>
<td>“Make lists of what’s due for what course for that week.”</td>
</tr>
</tbody>
</table>

Narrative Theme Summary

This chapter detailed three themes based on data gathered from the 10 participants interviewed in this study. Table 16 offers a summary list of all themes and sub-themes and the participants to which each applied. Participants stated barriers encountered in online courses by blind or visually impaired students include not having access to course material in proper formats, lack of audio descriptions for videos, and inaccessible maps and diagrams. The most challenging course content named by participants includes math and foreign language. Participants identified accessible formats, accommodations, good communication, and receiving content in advance as best practices used by professors in an online environment.

Other findings came from the study and those parts of the research questions. Those findings included most of the participants preferred the online course format because it provided flexibility and allowed them to work at their own pace. Most of the participants said they could see the benefit of having an E-learning orientation course even though most have learned how to use E-learning independently. Those participants who used a guide/service dog saw the dog
becoming detrained because of the lack of work during the pandemic. In addition, best practices for blind or visually impaired students enrolled in online courses included using tools to remember due dates such as calendars, planners, and cell phone reminders.

Chapter 5 Closure

In Chapter Five, I discussed how the data was gathered and the resulting themes from interviewing the 10 participants on their experiences of being a student who is blind or visually impaired enrolled in an online learning environment. Chapter Six contains the research findings of my conceptual framework and previous research on the topic, recommendations for future research, and the implications of online learning in higher education related to blind or visually impaired students.
Table 16

Major Themes and Sub-themes

<table>
<thead>
<tr>
<th>Themes and Sub-themes</th>
<th>Stu001</th>
<th>Stu002</th>
<th>Stu003</th>
<th>Stu004</th>
<th>Stu005</th>
<th>Stu006</th>
<th>Stu007</th>
<th>Stu008</th>
<th>Stu009</th>
<th>Stu010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Barriers</strong></td>
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</tr>
<tr>
<td>1.1 Not having access to course materials in a proper format</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1.2 Audio descriptions for videos</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>1.3 Inaccessible Maps, Diagrams</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<tr>
<td><strong>2. Difficult Course Content</strong></td>
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<tr>
<td>2.1 Math</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>2.2 Foreign Language</td>
<td>x</td>
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<tr>
<td><strong>3. Best Practices</strong></td>
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</tr>
<tr>
<td>3.1 Accessible Materials</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Accommodations</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>3.3 Good communication</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<td></td>
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<tr>
<td>3.4 Get material in advance</td>
<td>x</td>
<td>x</td>
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<tr>
<td><strong>4. OTHER FINDINGS</strong></td>
<td></td>
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<tr>
<td>4.1 Flexibility</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.2 E-learning course needed</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4.3 Covid-19 Pandemic effect -guide dog detrained</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4 Best practice by students – utilize tools for due dates</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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</tbody>
</table>
CHAPTER VI
DISCUSSION AND CONNECTION TO PRIOR RESEARCH

This chapter addresses the research questions of this qualitative study incorporating themes composed from interview data and supported by past research reviewed in Chapter III. I also offer recommendations for further research.

The research questions posed in this study sought to explore the lived experiences of students who are blind or have low vision enrolled in an online environment. This study involved ten blind or low vision students enrolled in online courses. Ten semi-structured, open-ended interviews were conducted, providing a vivid description of the students’ lived experiences as they encountered barriers, best practices, and utilized accommodations in the online learning environment. Data collected through these interviews identified three categories of themes: (a) barriers in learning, (b) most difficult course content, and (c) best practices.

To gain the student’s perspective on learning in an online environment as a visually impaired or blind learner, I designed this study to investigate three research questions while giving students a voice to portray and share their experiences. The overarching question that framed this study was: What are the lived experiences of college students with visual impairments enrolled in an online course? This overarching question was further developed through the following three sub-questions:

1. What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?

2. What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments?
3. What do such students voice as the best practices used by instructors of online courses to assist them with their learning?

The following dialog summarizes how the study’s themes, subthemes, and additional findings from Chapter 5 connect to previous research.

Major Results with Connections to Previous Research

Findings on Research Question 1: Learning Barriers Experienced by College Students with Visual Impairments

What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses? A summary of these include:

Finding 1. Course material is created in inaccessible file formats.
Finding 2. Video used in courses needs audio descriptions.
Finding 3. Inaccessible maps and diagrams

For Finding 1: Course material is created in inaccessible file formats. The research from this study found unavailable file formats were a learning barrier. This coincides with Massengale and Vasquez’s (2016) study concerning challenges with inaccessible formats. In their study, Massengale and Vasquez listed challenging formats as tables without headers, images with no alternative text, problematic links, and incompatibility with screen readers. One item in this list coincides with Stu003’s statement of “file formats that don’t work with assistive technology” as a barrier in learning. Kharade and Peese’s (2012) study also focused on inaccessible formats, specifically PDFs, especially if they are not tagged, which provides a logical structure for presenting the content through assistive technology. Both Stu008 and Stu010 spoke of PDFs as an inaccessible format, especially if they don’t have a word document as supplemental material.
For Finding 2: *Video used in courses need audio descriptions.* Data from this study found videos without audio descriptions were a learning barrier. Wormnaes and Sellaeg’s (2013) study demonstrated that audio-described material was valued and contributed to the involvement and engagement of those using the material. Gill et al. (2017) listed one of the challenges found in online courses: videos missing audio descriptions. As a result of this study, several students spoke of a lack of audio descriptions presenting a barrier with Stu006 explicitly stating, “if there is no audio description or there is nothing to describe what the student should get out of the video, no context to pull from then I get nothing out of listening to the video.”

For Finding 3: *Inaccessible maps and diagrams.* This study found inaccessible maps and charts were a barrier and needed tactile supplemental material. Hasper et al.’s (2015) study spoke of tactile literacy as a tool to assist students with visual impairments in pursuing higher levels of postsecondary education in STEM fields. In addition, Holt et al.’s (2019) study concentrated on creating accessible materials either in audible or tactile formats. Stu006 shows the link of this study to the previous studies by her statement that she uses a “toaster (PIAF (Pictures in a Flash) which is a conveyor under a heater that uses a special kind of paper where black on paper gets hot puffs up and creates a tactile diagram). It is extremely helpful with graphs or diagrams. I can look at it tactically and find out what the graph is.”

Findings on Research Question 2: Course Content Presenting the Most Difficulty

What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments? A summary of these include:

Finding 1. Math
Finding 2. Foreign Language
For Finding 1: *Math.* This study found math course content provided difficulty for the student who is blind or low vision. This is supported by Kapperman and Sticken’s (2002) study, which stated that students with visual impairments have difficulty becoming competent in math without reading and writing mathematical symbols. Stu004 links this research in the statement, “screen readers are not the best at reading numbers since this content is very visual and sometimes requires tactile objects and sighted assistance to help understand the information. In addition, Stu006 provides support when commenting, “math equations require a different braille code, and computers do not manage it well. If an instructor writes an equation on a whiteboard, that is not accessible because it is just a picture.” Both comments indicate the difficulty of learning math content for a blind or visually impaired student.

For Finding 2: *Foreign Language.* This study found foreign language course content provided difficulty for the student who is blind or has low vision. Although I did not review this topic as part of my literature review, in Orsini-Jones et al.’s (2005) study, they used a native speaker student helper to assist a blind student with learning a foreign language. This would support the need for blind or visually impaired students to listen to the foreign accent correctly to learn the language accurately. Stu006 also spoke of the lack of having a native speaker when stating, “although screen readers can read words in a different language if it is reading in an off accent then the learner who is blind or visually impaired is learning to listen (to the pronunciation of words) in the wrong way.”

Findings on Research Question 3: Best Practices used by Instructors

What do such students voice as the best practices used by instructors of online courses to assist them with their learning? A summary of these include:
Finding 1. Accessible formats – material can be accessed and read by the student independently.

Finding 2. Accommodations – students receive accommodations designated by DSS.

Finding 3. Good communication between instructor and student.

Finding 4. Receive course material in advance of use in the course session.

For Finding 1: Accessible formats. This study found that creating course content in accessible formats is a best practice to use with blind or low vision students. As Oswal and Hewett’s (2013) study discussed, students received correctly formatted material it provided independence. It allowed them to be fully engaged instead of performing a workaround to access the material.

For Finding 2: Accommodations. This study upheld providing accommodations as a best practice for students who are blind or have low vision. Myers and Bastian (2010) and Kharade and Peese’s (2012) studies found that instructors should talk to students about their accessibility concerns to ensure their accommodation needs are met. In fact, Stu004 stated he hadn’t seen any barriers in courses because professors are particularly good at supporting his needed accommodations.

For Finding 3: Good communication. The research from this study found good communication is not necessarily just speaking with students but also responding to email in a reasonable timeframe. This creates a positive instructional climate when the lines of communication are open, as found in Griful-Freixenet et al.’s (2017) study. As discussed in Kharade and Peese’s (2012) study, placing course material in accessible formats and emailing to the student allows the student to contribute to the class and not be hindered by accessibility issues.
For Finding 4: Receive course material in advance. This study found that providing course material in advance is a best practice for blind or low vision students. It is necessary to provide learning material early to review and make it accessible if it doesn’t meet their needs. In Majoko’s (2018) study, seven participants stated they felt a lack of access to lecture handouts and notes before presentation in the course interfered with their participation in learning. Students who are blind or have low vision must receive course material in advance to participate.

Other Findings

As this study progressed, other significant findings not related to the research questions became obvious. A summary of these findings include:

Finding 1. Enroll in an online course for flexibility
Finding 2. Need an overview of E-learning (learning management system)
Finding 3. Guide/Service dog detrains because of lack of use during pandemic
Finding 4. Best practice used by students – utilize tools for due dates

For Finding 1: Enroll in an online course for flexibility. Many students stated they enrolled in online courses for their flexibility. They could access the lessons anytime and anywhere. Participants said they could fit the courses into their work and family schedules. In addition, they did not need to schedule rides or wait on other transportation because they could access everything from home. This allowed them to make more valuable use of their time.

For Finding 2: Need overview of E-learning (learning management system). All the students saw having an E-learning course that would allow them to evaluate their skills and assistive technology with the E-learning software as valuable. Kharade and Peese’s (2012) study also supported this in their research. They stated that college students with visual impairments
should keep their assistive technology up to date to ensure it is compatible with the E-learning system.

For Finding 3: *Guide/Service dog detrained.* As I interviewed participants about the effects of the Covid-19 pandemic on their academic life, comments given by those with guide/service dogs included that the dogs were not as sharp as before the pandemic. It would take longer for the dog to focus on the task, and the guide dog handler would sometimes become nervous about taking the dog around many people because of the uncertainty of how the dog would react. Most said their guide dogs were acting more like a house pet than a service dog, and they were becoming detrained because they were not being used as much due to quarantine. This was a topic that I did not expect to encounter. I searched and could not find peer-reviewed articles on this topic.

For Finding 4: *Best practices used by students – utilize tools for due dates.* Almost half of the participants in the study stated they used some tool that would remind them of the due dates of assignments. The tool could be a planner, calendar, or an application on their cell phone. The tool helped them remember when assignments were due or their course schedule for the week.

Table 17 summarizes the key findings from my research about prior findings. It also documents how these findings are similar to those from previous research findings and how my results add to the body of knowledge in this area.
Table 17

Key Findings/Previous Research Comparison

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>RQ1 - What learning barriers are experienced by college students with visual impairments within both asynchronous and partially synchronous courses?</td>
<td>Kharade and Peese, 2012; Massengale and Vasquez, 2016</td>
<td>This finding deepens the understanding of the impact of unavailable course materials on student learning and performance in online courses.</td>
</tr>
<tr>
<td>Course material created in inaccessible file formats</td>
<td>Kharade and Peese, 2012; Massengale and Vasquez, 2016</td>
<td>This finding deepens the understanding of the impact of unavailable course materials on student learning and performance in online courses.</td>
</tr>
<tr>
<td>Videos used in courses need audio descriptions</td>
<td>Wormnaes and Sellaeg, 2013; Gill et al., 2017</td>
<td>This finding demonstrates findings from prior research regarding the lack of audio descriptions with videos presenting a barrier for blind or visually impaired students.</td>
</tr>
<tr>
<td>Inaccessible map and diagrams</td>
<td>Hasper et al., 2015; Holt et al., 2019</td>
<td>This finding deepens the understanding of the impact of inaccessible course materials and the lack of tactile supplemental objects on student learning, comprehension, and performance.</td>
</tr>
<tr>
<td>RQ2 - What type of course content presents the most difficulty for college students enrolled in online courses with visual impairments?</td>
<td>D’Andrea, 2012; Erhardt and Shuman, 2015; Lourens and Swartz, 2016; Mackowski et al., 2018; Spinczyk, 2019; Stepien-Bernabe et al., 2019</td>
<td>This finding supports the need to recognize math as an example of complex course content for blind or visually impaired students and the need to create accessible material and assistive technology that could assist with learning.</td>
</tr>
<tr>
<td>Math</td>
<td>D’Andrea, 2012; Erhardt and Shuman, 2015; Lourens and Swartz, 2016; Mackowski et al., 2018; Spinczyk, 2019; Stepien-Bernabe et al., 2019</td>
<td>This finding supports the need to recognize math as an example of complex course content for blind or visually impaired students and the need to create accessible material and assistive technology that could assist with learning. The finding adds essential supporting knowledge on the significance of correct speech pronunciation of foreign languages by the voice selected to use with screen reader software.</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>Orsini-Jones et al., 2005</td>
<td></td>
</tr>
<tr>
<td>Accessible format – material can be accessed and read by the student independently.</td>
<td>Oswal and Hewett, 2013</td>
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<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Accommodation – students receive accommodations designated by DSS Good communication between instructor and student</td>
<td>Myers and Bastian, 2010; Oswal and Meloncon, 2014; Lee and Oh, 2017 Farmer, 2015; Griful-Freixenet et al., 2017</td>
<td></td>
</tr>
<tr>
<td>Receive course material in advance of use in a course session</td>
<td>Majoko, 2018</td>
<td></td>
</tr>
</tbody>
</table>

This finding emphasizes the need for blind or visually impaired students to receive material in an accessible format. This finding supports the need to acknowledge and enforce student accommodations. This finding highlights the need for good communication between the student and instructor to support the student in their learning. This finding adds essential supporting knowledge to the need for blind or visually impaired students to receive course material in advance for their success in the online learning environment.
Implications for Higher Education Leaders involved with Digital Accessibility

Findings from this study revealed important insights into the experiences of college students who are blind or have low vision enrolled in online courses. This research aims to apply the knowledge gained toward developing proactive interventions that assist blind or low vision students to reduce educational barriers and support a mutual understanding of accessibility needs between the campus community and blind or low vision students. These findings would be applied to (a) advising the university’s DSS office regarding support services, (b) developing strategies to better prepare faculty for teaching students who are blind or low vision, (c) assisting faculty in gaining a greater understanding of classroom pedagogy and dynamics that are most effective in achieving academic success for students who are blind or visually impaired, and (d) hiring staff who are proficient in assistive technologies.

Implications for Faculty

The next set of implications focuses on how the faculty may help create an environment conducive for the students who are blind or have low vision to realize academic success. These implications suggest ways faculty who teach in an online learning environment can make the environment more inclusive of those students who are blind or visually impaired, (a) establish a level of comfort in communicating with the student concerning accessibility issues, (b) demonstrate a willingness to create accessible material, use accessible textbooks, and third-party vendors who champion accessibility, (c) be encouraging to the students who may be uncomfortable with self-advocating because this may be something new that they have never had to do before, and (d) be influential in helping the other class members become more comfortable in creating accessible material and communicating with students who are blind or visually impaired.
Recommendations for Future Research

The purpose of my research was to describe and interpret the lived experiences of college students who are blind or visually impaired in an online learning environment. My study explored these experiences through the ten participants who contributed to the study. While these students provided insight into their experiences, they also revealed the need for additional research. Although the recommendations mentioned below are specific to blind or visually impaired students, they may easily be applied to other students. First, there is an opportunity to engage in research that analyzes the need and creation of audio descriptions for course videos. This will assist the university in strategizing regarding funding, programming, and staffing personnel to create accessible videos. Secondly, there is a chance to research how blind or visually impaired students learn a foreign language. Collaborating with linguists and studying the process would add to the body of knowledge in this area. Lastly, analyzing how the pandemic has affected service/guide dogs and their relationships with their owners would help understand the effects of detraining and then reintroducing the dogs into service and adding to the body of knowledge in this area.

Conclusion

The literature on this topic has been expanded through my qualitative inquiry into the lived experiences of college students who are blind or visually impaired in an online learning environment. My study looked deeper into the barriers, course content, and best practices in online courses and instructors as blind or visually impaired students experienced it. This dissertation resulted in a deeper understanding of students’ experiences who are blind or visually impaired in the online learning environment.
Knowledge gained from this research can be applied toward developing effective online courses that alleviate barriers to a successful educational experience for blind or visually impaired students and those instructors who teach and create course material—findings from this research aligned with the conceptual framework on which it was based. Data from the study supported that blind or visually impaired students enrolled in online courses encounter course content containing barriers. The student does contact the instructor when problems are met, and the instructor aids the student in overcoming barriers by supporting accommodations and creating course material in an accessible format. Many of the participants in the study exhibited portions of the Self-determination Theory in that they expressed their strengths and limitations to their instructor to get the appropriate amount of assistance. The university is aware of Section 504 of the Rehabilitation Act of 1973 and supports students’ right to receive an education as barrier-free as possible. The data from the study also supports the Social Model. Participants in the study guided online course instructors toward focusing on their different means of accessing online course material rather than their blindness or visual impairment.

This qualitative research has resulted in an exploration of the lived experiences of college students who are blind or visually impaired in an online learning environment. Data were collected through in-depth and semi-structured interviews to describe and interpret their online learning experiences. The data revealed that blind or visually impaired students encountered barriers, including inaccessible course content, videos without audio descriptions, and inaccessible maps and diagrams. The students overcame these barriers with the help of their instructors, who used best practices: making course content accessible, providing accommodations, sustaining effective communication with the student, and providing course content before the class session. This data expressed their struggles, resilience, frustrations,
achievements, and other experiences. Findings addressed the central focus of this research: *What are the lived experiences of college students with visual impairments enrolled in an online course?*

Overall, these findings provided valuable insights in understanding how blind or visually impaired college students experience the online learning environment. They revealed the need for effective communication, understanding learning barriers, and applying best practices. If these needs are not better understood and utilized, initially by the instructor and subsequently by the student, a successful educational experience for the blind or visually impaired student can be impeded. On the other hand, success can be facilitated by applying best practices such as students having accessibility to course content beforehand, workable student accommodations, maintaining effective communication, and keeping an open dialog. Such strategies demonstrate an investment in the student and a desire for an inclusive environment. Knowledge of these potential hindrances and best practices better enable universities to implement proactive steps for positive educational experiences.
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Appendix A

Western Michigan University Letter of Approval
Date: June 15, 2021

To: Hsuing Shen, Principal Investigator
    Gwen Bostic, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

IRB Project Number 21-06-11

This letter will serve as confirmation that your research project titled “Lost in the Cloud: The Experiences of College Students with Visual Impairments in an Online Environment” has been approved under the expedited category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly as in the form it was approved. You must seek specific board approval for any changes to this project (e.g., add an investigator, increase number of subjects beyond the number stated in your application, etc.). Failure to obtain approval for changes will result in a protocol deviation.

In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

A status report is required on or prior to (no more than 30 days) June 14, 2022 and each year thereafter until closing of the study.

When this study closes, submit the required Final Report found at https://wmich.edu/research/forms.

Note: All research data must be kept in a secure location on the WMU campus for at least three (3) years after the study closes.
Appendix B

Participant Invitation Letter for Recruitment
Appendix B
Participant Invitation Letter for Recruitment

Dear Sir or Madam:

My name is Gwen Bostic, and I am a doctoral student in the Educational Leadership, Research, and Technology Department at Western Michigan University. I am inviting you to participate in my research concerning the *Lived Experiences of Visually Impaired College Students in an Online Learning Environment*.

With the use of web conferencing software (*Cisco Webex or Microsoft Teams*), I would like to conduct a 60-to-90-minute interview with you. In my efforts to understand the lived experience of visually impaired students in E-learning environments, I am seeking to interview current or former students who have taken asynchronous (student complete work on their own time) or partially synchronous (students and instructors online at the same time) online courses.

If you are interested in learning more about participating, please send an e-mail to gwen.bostic@wmich.edu. Participation in this study is strictly voluntary, and your identity will be kept completely confidential. There is no compensation for your participation.

Thank you for your time and consideration.

Sincerely,

Gwen A. Bostic
Western Michigan University
2008 University Computing Center
Kalamazoo, MI 49006
269-387-5016
gwen.bostic@wmich.edu
Appendix C

Consent Form
Western Michigan University
Department of Educational Leadership, Research, and Technology

Principal Investigator: Dr. Jianping Shen

Student Investigator: Gwen A. Bostic

Title of Study: LOST IN THE CLOUD: THE EXPERIENCES OF COLLEGE STUDENTS WITH VISUAL IMPAIRMENTS IN AN ONLINE ENVIRONMENT

You are invited to participate in this research project titled “Lost in the Cloud: The Experiences of College Students with Visual Impairments in an Online Environment.”

STUDY SUMMARY: The research study consent form will provide prospective participants with needed information about the study in their decision-making process. Participation in this study is completely voluntary. The purpose of the research is the following: to understand and describe the lived experiences of college students with visual impairments in an online learning environment and will serve as Gwen Bostic’s dissertation requirement for a Doctor of Philosophy degree. Research participants will be asked to describe their experiences as a blind or visually impaired student enrolled in online courses. The interview will take 60-90 minutes to complete. The foreseeable risks associated with the study are minimal. It is possible that answering certain interview questions may evoke anxiety or discomfort. To minimize these risks, participants may refuse to answer questions and may discontinue the interview at any point.

Involvement in this study will yield a better understanding of experiences for students at a four-year college or university. In addition, the study can provide researchers with information that can be used to improve the experiences of visually impaired students in online courses. Your alternative to taking part in the research study is - not to participate in it.

Please ask questions if you need more clarification to aid in your decision-making process to participate in the study or not. You are not giving up any of your legal rights by agreeing to participate in this research. After all your questions have been answered, and the consent document reviewed, participating in this interview online indicates your consent.

What are we trying to find out in this study?
This study aims to understand and describe the lived experiences of college students with visual impairments in an online learning environment.

Who can participate in this study?
To be included in this study, you must be registered with Disability Services for Students as a student with a visual impairment and enrolled or have completed an online course (partially synchronous or asynchronous). You also must be at least 18 years of age.

Where will this study take place?
We will conduct interviews at a mutually convenient time using a web conferencing platform such as Microsoft Teams or Cisco Webex.
What is the time commitment for participating in this study?
You will be asked to participate in one 60-90-minute interview. It is estimated that no more than 90 minutes total of your time, including follow-up questions or clarifications, will be required.

What will you be asked to do if you choose to participate in this study?
You will be asked to talk about your experiences with the online course environment. You will be asked to describe any barriers encountered and the functionality of assistive technology with the course content. You may also be asked to review a summary or analysis of the interview to check for the researcher’s understanding and accuracy.

What are the risks of participating in this study, and how will these risks be minimized?
The foreseeable risks associated with the study are minimal. It is possible that answering certain interview questions may evoke feelings of anxiety or discomfort. To mitigate these risks, participants may refuse to answer questions and may discontinue the interview at any point.

What are the benefits of participating in this study?
One benefit you might gain from the study is a better understanding of your experiences as a student at a four-year college or university. Another benefit of this study is the potential to provide the researchers with information to improve students’ experiences with visual impairments enrolled in online courses.

Are there any costs associated with participating in this study?
The only cost associated with participating in this study is 60-90 minutes of your time.

Is there any compensation for participating in this study?
There is no compensation for participating in the study.

Who will have access to the information collected during this study?
All information collected from you will be completely confidential. Your identity will be known only to me as the student investigator. To ensure the accuracy of your responses, the interview will be recorded using the web conferencing platform’s recording feature and later reviewed for transcription. Your name will not appear on any documents on which information is recorded. All documents will be coded with a pseudonym for data organization purposes. The student researcher will keep a separate master list with the names of participants and the corresponding pseudonym. Once the data are collected and analyzed, the master list will be destroyed along with the video.

What will happen to my information or biospecimens collected for this research project after the study is over?
After information that could identify you has been removed, de-identified information collected for this research may be used or distributed to investigators for other research without obtaining additional informed consent from you.

What if you want to stop participating in this study?
You can choose to stop participating in the study at any time for any reason and will not suffer any prejudice or penalty by your decision to discontinue your participation. You will experience
NO academic or personal consequences if you choose to withdraw from this study. You may also stop the web conferencing recording at any time during the interview. If you wish to stop the recording, I will continue the interview with your consent and take handwritten notes. As the student investigator, I can also decide to discontinue your participation in the study without your consent.

Should you have any questions before or during the study, you can contact the principal investigator, Dr. Jianping Shen, at (269) 387-3887, or the student investigator, Gwen Bostic, at gwen.bostic@wmich.edu.

You may also contact the Chair, Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the study.

This study was approved by the Western Michigan University Institutional Review Board (WMU IRB) on June 14, 2021.

Participating in this interview online indicates your consent to use the answers you supply.
Appendix D

Interview Script
Interview Script

Opening:

Thank you for meeting with me today. I want to speak with you again about consenting to participate in this research study. I will be conducting a 60–90-minute interview asking questions about your experience in online courses. You can ask for clarification if you have any questions concerning the interview process and stop the interview at any time. Continuing this meeting indicates your agreement to participate in the research study by discussion and indicates your consent to use the answers you supply. I appreciate you taking the time to participate in this study and for being willing to share your experiences. Today, I am interested in hearing how you describe your experiences as a college student with a visual impairment enrolled in online courses.

I am recording our conversation to review after today’s interview, but please feel free to ask to stop the recording at any time you feel uncomfortable. If you wish to stop recording, I will continue the interview with your consent and take handwritten notes. You may withdraw from the study without penalty at any time. There are no wrong or right answers, and your responses will be kept confidential, so please feel free to say what you think and feel.

Again, I want to thank you for agreeing to talk with me today about this topic. Are there any questions or concerns before we begin? Please start by describing your educational background and overall feelings about your college experience.

Background Prompts

1. You are currently in what semester? Or How many college semesters have you completed?
2. What is your major?
3. Did you take any online courses before coming to Western?
4. What type of visual impairment do you have (partially sighted, low vision, legally blind, blind)?
5. How long have you had a visual impairment?
6. What assistive technology do you use for your courses?
7. Describe your skill level with assistive technology?

**Experience Questions and Prompts**

1. What key factors make you successful in the online learning environment?
   Probe: Walk me through the process you use to explore a course when you first access it.
   Probe: How do you prioritize completing assignments?
   Probe: What are the warning signs that a class may have accessibility issues?

2. Describe any learning barriers you have experienced in the online learning environment.
   Probe: Explain why you identified a barrier as a barrier?
   Probe: What strategies have you used/do you use to address these barriers?
   Probe: Describe the help you receive from other departments/staff on campus when addressing barriers?
   Probe: Tell me about the different barriers you find in asynchronous and/or partially synchronous courses?
   Probe: Can you show me an example of the learning barriers you are describing?

3. What are the best practices used by instructors of an online course to assist you as a student with a visual impairment?
   Probe: Could you give me an example of a best practice?
   Probe: Describe how these practices vary depending on the type of course content?
   Probe: Can you share with me a course that displays some of the best practices?

4. What type of course content presents the most barriers? (ex: math, science, philosophy)
   Probe: What type of accessibility issues do you find with course content?
   Probe: Have you discussed the barriers you’ve found with your instructor? If so, what was their response?
   Probe: Can you point out a content barrier in a course?

5. What makes an online course satisfactory for you?
   Probe: What are some reasons why you choose to enroll in an online course?
   Probe: Where are you when you usually access your courses?
   Probe: Looking back at previous online courses you have taken, what would you change to make them satisfactory for you?

6. How has taken online courses during the pandemic affected you?

7. What haven’t we talked about that you would like to add? Additional prompts as necessary: Please tell me more about...Walk me through the process of...Can you provide an example of...