An Official Publication of the United States Distance Learning Association



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- ▲ Stumbling Made Me a Better Online Instructor: 13 Tips Toward Quality Improvement
- ▲ Feminist Pedagogy in Digital Spaces: Brief Systematic Literature Review
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PURPOSE

Distance Learning, an official publication of the United States Distance Learning Association (USDLA), is sponsored by the USDLA, by the Fischler College of Education at Nova South-eastern University, and by Information Age Publishing. Distance Learning is published four times a year for leaders, practitioners, and decision makers in the fields of distance learning, e-learning, telecommunications, and related areas. It is a professional magazine with information for those who provide instruction to all types of learners, of all ages, using telecommunications technologies of all types. Articles are written by practitioners for practitioners with the intent of providing usable information and ideas for readers. Articles are accepted from authors with

interesting and important information about the effective practice of distance teaching and learning.

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Strategies to Include Universal Design for Learning and Increasing Instructor Social Presence in Online Instruction Jamie Anne Marcus

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Online Courses Accessibility for Low Vision

Asma Marghalani and Cindy S. York

This qualitative study explores what accessibility design can be most important to facilitate learning in an online course for postsecondary students with low vision. The study was conducted in a U.S. public university offering online courses in the Midwest. This study was guided by 2 research questions: (1) What accessibility design did students with low vision who experienced online courses perceive to be helpful for their learning? (2) What accessible features would students with low vision want to exist in future online courses? The theoretical framework for this study was Universal Design for Learning (UDL). Three participants were interviewed to share their online learning experience and explore which accessibility aspects were perceived the most helpful for students with low vision. The finding revealed that alternative formats for materials-such as Word documents or Rich Text Format (RTF) and accessible PDF files—were the most helpful accessible text format in the online courses. In addition, the finding showed that headings and color contrasting for the online content are the main aspects of design to increase accessibility and facilitate reading for students with low vision. The last finding revealed that students with low vision need 2 additional accessibility designs in online courses: audio response and instructor video.



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INTRODUCTION

n the last 2 decades, due to flexibility and accessibility, online courses are becoming increasingly popular among nontraditional students and learners who have (in)visible disabilities (Summers et al., 2014). Students with disabilities need support, particularly students with low vision need special accessible features in online courses because they have some difficulties dealing with the technologies (Crow, 2008; Fichten et al., 2009; Summers et al., 2014). Universal Design of Learning (UDL) provides several accommodations for postsecondary students with low vision through assistive technology. It provides a variety of accessible features for this type of vulnerable population (Crow, 2008). Relevant research (Lorenzin & Wittich 2019; Okiki, 2019) shows that low-vision students will succeed academically when taking online courses with proper accessibility design. To explore which types of accessibility design aspects, based on the UDL principles, are deemed appropriate for online settings, this qualitative study seeks to understand the perceptions of students with low vision.

LITERATURE REVIEW

ONLINE COURSES

Online courses attempt to create a learning environment and serve as a process of connecting students, instructors, and learning resources when they are not physically present in the same location (Park & Choi, 2009). In 1997, the first online course platform was launched at famous universities, such as Yale, Cornel, and the University of Pittsburgh. In the same year, a learning management system known as Blackboard was founded and has become widespread to deliver online instruction. It is still utilized in many educational institutions and universities across the globe (Morton, 2016). Online courses use asynchronous and synchronous technologies. Synchronous technology requires students and instructors to work simultaneously but not in the same place through using video conference (Palmer, 2012). In contrast, asynchronous technology does not require students and instructors to work simultaneously (Palmer, 2012). They can work independently at a convenient scheduled time for each of them.

In the last 3 decades, online courses have significantly increased in higher education (Betts et al., 2013). Recently, 30% of postsecondary students are enrolled in at least one online course in U.S. higher education institutions (Cole et al., 2014). Although online courses have increased, students with disabilities enrolling in higher education institutions also have increased over the last 25 years (Lyman et al., 2016). Higher education has attempted to make online courses more effective and accessible for all students; however, some instructors and/or institutions may overlook the needs of students with disabilities (Kharade & Peese, 2012). Cook and Gladhart (2002) stated that 10% to 15% of postsecondary students identify themselves as disabled. According to the Americans With Disabilities Act (ADA.gov, 2020, para. 1), "a disability is a physical or mental impairment that substantially limits one or more major life activities." To be labeled as disabled, a person must have a history or record of such an impairment, or others should perceive a person as having such an impairment. These self-identified students with disabilities should have equal opportunities in their online courses as other students.

ONLINE COURSES FOR STUDENTS WITH LOW VISION

Low vision is one of the common types of visual disabilities (Richardson, 2014). It is defined as the functional limitation of the eye, eyes, or vision system (American Foundation for the Blind, 2015). The American Foundation for the Blind defines low vision as a condition caused by eye disease in which visual acuity is 20/70 or poorer in the better seeing eye and cannot be corrected or improved with regular eyeglasses (2015). Students with low vision usually have several academic difficulties (Moola, 2015). One of these difficulties is using technology because sometimes they cannot adjust technology according to their needs. For this study, low vision identifies as

a person who has difficulty accomplishing visual tasks, even with prescribed corrective lenses, but who can enhance his or her ability to accomplish these tasks with the use of compensatory visual strategies, low vision, and other devices, and environmental modifications. (Corn & Koenig, 1996, p. 4)

Consequently, the emergence of online courses has brought challenges for students with low vision (Argyropoulos et al., 2019; Summers et al., 2014). The literature on students' experiences with low vision is scarce, and most seminal articles focus on students with disabilities without specifying the type of disability (Lorenzin & Wittich 2019; Okiki, 2019). However, some relevant studies (e.g., Lee & Oh, 2017; Richardson, 2014) had observed that students with low vision are not often active in online courses due to the challenges they face in interacting with learning materials. On the contrary, several studies suggest online courses are beneficial for students with low vision since they provide remote learning experience (Barnard-Brak et al., 2012; Haegele et al., 2018; Kharade & Peese, 2012) and allow instructors to provide remote instructional assistance to the students anytime and anywhere even if they live far from the main campuses of the universities (Feucht & Holmgren, 2018).

Online courses benefit students with low vision because they can find a solution for the challenges of attending physically on campus, which poses great difficulty (Kharade & Peesa, 2012; Williams et al., 2006). Kharade and Peesa (2012) stated that the flexibility in the location, scheduling, and delivery of online courses reduced the challenges for attending on campus by providing flexibility in time and place of delivery. Feucht and Holmgren (2018) reported that students with low vision drop out because they cannot drive to the campus and do not live close. Walking around campus is also a challenge because sometimes it requires students with very low vision to use aids such as a cane or a guide dog. In some cases, students with low vision cannot even see the small things, or in other cases, students with low vision cannot see things in bright or dark places. Therefore, they often have difficulty self-navigating outside of wellknown environments and prefer indoors (Long et al., 1990). Some prefer to study and work in small physical spaces (Haegele et al., 2018). As a result, low vision affects a person's ability to learn or perform many job duties, severely limiting their main life opportunities for education and employment (Long et al., 1990). Therefore, online courses became an excellent option for students with low vision to complete their educational degrees and be more motivated to succeed (Kharade & Peese, 2012).

Besides flexibility, online courses allow students with low vision to adjust the instructional material through assistive technologies according to their needs (Crow, 2008; Fichten et al., 2009) during learning, reading, writing, and acquiring academic and nonacademic skills (Hewett et al., 2017; Rosner & Perlman, 2018). In addition, using assistive technologies in online courses help students facilitate learning and receive equal learning opportunities (Hewett et al., 2017). Because of this equality, students with low vision can be more active and motivated to participate in online activities such as discussion and group work. Assistive technologies help to improve the quality of learning for students with low vision (Crow, 2008). Online courses with assistive technologies encourage students with low vision to be active participants and share the ideas with classmates and instructors remotely

in online course activities (Crow, 2008; Fichten et al., 2009; Hewett et al., 2017).

Accessibility

Accessibility is an important priority in online courses delivered by top universities such as Harvard University, UC Berkeley, and Massachusetts Institute of Technology (Alahmadi, 2017). Following their trend, many colleges and universities have started to make program and policy changes in their online courses (Zuriff, 1996). Accessibility addresses the design of technology rather than the needs of specific individuals (Alahmadi, 2017). Accessibility means using course materials and tools by all types of students, regardless of their physical and/or developmental impairments. When a course is accessible, most students, even those with disabilities, can reach the material equally. All can access the course delivery system, navigate the course content, submit assignments, and successfully use all course tools. The most common example of accessibility includes obtaining printed materials in alternate formats (Pittman et al., 2014). Other examples involve the inclusion of a statement of support for students with disabilities in the course syllabus. In addition, all video content (web, DVD, and VHS) should be captioned, and transcripts of audio-based material and video-based materials should be available if they cannot be captioned.

There are several benefits of accessibility in online courses. The accessibility allows students to use flexible materials that can be adjusted according to their particular needs and preferences (McKenna & Velasco, 2018; Pittman et al., 2014). Audio, images, graphics, animations, video, or text are often the tools to present information and the relationships between objects, actions, numbers, or events. However, visual representations are not equally accessible to all students, particularly visually impaired students (McKenna & Velasco, 2018).

THEORETICAL FRAMEWORK

Most higher education institutions in the United States incorporate the principles of UDL into the educational and instructional materials. UDL is a framework for improving instruction because it helps provide equal opportunities for all learners to succeed. This strategy provides flexibility in how learners access, engage with, and demonstrate what they understand and increases the quality of learning materials for everyone (Rose & Mayer, 2008). UDL principles support students with low vision who have challenges in online courses by providing resources and flexibility to engage the students' complete learning (Houston, 2018). Most research has found that UDL is essential for integrating students with visual impairments into higher education (Al-Azawei et al., 2016; Houston, 2018; McKenna & Velasco, 2018). According to the Center for Applied Special Technology (2008) and Rose and Mayer (2008), there are three UDL principles: representation, action, expression, and engagement. The first principle of UDL is "representation," which involves providing learners with various ways of acquiring information and knowledge connected to the accessibility formats, which require instructors to provide various resources to facilitate students' access to the learning materials. The second principle is "action and expression," which provides students with various routes to access the necessary materials using assistive technology. The third principle is "engagement," which enables an instructor to tap into students' interests, challenges them appropriately, and motivates them to learn through facilitating resources.

This study sought to explore the perceptions of students' current experiences with low vision in online courses to identify what accessibility design aspects offer the greatest support based on UDL guidelines and would be beneficial. This research is intended to provide recommendations for future instructors and instructional designers to consider when creating online courses for students with low vision.

METHODOLOGY

SETTING, SAMPLE, AND PARTICIPANTS

The study took place at a U.S. public university in the Midwest with a total enrollment of students 17,169 for fall 2018. According to the university website (2018), there are 12,788 undergraduates, 4,121 graduates, and 260 college of law. As the mission states, the school celebrates its diverse population in all forms, including gender, race, ethnicity, ability, spirituality, sexuality, age, and individual identities. This Midwest public university offers approximately 20 undergraduate and graduate degrees online and about 10 additional certificates fully online.

For this study, purposeful sampling was used because the researcher purposefully selected the students with low vision who were enrolled in online course settings. Creswell (2009) stated that researchers identify participants and sites using purposeful sampling based on places and people that can best help a researcher understand the central phenomenon in qualitative research. The participants were from different majors and educational levels, ranging from 22 to 54 years old. All the participants registered in the disability resources center and had taken between three to six online courses. The participants had different low vision types; retinitis pigmentosa, optic nerve coloboma, and blurred vision.

RESEARCH QUESTIONS

- 1. What accessibility design did students with low vision who experienced online courses perceive to be helpful for their learning?
- 2. What accessible features would students with low vision want to exist in future online courses?

DATA COLLECTION

Three students were interviewed, and the interviews were audio recorded. Interviews were conducted either face to face or by telephone, depending on the participants' preference. The duration of each interview was 45 to 60 minutes. They were asked around 20 demographic questions, questions related to their experience with online courses, and questions regarding accessibility and assistive technologies that helped them overcome their challenges.

DATA ANALYSIS

А professional transcription service (Rev.com) was used to transcribe the interviews. Then, the textual data of the interviews were read multiple times to gain a deeper understanding of the information contributed by participants (Creswell, 2012). Before proceeding to the data analysis, a codebook was created based on each research question: accessibility coded as AA and highlighted in pink; assistive technology coded as AT and highlighted in blue, and the wish list of the students with low vision coded as WLA and highlighted in red. The data was analyzed line by line to code thoroughly. An open-coding strategy was applied to analyze the responses from the interviews by looking specifically for words related to predefined codes. For example, when the participants mentioned a screen reader, the researcher coded it as AT and highlighted it in blue. According to Patton (2002), coding starts with segmenting and labeling similar codes to form descriptions and broad themes. Therefore, each of the predefined codes is labeled as themes. The themes were used to respond to each research question.

FINDINGS

1. What accessibility design did students with low vision who experienced online courses perceive to be helpful for their learning?

The participants identified three accessibility design aspects: alternative materials, headings, and color contrasting for online content as the most helpful accessibility for experiences. their learning Ruby responded that she has many reading requirements to complete the online assignments as a graduate student. She clarified, "Word document and RTF are the most beneficial types of alternative formats for online textual materials. Having formats like word documents or RTF are super helpful to access the text and use Read Aloud feature when I need it."

Sarah added, "I avoided reading. I avoided doing anything that wasn't just hands-on like the building because I'm actually in the construction trades." Also, she mentioned that she has difficulty reading a book, but she can read text font "Arial' and size 16 or 18. She said, "sometimes I get notes, teacher's notes and I have to change the font to just an Arial font because the New Times Roman is hard for me to read. Yeah, it has too many like little curves in it, and the letters are too close." Thus, she requests alternative formats for the online textual materials to audio: "Well, everything needs to be audio for me."

In contrast, Karen described that she prefers Adobe accessible PDF version, which includes features that allow students with low vision access text to be more readable such as taking notes, searchable text, and tracking information.

I would like to see that used more and more like accessible PDF documents instead of just taking a picture. I think it's just giving me more access. For example, being able to look at like a PowerPoint in an accessible format. I can use it more easy to take notes and to keep track of information instead of having to like struggle through the slide.

Sarah and Ruby use screen reader software, which they mentioned as the most helpful assistive technology. Ruby said: And so being able to have, like for example, the articles that we had to read were in two formats. They were in like a scanned in PDF, and they were in like a word document. And so I was able to use my screen reader to read the word document, and I had access to the course material without having to ask somebody to help me read it or help me scan it and to be able to change the scanned document.

Moreover, Sarah and Ruby use the "Read Aloud" feature in Word. For the web pages and other documents, they use screen reader software "Narrator" in Windows. They mentioned that they do not install JAWS or Kurzweil 3000 on their computers. Ruby has used JAWS in the past; however, she is not using JAWS anymore because the screen reader is available in Windows and helps her read long articles.

Additionally, the participants identified heading and color contrasting for online courses that helped them find and use online course materials. Ruby and Karen mentioned that designing online courses with headings guides them while navigating the online environment. Ruby said, "I'd say headings help split things into sections." Karen said, "have a lot of headings to navigate that makes things easier." In addition, Sarah mentioned that using contrast color for the text and background facilitates reading the PowerPoints. She described her current challenge reading some colors:

One of the classes I have now, he has a lecture, it's short, it's a simple lecture. But then he has a PowerPoint, and that does not have any audio to it, and it's kind of a struggle for me to read through that. It's actually on the university [brand]; the background is red with the black and the gray, and that's actually hard to read. I think that's hard to read.

An additional accessible design that one of the interview participants reported was added description for videos. Sarah said, "I'd say more ideal description from videos" would help students with low vision understand what is happening in the video.

2. What accessible features would students with low vision want to exist in future online courses?

The results revealed some improvement accessibility suggestions that students with low vision wished would exist in online courses. Audio and instructor video were the two alternative formats that did not exist in most online courses. The participants described two ways of using audio in online courses: audio with PowerPoint and audio response in the discussion boards. Sarah suggested that instructors in online courses should use audio with PowerPoint slides to facilitate learning; she said, "when the teacher has a PowerPoint, it's great, but I have to read it. I want it to read to me, and I want the word to stand out as are being read." Ruby suggested adding the option of "audio" to participate in the discussion boards; she said:

I think more audio would be really helpful. So I don't know if this is something that necessarily instructors would have jurisdiction over, but I guess just having its different alternatives, communicating with discussion boards, you know, maybe having like an audio option to leave audio responses. They're having a more simplified platform. So that would be one of the things on my wish list.

Additionally, all the participants suggested that instructors in online courses should record videos to help the students be engaged in their learning. Karen would have more videos to understand some subjects; however, she did not specify the video types. She said, "Say we were assigned to read a chapter and then the teacher would have provided a video or something explaining certain things. I think that's always helpful." On the other hand, Ruby and Sarah specified receiving instructor-recoded videos. Ruby said, "I wish the professors would do in-person videotaping of themselves." Moreover, Sarah added that seeing the body language helps to engage the students in online courses; she said,

When the instructor goes into the connect and has a PowerPoint, and he's just talking, I think that's okay. But it would be really nice if you actually saw him because movement, your body gestures are engaging.

Sarah also recommended the instructors should record video to explain the course content to improve the students' learning performance; she said,

Everything was online. It would have been so cool if the teacher had done what my classroom teacher did and said, "Okay, here's 20 minutes, here's the problem on the chalkboard. I'm video recording myself, and this is what you do and, oh, you think about this and now, you go to the next step and you have to remember that. And then ...". That would have been great. I mean, I know that some minor technical classes, safety will say, "Look, my last class was a safety class." I mean, I can't imagine an instructor going if I taught the class ... ultimately, I would like to teach, but if I taught the class, I probably would read the book, they're like safety hazards. So let's say in the parking lot or in a building, I probably would record it. "This is a safety hazard."

DISCUSSION

ACCESSIBILITY

There were three significant findings related to accessibility. The first finding revealed that alternative formats for materials—such as Word documents or Rich Text formats (RTF) and Adobe accessible PDF files—were the most helpful accessible format in the online courses. These alternative formats allowed students with low vision to make changes according to

their own needs and use text-to-speech assistive technology such as screen reader software or the "Read Aloud" Word file feature. All participants highlighted that the alternative formats provided them equal access to the online materials. In addition, this finding is consistent with the literature (e.g., Pascual, 2014; Spooner, 2014) mentioned that students with low vision preferred to use alternative formats because it allows them to edit and make changes that best suit their needs. For example, Sarah explained that she could only read the "Arial" font; therefore, having the materials in Word allowed her to change the font to "Arial" because "Times New Roman" was hard for her to read. This finding is consistent with Houston's (2018) study that recommends using sansserif fonts in online course materials because Serif font types help make online content legible to all students, including those with visual impairments. Common sans serif fonts include Arial, Trebuchet, and Helvetica. On the other hand, some serif font types-such as Times New Roman, Courier, New Century Schoolbook, and Palatino—have semistructural details or small decorative curves on the ends of some of the strokes, making the letters and symbols challenging to read. Overall, this finding aligns with UDL representation principles, which entail the accessibility of instructional materials for all students, including students with disabilities, providing them equal access (Center for Applied Special Technology, 2008).

The second finding was that participants identified assistive technology within alternative formats as one of the most helpful accessibility features. The finding showed that text-to-speech reader software, such as screen reader, was the most helpful assistive technology for students with low vision to read online course materials. For instance, Sarah mentioned that she always needed assistive technology such as a screen reader to convert the text materials to audio. Also, other participants mentioned that using a screen reader reduced their challenges when reading online materials, as they did not have to seek assistance in reading the materials. In addition, the finding showed that Word processing was the most helpful assistive technology because of its "Read Aloud" feature. These findings are consistent with the literature that identified textto-speech assistive technology as the most beneficial to suit students' individual needs with low vision (e.g., Fichten et al., 2009; Hersh & Johnson, 2010; Nees & Berry, 2013). In addition, this finding is tied to the "action and expression" UDL principle, which asserts that individuals with disabilities should get opportunities for independence through assistive technologies as they help them overcome barriers in the educational environment (CAST, 2008).

However, the findings of this study were not consistent with some literature on magnifiers as helpful assistive technology. The participants expressed that they have visual condition abilities to read the original document. Karen mentioned that magnifying or enlarging text was not helpful for her in online courses. Sarah mentioned that she avoids reading and she prefers using speech to text assistive technology to receive information through audio mode. According to this finding, magnifiers as the primary method of providing accommodations were less valuable than choosing which forms of assistive technology were most beneficial for the online courses. Therefore, the participants needed to hear the information or conversations in online courses, so they did not need to use a magnifier but used speech-to-text features such as "Read Aloud" or screen reader. This finding shows that online course designers should provide more accessible online materials to allow individuals to choose which type of assistive technology will work best for them, such as text to speech.

The third finding showed two design aspects to increase accessibility and facilitate reading for students with low vision: headings and color contrasting for the online content. The participants indicated that headings are helpful to direct their attention toward key concepts and facilitate navigation; however, the study did not reveal adequate headings styles for students with low vision. This finding is consistent with the literature (e.g., Kearns et al., 2013) that recommends online course designers to design online materials with headings and use high-contrast colors, plain backgrounds, and scalable text for low vision or colorblind students as they allow them to skim the page quickly. Headings allow students with low vision to locate the information more easily and grasp the text's main ideas (e.g., Fichten et al., 2009; Houston, 2018).

Online low-contrast materials can be challenging to read for students with low vision, making color contrast necessary to improve accessibility (e.g., Houston, 2018). Sarah mentioned that she had difficulty reading the online PowerPoint slides because the black and gray text font contrasted in a red background. She expressed that this background color was not suitable for her visual condition. However, this study did not expand on the color contrast of online materials. Houston (2018) suggests avoiding some color combinations that are not easy to read for students with low vision, such as blue links on black backgrounds, red text on green backgrounds, or other combinations where contrast is not enough. Although Houston's (2018) study did not find a list of color combinations that can assure accessibility for students with low vision, his study suggests that materials in online courses should be presented using a dark font color contrasted with a pale background.

Finally, UDL principles and literature (e.g., Kharade & Peese, 2012; Pittman & Heiselt, 2014) address additional beneficial accessibility aspects for students with low vision, but the findings of this study showed that some of these aspects were not applicable in participants' online courses. Aspects that were not present in online courses for most of the participants in this study were closed captions on video media; a transcript of the video or audio presentation; visual analogs to represent emphasis and prosody (e.g., emoticons, symbols, or images); and text descriptors for any relevant image, graph, or chart. However, Sarah mentioned that added descriptions for videos were helpful to understand the video contents. This finding supports the UDL representation principle, which suggests that presenting information in several formats increases accessibility.

WISH LIST FOR STUDENTS WITH LOW VISION IN ONLINE COURSES

The findings revealed that students with low vision need two additional accessibility design aspects: audio response and instructor video. Students with low vision can benefit from submitting their responses to the discussion board as audio files, reducing time spent formatting the answer, such as using a screen reader to double-check responses and focus on content. This finding is consistent with (e.g., Ching & Hsu, 2015) that addressed audio discussion modality in online courses; however, the literature does not address the needs of students with low vision.

In addition, the participants expressed the need for videos in which their instructor presented the content. This finding is consistent with the literature (e.g., Choi & Johnson, 2015) that addressed the positive effects that instructor-recorded videos explaining content have on students. They improve students' understanding and engagement with the materials. Relevant literature (Kim et al., 2019) suggests that audio representation of the content helped make curricula more accessible to students with low vision. Therefore, the findings of this study showed the need for the inclusion of audio discussion modality and instructor's audio representation of the content to reduce the challenge and enhance the learning of students with low vision.

RECOMMENDATION, IMPLICATION, AND CONCLUSION

The findings of this study serve as a foundation for future research on this topic. The literature review presents research on UDL, especially regarding accessibility and assistive technology for students with low vision. This study will help instructors and online designers who might teach online courses or improve online courses. This study could primarily impact those students with low vision who take online courses and face challenges so that they will have a better learning experience in online courses. Literature (e.g., Barnard-Brak & Sulak, 2010) found that students with invisible disabilities often are not comfortable disclosing their disabilities. This study also indicates that online instructors should provide audio responses to accommodate students with low vision in online courses.

Based on the interpretations of the findings, this study focused on one type of visual impairment; however, a much broader future study can include other visual impairment types. In addition, this case study focused on fully online courses to replicate future research in blended courses, including face-to-face and online sessions of similar size and student population. The UDL theoretical framework can help future researchers replicate the study by focusing on specific principles of UDL. Such factors affect students with low vision engagement in online courses. Other research can expand the case study to examine students' and/or professors' perceptions of the accommodations and assistive technology for engaging students with low vision in online courses. In addition, this study was limited to students with low vision; therefore, future studies can expand this case study to examine instructors' challenges when providing helpful accommodations for students with disabilities in online courses.

This study showed that students with low vision identified a screen reader as the most helpful assistive technology in online courses. Future studies can employ a quantitative approach to compare two groups of students with low vision to examine the effectiveness of using specific assistive technology in online courses. In addition, this study's findings included the students with low vision preference for information delivery methods. Future studies can employ quantitative methods to compare groups of students receiving different information delivery methods in online courses to understand the relationship between information delivery methods and learning performance.

The overall purpose of this qualitative case study was to explore the most helpful accessibility design and assistive technology for students with low vision in online courses. Individual interviews were conducted to obtain in-depth data. This study found that the most beneficial aspects for online content accessibility for students with low vision are headings, color contrasting, and alternative formats for materials, such as Word documents, RTF, or Adobe accessible PDF files. Overall, this study reveals that online courses require more accommodations and better implementation of UDL principles to meet the needs of students with low vision. Considering the findings of this study may bring about significant understanding and renovation in the design of the online course that will guarantee equal learning opportunities for students with low vision. Online designers, instructors, and disability resource centers may benefit from this study as the findings can guide their decisions on providing support to students with low vision.

REFERENCES

- ADA.gov. (2020). Introduction to the ADA. https://www.ada.gov/ada_intro.htm
- Alahmadi, T. (2017). Accessibility evaluation of top-ranking university websites in world, Oceania, and Arab categories for home, admission, and course description webpages. *Journal of Open, Flexible and Distance Learning*, 21(1), 7–24.
- Argyropoulos, V., Padeliadu, S., Avramidis, E., Tsiakali, T., & Nikolaraizi, M. (2019). An investigation of preferences and choices of students with vision impairments on literacy medium for studying. *British Journal of Visual Impairment*, 37(2), 154–168.
- American Foundation for the Blind. (2015). *Low vision and legal blindness terms and descriptions.* https://www.afb.org/blindness-and-low vision/eye-conditions/low vision-and-legalblindness-terms-and-descriptions
- Al-Azawei, A., Serenelli, F., & Lundqvist, K. (2016). Universal design for learning (UDL): A content analysis of peer-reviewed journals from 2012 to 2015. *Journal of the Scholarship of Teaching and Learning*, 16(3), 39–56.
- Barnard-Brak, L., Paton, V., & Sulak, T. (2012). The relationship of institutional distance education goals and students' requests for accommodations. *Journal of Postsecondary Education and Disability*, 25(1), 5–19.
- Betts, K., Cohen, A. H., Veit, D. P., Alphin, H. C., Broadus, C., & Allen, D. (2013). Strategies to increase online student success for students with disabilities. *Journal of Asynchronous Learning Networks*, 17(3), 49–64.
- Center for Applied Special Technology. (2018). Universal Design for Learning Guidelines version 2.2. http://udlguidelines.cast.org
- Ching, Y. H., & Hsu, Y. C. (2015). Online graduate students' preferences of discussion modality: Does gender matter? *Journal of Online Learning and Teaching*, 11(1), 31–51.
- Choi, H. J., & Johnson, S. D. (2005). The effect of context-based video instruction on learning and motivation in online courses. *American Journal of Distance Education*, 19(4), 215–227.
- Cole, M. T., Shelley, D. J., & Swartz, L. B. (2014). Online instruction, e-learning, and student satisfaction: A three-year study. *International Review of Research in Open and Distance Learning*, 15(6), 111–131.
- Cook, R., & Gladhart, M. (2002). A survey of online issues and instructional strategies for

postsecondary students with learning disabilities. *Information Technology and Disabilities Journal*, 13(1).

- Corn, A. L., & Koenig, A. J. (Eds.). (1996). Perspectives on low vision. In *Foundations of low* vision: Clinical and functional perspectives (pp. 3–25). American Foundation for the Blind.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). SAGE.
- Creswell, J. W. (2012). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). SAGE.
- Crow, K. L. (2008). Four types of disabilities: Their impact on online learning. *TechTrends: Linking Research and Practice to Improve Learning*, 52(1), 51–55. https://doi.org/10.1007/ s11528-008-0112-6
- Feucht, F. C., & Holmgren, C. R. (2018). Developing tactile maps for students with visual impairments: A case study for customizing accommodations. *Journal of Visual Impairment* & Blindness, 112(2), 143–155.
- Fichten, C. S., Asuncion, J. V., Barile, M., Ferraro, V., & Wolforth J. (2009). Accessibility of elearning and computer and information technologies for students with visual impairments in postsecondary education. *Journal of Visual Impairment & Blindness*, 103(9), 543– 557.
- Haegele, J. A., Kirk, T. N., & Zhu, X. (2018). Selfefficacy and physical activity among adults with visual impairments. *Disability and Health Journal*, 11(2), 324–329.
- Hersh, M., & Johnson, M. A. (Eds.). (2010). Assistive technology for visually impaired and blind people. Springer Science & Business Media.
- Hewett, R., Douglas, G., McLinden, M., & Keil, S. (2017). Developing an inclusive learning environment for students with visual impairment in higher education: Progressive mutual accommodation and learner experiences in the United Kingdom. European Journal of Special Needs Education, 32(1), 89–109. https://doi.org/10.1080/08856257.2016 .1254971
- Houston, L. (2018). Efficient strategies for integrating universal design for learning in the online classroom. *Journal of Educators Online*, 15(3), n3.
- Kearns, L. R., Frey, B. A., & McMorland, G. (2013). Designing online courses for screen

reader users. Journal of Asynchronous Learning Networks, 17(3), 73–86.

- Kharade, K., & Peese, H. (2012). Learning by elearning for visually impaired students: Opportunities or again marginalization? *E-Learning and Digital Media*, 9(4), 439–448. https://doi.org/10.2304/elea.2012.9.4.439
- Kim, J., Lee, Y., & Seo, I. (2019). Math graphs for the visually impaired: Audio presentation of elements of mathematical graphs. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1–6).
- Lee, S. M., & Oh, Y. (2017). The mediator role of perceived stress in the relationship between academic stress and depressive symptoms among e-learning students with visual impairments. *Journal of Visual Impairment & Blindness*, 111(2), 123–134.
- Long, R. G., Rieser, J. J., & Hill, E. W. (1990). Mobility in individuals with moderate visual impairments. *Journal of Visual Impairment & Blindness*, 84(3), 111–118.
- Lorenzini, M. C., & Wittich, W. (2019). Factors related to the use of magnifying low vision AIDS: A scoping review. *Disability and Rehabilitation*, 1–13.
- Lyman, M., Beecher, M. E., Griner, D., Brooks, M., Call, J., & Jackson, A. (2016). What keeps students with disabilities from using accommodations in postsecondary education? A qualitative review. *Journal of Postsecondary Education and Disability*, 29(2), 123–140.
- McKenna, M. A., & Velasco, J. C. (2018). Student's accessibility to the academic curriculum with support(s) from offices of disability services in higher education. *Curriculum Studies Summer Collaborative*, 65. https://digitalcommons.georgiasouthern.edu/cssc/2018/ 2018/65
- Moola, F. J. (2015). The road to the ivory tower: The learning experiences of students with disabilities at the University of Manitoba. *Qualitative Research in Education*, 4(1), 45–70.
- Morton, J. M. (2016). Unequal classrooms: Online higher education and non-cognitive skills. *Philosophical Inquiry in Education*, 23(2), 97–113.
- Nees, M. A., & Berry, L. F. (2013). Audio assistive technology and accommodations for students with visual impairments: Potentials and problems for delivering curricula and educational assessments. *Performance Enhancement & Health*, 2(3), 101–109.

- Okiki, O. C. (2019). Access to information resource and opportunities for social in inclusiveness: Perceptions of visually impaired students of higher education institutions in Lagos, Nigeria. http:// 196.45.48.59:8080/bitstream/handle/ 123456789/4340/Access%20to%20Information%20Resource%20and%20Opportunities.pdf?sequence=1&isAllowed=y
- Pascual, A., Ribera, M., Granollers, T., & Coiduras, J. L. (2014). Impact of accessibility barriers on the mood of blind, low vision and sighted users. *Procedia Computer Science*, 27(0), 431–40.
- Park, J.-H., & Choi, H. J. (2009). Factors influencing adult learners' decision to drop out or persist in online learning. *Educational Tech*nology & Society, 12(4), 207–217.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). SAGE.
- Palmer, S. (2012). Understanding the context of distance students: Differences in on- and offcampus engagement with an online learning environment. *Journal of Open, Flexible and Distance Learning*, 16(1), 70–82.
- Pittman, C. N., & Heiselt, A. K. (2014). Increasing accessibility: Using universal design principles to address disability impairments in the online learning environment. *Online Journal of Distance Learning Administration*, 17(3).
- Richardson, J. T. E. (2014). Academic attainment of students with disabilities in distance education. *Journal of Postsecondary Education and Disability*, 27(3), 291–305.
- Rose, D., & Meyer, A. (2008). A practical reader in universal design for learning. Harvard Press
- Rosner, Y., & Perlman, A. (2018). The effect of the usage of computer-based assistive devices on the functioning and quality of life of individuals who are blind or have low vision. *Journal of Visual Impairment & Blindness*, 112(1), 87–99.
- Spooner, S. (2014). "What page, Miss?" Enhancing text accessibility with DAISY (Digital Accessible Information System). Journal of Visual Impairment & Blindness, 108(3), 201– 211.
- Summers, J. A., White, G. W., Zhang, E., & Gordon, J. M. (2014). Providing support to postsecondary students with disabilities to request accommodations: A framework for intervention. *Journal of Postsecondary Education and Disability*, 37(3), 245–260.

- Williams, M. D., Ray, C. T., Wolf, J., & Blasch, B. B. (2006). Objective mobility documentation using emerging technologies. *Journal of Visual Impairment & Blindness*, 100(12), 736–741.
- Zuriff, G. E. (1996). Medicalizing character. *Public Interest*, 123, 94–100.

APPENDIX: SEMISTRUCTURED GUIDING INTERVIEW

PART 1:

- 1. When were you diagnosed with low vision?
- 2. In which educational level did you recognize you needed more support and accommodations from the school or teachers/instructors?
- 3. Do you have other family members who have the same or a similar condition?
- 4. Do you learn from them? Or did you teach them how to deal with low vision in an academic setting?

PART 2:

- 1. As a student with low vision, do you prefer online or face-to-face courses?
 - Face-to-face course?
 - Online course?
 - Hybrid/blended course?
 - All types of courses?
 - Why do you prefer that type of course?
- 2. What are the information delivery methods (text such as pdf or word document, audio, video) that you find to be most beneficial with regard to your learning in the past online courses?
 - How did you use those methods of delivering information to help your personal learning preferences?

- What currently unavailable methods of providing the information would you like to become available in the future?
- How has accessibility and assistive technology helped you to overcome challenges in your online courses? What were these challenges?
- 3. Which types of accommodations and assistive technologies could contribute better to your engagement, participation, and learning of the content of your online courses?
- 4. According to your experience, what accessibility accommodations in online courses were helpful to you, and how were they helpful (to navigate the online courses, to better understand online instruction, and/or to complete online activities?
- 5. What accessibility design did you need in online courses but did not help you understand the material?
 - What kind of visual information were you looking for in online courses?
 - What kind of auditory information were you looking for in online courses?
- 6. What is your wish list regarding accessibility accommodations you would prefer in an online course? Can you describe a specific experience where you felt like you did not have access to services or accommodations that you thought would be helpful in your education?
- 7. Is there anything else you would like the researchers to know about your online course experience regarding your low vision?
- 8. What question should I have asked but did not?