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Blind accessibility in college and university: is online learning accessible to all?

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BLIND ACCESSIBILITY IN COLLEGE AND UNIVERSITY:

IS ONLINE LEARNING ACCESSIBLE TO ALL?

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ABSTRACT

BLIND ACCESSIBILITY IN COLLEGE AND UNIVERSITY: IS ONLINE LEARNING ACCESSIBLE TO ALL?

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Increasing technological advancement, coupled with the rise of the COVID-19 pandemic and resulting social distancing orders, has amplified the push for online learning and hybrid courses like never before. As education moves online, are the necessary adjustments to accommodate students with varying levels of ability being made? One would think that online learning would be easier to navigate for Blind and Visually Impaired (BVI) students, but is that truly the case? In this study I investigated if the Learning Management System (LMS), Canvas, is accessible to BVI students. I hypothesized that BVI students would have more difficulty accessing classroom material on Canvas than their able-bodied peers due to a lack of accessibility options within the software. Data on Canvas user experiences were collected via survey to assess student attitudes and behaviors. Statistical analyses revealed no significant difference in the Usability ratings of Canvas in both BVI and averagely sighted students. However, qualitative BVI student self-report data did reveal minor issues with the usability and functionality of Canvas while utilizing Assistive Technologies (ATs) on various platforms. Further research on AT-Canvas interactions is needed to assess accessibility.

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Renowned human rights' activist Helen Keller once said, "The chief handicap of the blind is not blindness, but the attitude of seeing people towards them" (2000, p. 113). This quote can easily be extended beyond Blind and Visually Impaired (BVI) people to include all people with disabilities. Critical Disability Theorists (CDTs) have worked diligently to reframe disability in society by centering their scrutiny not on mental or physical impairments, but on the societal norms that deem certain attributes to be impairments, as well as the societal conditions that group stigmatized attributes in particular populations (Hall, 2019). CDTs are anxious to move away from the prevailing medical model of disability, in which it is viewed as a malfunction that must be treated (Finkelstein, 1990). This perspective, whether intentional or not, associates the "problem" with the person, further stigmatizing disability. Psychologists have often been at the forefront of this medical model, acting as clinicians in a rehabilitation setting. The field of psychology has the opportunity to collaborate with other fields to develop a more nuanced and interdisciplinary perspective of disability. This new psychology of disability, as Finkelstein calls it, would be "based upon an understanding of disabled people as 'functioning' human beings and will move away from the whole notion of disability meaning 'functional limitations'" (p. 1).

In an ever-advancing technological landscape, it is imperative that we as a society provide tools for those who need them. While many institutions of higher education are trying to make their websites and Learning Management Systems (LMSs) accessible to all, how do we know whether they are actually effective in aiding students with low vision?

Blind and Visually Impaired

The World Health Organization estimates that there are now more than 2.2 billion people worldwide who are visually impaired or blind; this number is predicted to increase as populations continue to age (World Health Organization [WHO], 2019). Despite what many may think, the term "blind" is used to describe varying degrees of sight, and many within the blind community use it as a catch-all term in reference to blindness and visual impairment. In fact, the majority of blind people -- 85% -- still retain some sight (American Foundation for the Blind [AFB], 2015). There are many terms that have been used to describe those with visual impairments; partially sighted, partial blindness, or poor vision to name a few. However, the preferred term to describe someone with vision loss, who is not totally blind, is low vision. Low vision is characteristically described as anyone whose visual acuity is 20/70 or worse, with best correction (AFB, 2015). Visual acuity is the measure used to describe one's sharpness or clarity of vision. A visual acuity of 20/20 is normal and unimpaired. The numbers that make up one's visual acuity, 20/70 for example, simply describe that what a person with 20/70 visual acuity sees at 20 feet is akin to what a person with a normal visual acuity of 20/20 sees at 70 feet. This can best be conceptualized by viewing a standard Snellen eye chart (see Figure 1), a test used by optometrists and ophthalmologists to measure distance visual acuity. For reference, the typical visual acuity cutoff point for obtaining a driver's license in the United States is 20/40 vision with best correction; those with a visual acuity lower than that are unable to drive cars. The term low vision is typically used in reference to uncorrectable, often permanent, vision loss that interferes with and impairs daily life activities. Legal or statutory blindness, as defined by the United States government, is a "central visual acuity of 20/200 or less in the better eye with the use of correcting lens. An eye which has a limitation in the field of vision so that the widest diameter of

the visual field subtends an angle no greater than 20 degrees is considered to have a central visual acuity of 20/200 or less" (Blindness, 1983). Many blind people can differentiate between light and dark and even determine the source and direction of light. However, those with no light vision are known as those with total blindness or NLP (no light perception). The level of vision loss will determine the types of accommodations and assistive technologies one will need. For the purpose of this study, I will be using the initials BVI, meaning Blind and Visually Impaired, to describe all blind and low vision participants.

Legal Requirements

Title II of the Americans with Disabilities Act (ADA) and Section 508 of the Rehabilitation Act require all federal, state, and local government websites to be ADA compliant (Workforce Investment Act, 1998). Both acts mandate that entities that receive federal funding must make their websites accessible or provide alternative solutions (United States Department of Justice, 2017). Thus, state-funded colleges and universities are required to make their online resources accessible to students. The ADA offers a list of resources for agencies to accommodate disabled users, such as adding text captions to images, posting documents in text-based formats, avoiding distracting colors and fonts, and including audio descriptions and captions to videos and other multimedia features.

The accessibility and usability of Web-based applications, including learning management systems, has traditionally been evaluated using the Web Content Accessibility Guidelines (WCAG: Babu & Singh, 2013). The design guidelines established in the WCAG were developed by the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI). WCAG is guided by four accessibility principles: perceivability, operability, understandability, and robustness. The WCAG was instrumental in the drafting of accessibility

criteria and regulations for laws such as Section 508 of the U.S. Rehabilitation Act (Babu & Singh, 2013).

Accessibility

The AFB defines Accessible Information as "information that can be accessed via screen reader software, magnification, Braille, audio description, captioning, sign languages (e.g., ASL, Signed English), visual interpreters, and support service providers. For example, maps, charts, and images may be accessible if they include a text description of visual content, large fonts, and high-contrast colors in the design" (Rosenblum, Herzberg, et al., 2020, p. 2).

Accessibility used within Web and software development refers "specifically to the principles and processes by which digital media have been made to support devices, customizations, and options and thus to meet the needs of people with a range of disabilities" (Elleessor, 2015).

Although by law universities and colleges are required to provide equitable access to students with disabilities, nearly one-fourth of disabled students reported not receiving the necessary accommodations for them to be academically successful in a college environment (National Center for Education Statistics, 2019). That statistic fails to account for the percentage of disabled students who never even apply for accommodations; one estimate reported that as many as two-thirds of disabled students do not seek out accommodations, while another study found that "negative instructor attitudes decreased the willingness of students to advocate for themselves" (Grasgreen, 2014; Junco, 2002, as cited in Pingry O'Neill et al., 2012, p. 22). Furthermore, teachers frequently struggle to provide necessary accommodations to students with disabilities (Burgstahler et al., 2000). Ironically, they fear unfairly benefitting the disabled student over their able-bodied peers. A recent interview of college students with psychological

and physical disabilities illustrated this struggle perfectly; one student said it felt like "a luxury" if and when professors and staff accommodated their disability, while other students admitted to simply going without accommodations like extra time for testing or keeping a therapy dog in a dorm room (Grasgreen, 2014). Additionally, students with hidden or invisible disabilities (disabilities that are not immediately apparent, like those with low vision who don't use a cane or guide dog) often do not disclose their disabilities, "fearing embarrassment, retribution, marginality, and failure" if they do (Olney & Brockelman, 2003; Tripoli et al., 2004, as cited in Myers et al., 2014, p. 13).

In October 2020, the American Foundation for the Blind published a research report on the impact of COVID-19 on adults who are blind or have low vision which found that when postsecondary schools made the move to remote learning, BVI students reported experiencing access issues in online platforms (Rosenblum, Chanes-Mora, et al., 2020). They frequently did not receive the same accommodations they had when enrolled in on-campus classes, such as braille materials, tactile graphics, sighted assistance, or alternative testing arrangements. This drastically limited BVI students' access to class materials and thus negatively affected their ability to learn. Furthermore, two-thirds of participants (n=82) reported that their school had implemented new technological tools to ease the transition into remote learning, and for 60% (n=49) of them, the new technologies were inaccessible. These findings are consistent with what I encountered when attempting to find BVI students to participate in my research. While contacting various postsecondary disability resource offices, I spoke with one disability support staff member who admitted to me that the college, to her knowledge, had absolutely no blind students currently enrolled. They had all dropped out after schooling moved online during the COVID-19 pandemic, citing difficulties with accessibility when learning via Zoom, and their

preference for in-person classes (N. Barbero-Menchaca, personal communication, January 28, 2021).

Throughout their academic career, BVI students face barriers at almost every level of academia (Butrymowicz & Mader, 2017). Students with low-vision face challenges in early learning development due to imprecise visual perception and inaccurate hand-eye coordination (Dini et al., 2006). Students who faced accessibility issues in K-12 are likely to be educationally behind other able-bodied students. This directly impacts blind students who continue onto higher education. While data on high school and college graduation rates for BVI students is lacking in the literature, a recent report by the Minnesota Department of Education (2018) revealed lower high school graduation rates in BVI students in comparison to the general student population. Data collected from the academic school years of 2010-11 to 2016-17 demonstrated a decrease in high school graduation rates for BVI students, with only 71% graduating in the 2016-17 school year, compared to 85% of general education students graduating the same year. There is one caveat: BVI students tend to spend five years in high school instead of the traditional four, frequently due to participating in Expanded Core Curriculum (specialized instruction for BVI students). When accounting for the extra year of high school, BVI students graduated the 2016-17 academic year at 77%.

Students with disabilities are less likely to attend college, less likely to graduate from college when they do attend, and are less likely to find a career in their field after college, in comparison to their non-disabled peers (Butrymowicz & Mader, 2017). Students with disabilities frequently report having a difficult first year in college or university as they transition into a new learning environment out of secondary school. They struggle not only academically, but socially as well, having difficulty forming social connections with professors, staff, and peers. They fear that

others do not or will not accept their needs as a disabled learner, and often end up moving closer to home or even transferring from a university to a two-year college (Grasgreen, 2014). Accessing academic material at university has also proven to be an issue; in a recent study, the accessibility of eight Ivy League university library websites was measured in accordance with the guidelines set out in Section 508 of the Rehabilitation Act. Results indicated multiple errors in the formation of the sites, including missing alternative text, missing form labels, missing headers, and a lack of links to pdf alternatives (Yang et al., 2020). However, all is not lost: When intervention and accessibility accommodations are provided at a young age for the visually impaired, it is easier for them to keep up throughout schooling with their fully sighted peers (Robinson, 2009).

Universal Design

Universal Design (UD) is an engineering concept that aims to design and compose an environment, building, product, or service that can be accessed, understood, and used by all people regardless of age, size, ability, or disability (NDA, 2020), without putting the onus on the individual to find assistive adaptations. UD has been applied to the classroom and is known as Universal Design of Instruction (UDI; Taylor, 2016). In a truly altruistic UDI scenario, students would not need to use outside tools for assistance because it would already be incorporated into the learning environment. For example, documents would be made accessible before distributing them to students, and PowerPoints would be in larger fonts, with better contrast for viewing ease. There are nine guiding principles of UDI that attempt to anticipate the needs of diverse students and incorporate effective instruction strategies in curriculum to ensure a more accessible learning environment for all. The principles range from Equitable Use (ensuring all students are provided with identical and accessible instruction when possible, or equivalent when not), Simple and

Intuitive (instruction is straightforward, easy to understand, and predictable, regardless of student skill level), Tolerance for Error (students are to be treated with patience, understanding, and with a guiding knowledge that all learners come with different skill levels and abilities), Size and Space for Approach (diversity of student body size, posture, mobility, and communication needs are carefully considered in instructional design, ensuring all students are able to participate), and Instructional Climate (instruction is welcoming, accepting, inclusive, and high expectations for learning are extended to all students), to name a few (Shaw et al., 2001). I believe that implementing the concept of UDI and its nine guiding principles would benefit not only BVI and other disabled students in their education, but also able-bodied students.

Learning Management Systems

A 2014 report conducted by the Education Center for Analysis and Research found that 99% of postsecondary schools have a Learning Management System, and as much as 85% of teachers utilize an LMS in their courses (Rhode, et al., 2017). Canvas is a Learning Management System utilized by 34 Washington colleges and six public Washington universities. Its parent company, Instructure, is "committed to ensuring its products are accessible to users with disabilities" and touts regular internal accessibility testing, along with semi-annual third-party evaluations of accessibility in accordance with WCAG as required by the ADA and Section 508 of the Rehabilitation Act (Canvas, 2019).

The move to remote learning in the wake of the COVID-19 pandemic has led to a massive increase in the use of LMSs. In April 2020 the peak number of Canvas users logged in at once was 2.2 million; by Fall 2020 that number had increased to 6 million (CNN, 2020). While the prevalence of LMSs continues to increase, there is still little known about how BVI students interact with and use the software (Bahu, 2011).

Assistive Technology

A recent review of the literature by Pavithran (2017) surrounding blindness and education found that there is little known about how blind students access online learning, what assistive technology (AT) devices they commonly use, and how they feel when faced with inaccessibility. To begin to make online learning accessible for blind students, we must first understand how they are interacting with LMSs and ATs.

Many technological advances have been made in recent years that aid disabled users to better interact with the world around them. Perhaps the most commonly used ATs by BVI people are screen magnifiers and screen readers. Screen magnification software allows users "to adjust the size of the screen content and select alternative background/font combinations to make viewing content easier," while screen reading software "converts text to speech and allows the individual to use keyboard commands when using a mouse is not possible or efficient" (Rosenblum, Herzberg, et al., 2020, p. 3).

In principle, electronic resources should be beneficial to low-vision students since their traditional paper counterparts tend to be inaccessible. For example, an online document can be altered to have larger, bolder text, the contrast can be manipulated, and the background color can be changed to increase visibility. The reader can zoom in or the computer can read aloud to the student. A hard copy in 12 pt. font cannot be easily altered; it must be scanned and then manipulated in a computer program.

According to the Royal National Institute of Blind People, 95% of BVI people have collided with an object in their daily lives over a three-month period (RNIB, 2015, p. 7). Physical barriers at school could include, but are not limited to, poorly placed trash bins, fixed or mobile furniture, other people, a spill on the floor, and many more. An absence of these kinds of

physical barriers should make online learning a better environment for BVI students than an on-campus experience (Jacko, 2011). However, in practice, many of the websites and software available are not truly accessible for students —the font is still too small, there is poor contrast between text and background, the items are too close to one another, etc. (Dini et al., 2006). Even when students have adaptive software, it can be incompatible with e-learning software (e.g. PowerPoint presentations, classroom response systems like PollEverywhere and Socrative, textbooks with corresponding digital access software, school databases, etc.; Fichten et al., 2009). Many webpages where faculty send their students for additional information, and software that is needed for coursework, are incompatible with common accessibility tools like screen readers.

While many ATs exist to aid blind and visually impaired people, they are very dependent on specific document layouts and Web designs. If specific qualities are not adhered to, it can render the tools less reliable and less usable. To determine the extent to which these shortcomings interfere with BVI students' learning, we can implement a user experience study.

User Experience Research

User Experience (UX) is a relatively new interdisciplinary field of research in which researchers aim to understand how users think about, use, perceive, feel about, and interact with a product or system. Researchers then use that understanding to design and develop better products with the user's best experience at heart. This type of research is typically conducted with smaller sample sizes and frequently utilizes both quantitative and qualitative methods. UX research relies on users' feedback to alter, tweak, or entirely scrap products – instead of guessing about what is and is not working, UX research simply asks users for their feedback. Developing products with consumers in mind is beneficial not only for the consumer, but for the organization

as well. Products that appeal to a wide variety of people are likely to turn a larger profit. As one UX researcher put it: “User Experience at its core involves understanding people. You need to know their wants, needs, abilities, constraints, and behaviors. You then need to use this information to figure out what to make and then how to make it” (Kremer, 2013).

I believe that the current study will be a beneficial contribution to the field of UX research. Understanding the user, the user’s characteristics, emotions, motives, and cognitive processes is important when crafting new products and technologies, especially in terms of assistive technology. Regardless of positive or negative results and feedback, knowing how users – especially those with disabilities that require specific, particular assistance – feel about and interact with a product like Canvas, is inherently valuable. It is valuable in that it not only creates a better product, but it fosters a relationship with the user; it shows the user that their perspective is not only valuable but matters and can make a difference.

Equity Theory and Sensitivity

Equity theory aims to determine whether the distribution of resources is fair for all parties involved. This involves a two-step process in which the individual compares their inputs to the situation against the outcomes received, and then compares their perceived input/outcome ratio to that of others’ inputs and outcomes (Huseman et al., 1985). In an educational setting, inputs can include abilities, efforts, time spent, cognitive energy, money, and anything else that is required out of a student. Outcomes can include grades, overall GPA, instructor feedback, feelings of satisfaction or disappointment, a degree or certification, and anything else that a student would receive in return for their inputs.

For an example of this concept in a school setting, imagine the following scenario: An instructor distributes a hard copy of a10-page article to everyone in the class, instructing them to

read the article and answer the corresponding questions by the next class meeting. The assigned reading is formatted as per usual: 12-pt font, black text on a white background. In order to read the article, a BVI student must scan the article onto their computer and alter it using an assistive technology to increase the font size and change the contrast. Alternatively, the BVI student may need to obtain a PDF copy of the document and have their screen reader read the article aloud to them or may even need to convert the article to braille. It may take this student twice as long to read the article as an averagely sighted student, and that does not include the time taken to make the document accessible. By the time the student gets around to answering the questions, the student has invested far more time and energy than was ever intended, or than was invested by an able-bodied student. When the student eventually receives their grade for the assignment, perhaps it is lower than their peers'. The BVI student perceives inequity, because when they compare their input/outcome ratio to that of their classmates, the ratios are unequal.

There are four main assumptions underlying equity theory: "1. People strive to maintain a state of equity. 2. When inequity is perceived, a state of tension results. 3. When faced with this tension, people are motivated to reduce the tension. 4. The greater the magnitude of the perceived inequity, the greater the motivation to act to reduce the tension" (Levy, 2017, p. 293).

The first scale developed to measure equity sensitivity is the Equity Sensitivity Instrument (ESI; Huseman et al., 1985, 1987). The ESI categorizes individuals into three groups:

> "*Benevolents*, those who prefer their outcome/input ratios to be less than the outcome/input ratios of the comparison other; *Equity Sensitives*, those who, conforming to the traditional norm of equity, prefer their outcome/input ratios to equal those of comparison others; and *Entitleds*, those who prefer their outcome/input ratios to exceed the comparison other's" (Huseman et al., 1987, p. 223).

The ESI's utilization of conceptual breakpoints and sample-specific scoring left some researchers questioning the validity and reliability of the scale (Shore & Strauss, 2008). Some have argued that the ESI's items fail to fully represent the domain of equity sensitivity, and thus presents an issue with the content validity of the scale (Sauley & Bedeian, 2000). The construct of equity sensitivity encompasses preferences for levels of inputs, levels of outcomes, relative levels of inputs to outcomes, and certain equity ratios relative to a comparison other (Sauley, 1995). However, the ESI only investigates preferences of relative levels of inputs to outcomes. As a result of these shortcomings, experts in the field have searched for a different method of measuring equity sensitivity and, eventually, to develop new measures. The most popular of these new measures is the Equity Preference Questionnaire.

The Equity Preference Questionnaire (EPQ) was developed with a desire to better measure the construct of equity sensitivity in all four of its underlying assumptions. In a series of six different studies, Sauley and Bedeian (2000) developed and evaluated the EPQ as an alternative to the ESI for measuring the construct of equity sensitivity. Seventy-nine items were created, with a mind towards content validity. An independent sample of judges knowledgeable in psychometrics evaluated the items, placing each into one of the three categories defined by the ESI (Benevolents, Equity Sensitives, and Entitleds), and throwing out those that were too ambiguous, or on which the judges differed too greatly, resulting in the final 16 items (Shore & Strauss, 2008). The items are rated on a 5-point Likert scale (ranging from strongly disagree to strongly agree) that represent all four domains of equity sensitivity. Scoring of the EPQ is much simpler than the ESI; responses are averaged across all 16 items, low scores represent Entitleds, and high scores represent Benevolents; Equity Sensitives are in the middle.

The construct of equity sensitivity itself has been subject to question as well. Because the ESI was the first scale to attempt to measure equity sensitivity, it played a large role in shaping the understanding of the construct. Notably, King and Miles (1994) tweaked Huseman, Hatfield, and Miles' (1985) original definitions of Benevolents. Instead of Benevolents *preferring* their input/outcome ratio to be lower than that of comparison others', they argued that Benevolents are *more tolerant* of under-reward than Equity Sensitives or Entitleds. This shift in definition is now the more commonly accepted meaning.

Some have argued that Adams' original perceptions of equity sensitivity were too narrow; Jeon (2011) reasoned that "individuals may have varying sensitivity dispositions to unfair treatment, regardless of comparisons with others' outcomes and regardless of explicit outcome/input ratios" (p. 2). Jeon posits that perhaps one's general sensitivity to unfairness in all aspects of their life may play a larger role in determining how one may react to perceived inequity at work or school.

Other researchers have pushed to add a fourth category onto the original three; results from studies done by Clark, Clark, Foote, & Hanna (2013) "revealed a fourth response category that included individuals who did not show any equity sensitivity preference, which they labeled *indifferent*" (p. 243). Additionally, Clark et. al.'s research revealed that more people are placed into the Equity Sensitives category than was once previously assumed. Similarly, Bynum and Davison (2014) argued that the three categories of equity sensitivity are not really three distinct categories at all; rather the construct simply measures low, medium, and high benevolence.

While the ESI is still in common use, it appears that the EPQ is the better of the two scales. In multiple studies comparing the EPQ to the ESI on reliability, convergent validity, and content validity, Shore and Strauss (2008) found that while both the EPQ and the ESI had high

reliability scores and confirmed both consistently measured a construct, considerably stronger evidence for convergent and content validity was reported for the EPQ than for the ESI. These findings suggest that the EPQ is measuring what it claims to be measuring: equity sensitivity. The same cannot be said for the ESI, with its relatively weak evidence for convergent and content validity, which raises questions about what construct is actually being assessed by this measure. Shore and Strauss concluded that the EPQ is a good measure of equity sensitivity and worthy of further research.

The goal of the current research is to investigate whether Canvas is accessible to BVI students, whether there is a relationship between one's Degree of Vision and one's GPA, and whether BVI students are more concerned with equity than able-bodied students are. Furthermore, this study attempts to establish a relationship between Canvas User Ratings and EPQ category, between Canvas User Ratings and student GPA, and between Canvas User Ratings and efficient use of Canvas.

Hypotheses

Hypothesis 1: BVI students will self-report Canvas to be more difficult to use than able-bodied students.

Hypothesis 2: BVI students will have a lower self-reported GPA than able-bodied students.

Hypothesis 3: BVI students will score as Equity-Sensitives on the Equity Preference Questionnaire.

Hypothesis 4: Those who score as Benevolents on the EPQ will rate Canvas more favorably on the Canvas User Experience Survey, and those who score as Entitleds on the EPQ will rate Canvas less favorably on the Canvas User Survey.

Hypothesis 5: Students who rate Canvas low in most categories will have a lower GPA than those who rate it high in most categories of the Canvas User Survey.

Hypothesis 6: Students who score efficient in the mock classroom questions will rate Canvas more favorably in the Canvas User Survey.

Method

Sample

A total of 85 respondents participated in this study; 19 identified themselves as Blind or Low Vision. Sixty-two identified as Women, 20 identified as Men, one as Non-binary, one as Transgender, and one as Other. For ease of measurement, the latter three categories were combined into one "Other" category. Forty-seven respondents identified as White, 12 as Multi-Racial, nine as Latinx, nine as Asian, five as Black, two as Other, and one as Middle Eastern.

Following the method used by the American Foundation for the Blind (Rosenblum, Cbanes-Mora, et al., 2020; Rosenblum, Herzberg, et al., 2020), BVI participants were categorized by their usage of AT. Responses from the following question were used to categorize BVI participants: "What assistive technologies do you utilize to access Canvas or other learning management systems?" Participants who said they used a screen reading software (e.g., Jaws, VoiceOver, NVDA) and/or a refreshable Braille display were coded as Blind. Participants who said they used a screen magnification software (e.g. ZoomText), a combination of screen reader and screen magnifier, built-in features of a device (e.g., reverse contrast, enlarged font), or no ATs at all were categorized as Low Vision.

BVI participants were recruited from the disability support services at the following post-secondary schools: Eastern Washington University, Western Washington University, Highline College, Pierce College, Bellevue College, Lake Washington Institute of Technology, Spokane

Community College, and Green River College. BVI participants were also recruited via the Washington State Department of Services for the Blind, as well as the Reddit forum, /Blind, and the Facebook group, National Association of Blind Students. BVI participants were offered the opportunity to enter into a raffle to win one of three $25 Amazon gift cards. Averagely sighted student participants were recruited from online undergraduate psychology courses at Eastern Washington University, Bellevue College, Lake Washington Institute of Technology, and Pierce College, and were awarded extra credit in their psychology classes for participation.

The Institutional Review Board of Eastern Washington University approved this study and the ethical principles laid out by the American Psychological Association were strictly adhered to.

Materials

To participate in this study, respondents required the use of a web-enabled device (e.g. computer, laptop, smartphone, tablet) to access the study delivered on Survey Monkey. BVI students were encouraged to use any AT necessary to access the survey.

Canvas Mock Classroom

To assess efficiency in Canvas, participants viewed a series of seven screenshots of a mock Canvas classroom and responded to the questions or directives associated with each screenshot. For example, participants were shown an image of a typical Canvas classroom module and were asked: “Looking at the upper right corner of this image: What does ‘Complete All Items’ mean?” There were two response options to choose from: “It is an encouragement to complete all of the items in the module” or “It indicates that all items must be completed before the next module will open.” Correct responses across these seven items were summed to create a Mock Classroom Efficiency score.

Canvas User Survey

For assessing user satisfaction with Canvas, the Canvas User Survey (adapted from Park et al., 2013) was administered to participants. In this 37-item survey, participants rated different aspects of the Learning Management System on a 7-point scale ranging from 1 ("not at all") to 7 ("very much")across three subscales: Usability (Memorability, Familiarity, Predictability, Intuitiveness, Consistency, User Support, Easy Installation, Error Prevention, Forgiveness, Feedback, Helpfulness), Affect (Delicacy, Simplicity, Texture, Luxuriousness, Color, Attractiveness), and User Value (Self-Satisfaction, Identity, Challenge, Confidence, Pleasure, Fun, Refresh, Sociability, Social Emotion, Social Value, Friendship, Customer Need, Eagerness, Expectation, Usefulness/Utility, Customizability, Attachment, Novelty, Preciousness, and Trustworthiness). Each item included an example of the quality being assessed (e.g. "Intuitiveness: Degree of understanding the way Canvas looks and works by intuition; e.g. the Canvas calendar is easy to use, based on your own instinct").

Following the Canvas User Survey, all participants were given the option to add to a textbox any other thoughts or feelings they had about the Canvas platform.

Equity Preference Questionnaire

To determine sensitivity to equity in an educational setting, the Equity Preference Questionnaire was adapted (Sauley, 1995; Sauley & Bedeian, 2000). The EPQ contains 16 items rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with adapted statements such as, "I am most satisfied in class when I have to do as little as possible" and "Even if I received low grades and poor feedback from my professor, I would still try to do my best in class." To place participants into Benevolents, Equity Sensitives, and Entitleds, first the quartile scores were determined, then three groups were created: The top 25% of scorers were

labeled Benevolent, the bottom 25% were labeled Entitled, and the middle 50% of scorers were labeled Equity Sensitives. Cronbach's alpha for the sample was .70, which exceeds the cutoff for internal consistency set by Nunnally (1978).

Demographics

Following the EPQ, participants were asked what school they attended, how many years of experience they had with Canvas, and which other LMSs they have used in academia. Participants were then asked questions about their GPA in In Person classes, GPA in Online classes, and their GPA Overall. Lastly, participants were asked to respond to general demographic questions about their age, gender, and race.

BVI Qualitative Questions

Next, participants were asked if they are Blind or Low Vision. Students who responded negatively were directed to the final page of the survey. Students who responded affirmatively were then directed to a series of additional questions. They were asked to provide their visual acuity, which most did not know. Next, they were asked if they found Canvas to be easily accessible with their current vision and without using AT. Participants were directed to elaborate in a textbox why they answered yes or no. They were asked if they use any AT and if so, what kind. Lastly, they were asked, "In your opinion, what could Canvas and other learning management systems be doing better to ensure that blind and low vision students can easily access class materials?"

Procedure

The survey began with an information sheet, detailing the purpose of the study, directions, benefits or risks of participating, information on privacy and confidentiality, and the contact information of the principal investigator for further questions or information. Participants

were then directed to respond, on separate screens for each topic, to the mock Canvas classroom scenario, the Canvas User Survey, the Equity Preference Questionnaire, general demographic questions, and lastly the questions directed to BVI students. Upon completion of the survey, non-BVI students were directed to take a screenshot of the "Thank You!" final page to submit for extra credit. BVI students were given a hyperlink to sign up for an anonymous raffle to win one of three $25 Amazon gift cards.

Results

All nonsignificant results will be at $p > .10$.

Hypothesis 1: *BVI students will self-report Canvas to be more difficult to use than able-bodied students.*

To assess the first hypothesis, qualitative self-report responses were collected via three different questions. All participants were given the option to respond to the prompt, "Please feel free to add any other thoughts or feelings that you have about Canvas." Of the 84 participants in this study, fifty responded to this question. The vast majority of responses were positive; one such response from a BVI participant said,

> "I have use[d] Canvas for a number of years now and, I have always really appreciated how easy it was to use and how accessible the platform is, in particular, I enjoy using the mobile app on my iPhone and iPad. It is definitely accessible and easy to use. Especially since remote learning beg[an] and I have heard other legally blind students…discuss their struggles with other learning platforms such as Blackboard, I have definitely appreciated how accessible and intuitive Canvas [is]."

Many respondents, BVI and averagely sighted participants alike, preferred it over other LMSs like Blackboard and Google Classroom, and over one-third of respondents to this particular

question mentioned the LMS' "ease of use." More than a few participants mentioned how helpful Canvas has been during the COVID-19 pandemic: "I am greatly satisfied with the Canvas tool. During the Coronavirus pandemic, Canvas has been essential in guiding me through the courses that I am taking." In terms of accessibility, one BVI participant said the following, "I find the accessibility good overall, however there are some things about its usability that I think could be improved." While most student responses were positive, some believed that Canvas should be doing more to fix occasional glitches and make the site more uniform. Many students emphasized that last point; because Canvas is so customizable, there is little consistency amongst professors. One may set up their Canvas course classroom to use only Panopto (a built-in video lecture application) and work from the To Do List, while another may only use the Modules tab and expect their students to work from there alone. One student wrote, "I personally think they need to fix some bugs/make it easier for students to navigate. It would also help if teachers communicated to each other how they have set up their Canvas to better assist their students." Another wrote, "Sometimes teachers adjust Canvas to their needs. This can sometimes be confusing and hard to use or understand." Again, another participant said, "I think that Canvas sometimes is very stressful to us students trying to understand the way each teacher uses Canvas. Each teacher uses it in their own way and is not uniform. This is a big struggle for many students." Multiple respondents associated Canvas with negative feelings, not because of the LMS itself, but because of its inherent relationship with school: "It's a good site but it's still school so it doesn't bring me joy to use it. School is school but the site does make some classes easier to do." A similar response read, "I think Canvas does its job. It's not 'exciting' because it's involved with school. Not everyone enjoys school [and] thus won't enjoy Canvas." Lastly, in response to items on the Canvas User Survey, a handful of participants responded negatively to

the descriptor adjectives used: “Some of the questions are hard to answer because… it’s a tool, nothing more. Canvas is a tool, not a place to ‘express my emotions,’ or whatever.” Another went on to say, “Canvas is very functional and easy to navigate, but ultimately represents the work and effort required for school. It’s not a ‘pleasure’ space for me.”

The next two qualitative questions were only delivered to BVI participants. “Do you find Canvas to be easily accessible with your current vision (without using assistive technology)? Please elaborate on your response to the previous question. If you answered yes, Canvas is accessible to you, describe in further detail how it succeeds in being accessible. If you answered no, Canvas is inaccessible in your current visual state, describe in further detail how it fails in being accessible.” Of the 19 total BVI participants, 16 answered this question. Six respondents said something positive about the font and/or layout of the LMS. One wrote, “It is accessible because there is not too much on the screen. It doesn’t overwhelm my eyes seeing so much on the screen. The bright colors make it easier to distinguish between classes.” Similarly, one responded with, “I love that I can change the colors when needed. I like that the fonts are big and bold. I like that, when I need my screen-reader, I rarely ever run into any problems.” Of course, those identified as Blind are not able to access the LMS without ATs, but still had positive things to say about Canvas; “Although it is not accessible without assistive technology, I am able to use Canvas successfully with a screen reader which relieves stress and makes school possible.” While another wrote,

> “Canvas is accessible for me, a screen reader user. I have used Canvas on Mac, Windows, and iOS. I believe that it is fully accessible to the extent that it can be. I have had no issues at all attending college classes during the pandemic, and I have not had to ask for any assistance from any [sighted] individual. In addition, I was able to participate

> in all online forums, conferences, quizzes, and other activities. The only thing that I am not able to read on windows, but am able to see on Mac OS, is the word count for discussion posts or other written responses."

The final qualitative was, "In your opinion, what could Canvas, and other learning management systems be doing better to ensure that blind and low vision students can easily access class materials?" Of the 16 BVI responses to this question, four said that they had no suggestions for making the LMS better and that it was already accessible. However, four different BVI respondents suggested that Canvas do some type of user experience testing, with one suggesting that Canvas consult "with visually impaired students in the development and refinement of these platforms," and another writing that Canvas should ensure through user testing that its platform is compatible and accessible with all screen-readers. In terms of user testing, another respondent had this to say, "The accessibility is great, but in some areas, the usability (how easy/intuitive it is to perform tasks) could be improved, so Canvas could conduct usability sessions with people using a range of assistive technologies at all technology skill levels." Some respondents had issues with the lack of customizability for students, with one suggesting that the LMS offer "more options where the students can choose by personal preference" and another commenting, "I think Canvas can make it a lot easier if students could organize where they want their stuff to be at." Other respondents had less of an issue with Canvas itself, but more so with the class materials accessible through Canvas: "Some of the power point slides make it difficult to read and could be bigger." Similarly, another respondent said,

> "I would say that my experience overall with Canvas has been positive. If more platforms mirrored Canvas, it would be a very accessible world. I think the important thing is for

professors to remember that there are things they should consider (i.e. captioning photos, making PDFs accessible, etc.) that can allow for a more accessible experience."

I received some informative feedback via the reddit thread /Blind when attempting to recruit participants for this study. Two different comments stood out that I found valuable to share here. The first discussed the accessibility of Canvas, saying,

> "What I can tell you is that the main stuff is easy to access, but the Canvas inbox is next to impossible to use with NVDA and Firefox. The assignment submission page is also very cluttered. Submitting a reply to a discussion is also difficult because the text field is contained inside of an application frame. I can't simply navigate to it using form fields, and sometimes I get stuck inside of it with no way out. The hardest thing about Canvas is that every instructor organizes their course differently, making getting started in a new course an exercise in frustration."

The other commentor did not give feedback on Canvas, but on the study itself, suggesting a more thorough review of AT's interaction with Canvas, writing,

> "You might want to make sure you get users of all different kinds: Windows laptops with JAWS, Windows laptops with NVDA, iPhones with VoiceOver or the enlarging text, Androids with their Talkback feature, and don't even get me started on all the Braille notetakers! You should make sure all these different variables are examined in your study, because there might be a bug someone encounters on an iPhone that they don't encounter using anything else, and it could get overlooked if no one with an iPhone participates in your study. Just because something's accessible on one device doesn't automatically mean said thing will be accessible across all devices with no problems."

Both commentors had pertinent insights in working with Canvas and with ATs that were not reflected in other respondents' qualitative answers.

As for hypothesis 1, I cannot say if it was supported or refuted. Clearly, BVI students had positive and negative feedback, as did averagely sighted participants as well. I do not think that BVI participants overall found Canvas to be more difficult to use than able-bodied students, as the able-bodied students had multiple complaints about the LMS as well. However, there is an inherent difference in their complaints; one centers irritation with schooling and inconsistent use by professors and the other focuses on a lack of access to material and difficulty seeing without zooming in or using some type of AT, in addition to inconsistent use by professors.

Hypothesis 2: *BVI students will have a lower self-reported GPA than able-bodied students.*

A 3 (Gender) x 2 (Vision) between-subjects ANOVA was performed on GPA In Person. There was a main effect of Gender, $F(2, 65) = 2.79$, $p = .069$, $\eta_p^2 = .079$. Tukey's b post hoc analyses revealed that Women ($M = 3.57$, $SD = .38$) and Men ($M = 3.48$, $SD = .41$) had higher GPAs In Person than Other ($M = 3.27$, $SD = .40$). The main effect of Vision was not significant. The interaction of Gender and Vision was significant, $F(2, 65) = 2.93$, $p = .060$, $\eta_p^2 = .083$. See Table 1 for the means and standard deviations for each group; the BVI Men and the averagely sighted Others reported significantly lower In Person GPAs than any other group, which were all roughly equal.

A 3 (Gender) x 2 (Vision) between-subjects ANOVA was performed on GPA Overall. There was a main effect of Gender for GPA Overall, $F(2, 65) = 4.21$, $p = .019$, $\eta_p^2 = .115$. Tukey's b post hoc analyses revealed that Women ($M = 3.64$, $SD = .26$) had higher GPAs Overall than did Other ($M = 3.51$, $SD = .36$) and Men ($M = 3.46$, $SD = .43$). The main effect of

Vision was not significant, nor was the interaction of Gender and Vision. See Table 2 for the means and standard deviations for each group.

A 3 (Gender) x 2 (Vision) between-subjects ANOVA performed on GPA Online found no significant main effects or interactions.

Hypothesis 3: *BVI students will score as Equity-Sensitives on the Equity Preference Questionnaire.*

Spearman's rho correlation revealed no statistically significant relationship between Degree of Vision and EPQ Category, $r(84)=-0.11$, $p>.05$. To explore the possibility of a curvilinear rather than linear relationship, the EPQ scores were converted into a new variable called EPQ Categories: The bottom 25% of scores were labeled "Entitled," the middle 50% of scores were labeled "Sensitive," and the top 25% of scores were labeled "Benevolent." A Degree of Vision x EPQ Categories Crosstabulation demonstrated no significant difference in EPQ Categories by Vision, $\chi^2(2) = .71$, $p = .70$. Of those identified as Blind, 37.5% scored as Entitled, 37.5% as Equity Sensitive, and 25% as Benevolent. Of those identified as Low Vision, 25% scored as Entitled, 50% as Equity Sensitive, and 25% as Benevolent. Lastly, of those in the Averagely Sighted category, 32.3% scored as Entitled, 36.9% scored as Equity Sensitive, and 30.8% scored as Benevolent.

Hypothesis 4: *Those who score as Benevolents on the EPQ will rate Canvas more favorably on the Canvas User Experience Survey, and those who score as Entitleds on the EPQ will rate Canvas less favorably on the Canvas User Survey.*

One-way between-subjects ANOVAs were performed with EPQ Category as the IV and each of the Canvas User Ratings (Usability, Affect, Value, and Canvas UX Overall) as the DVs. There were no significant effects of EPQ Category on Usability or Affect ratings. EPQ Category

had a significant effect on Value, $F(2, 76) = 2.66$, $p = .077$, $\eta_p^2 = .067$. Tukey's b post hoc analyses revealed that Entitleds ($M = 78.77$, $SD = 25.35$) rated Canvas significantly lower in Value than either Equity Sensitives ($M = 91.48$, $SD = 22.66$) or Benevolents ($M = 92.91$, $SD = 24.40$), which did not differ in their ratings.

EPQ Category also had a significant effect on Canvas UX Overall, $F(2, 76) = 2.42$, $p = .096$, $\eta_p^2 = .061$. Tukey's b post hoc analyses revealed that Entitleds ($M = 164.04$, $SD = 37.95$) rated Canvas significantly lower Overall than did Benevolents ($M = 185.86$, $SD = 39.27$), with Equity Sensitives rating in-between, and not significantly different from, the other two ($M = 180.62$, $SD = 32.84$).

Hypothesis 5: *Students who rate Canvas low in most categories will have a lower GPA than those who rate it high in most categories of the Canvas User Survey.*

The relationships between Canvas User Ratings (Usability, Affect, Value, and Canvas UX Overall) and self-reported student GPAs (Online, In Person, and Overall) were investigated using Pearson's correlations. None of the Canvas User Ratings variables correlated significantly with any of the GPA variables. See Table 3 for correlation coefficients.

Hypothesis 6: *Students who score efficient in the mock classroom questions will rate Canvas more favorably in the Canvas User Survey.*

Pearson's correlations revealed no statistically significant relationship between Mock Classroom Efficiency and Canvas User Ratings of Usability, Affect, User Value, and Canvas User Experience overall. See Table 3 for correlation coefficients.

Discussion

The overall findings of this study suggest that there is little academic difference between BVI students and their able-bodied peers. BVI and able-bodied students have similar attitudes

about Canvas, similar navigation strategies within Canvas, and similar academic performance levels.

The hypothesis that BVI students would self-report Canvas to be more difficult to use than able-bodied students was partially supported. Accessibility of the Canvas LMS was measured via self-report data from Blind and Visually Impaired students currently enrolled in an online class. Qualitative data suggests both BVI and averagely sighted students have a mix of positive and negative views about Canvas. Nevertheless, the themes of the negative responses differed between the two groups; BVI students reported issues pertaining to accessing Canvas and usability, whereas averagely sighted students' negative responses tended to focus on the inconsistency of course set-up due to individual teacher preference.

BVI students were not as forthcoming or elucidative on their complaints of Canvas as I anticipated. While I am surprised by these findings, I can only make conjectures as to why this is the case. Perhaps BVI participants were reluctant to complain about any lack of accessibility due to social desirability bias. It is entirely possible that BVI and other disabled people have been conditioned to respond with gratitude instead of complaints when met with access issues in their daily lives. Alternatively, maybe BVI students are so accustomed to inherent inaccessibility that a lack of access or accommodations are the norm for them. Conceivably, the bar for accessibility and accommodations could be so low that when an organization or individual even slightly tries to meet accommodations, it is embraced with open arms and gratitude. This assumption is supported by self-report data of students with disabilities (Burgstahler et al., 2000); some said that they had so frequently been denied accommodations that when an instructor is willing to accommodate them, they try to take as many courses as possible with that instructor.

Drawing from my hypothesis that Canvas would have accessibility issues for BVI students, I assumed that these accessibility issues would be reflected in student GPA. However, BVI students did not significantly differ from their able-bodied peers in GPA, whether that be for In Person classes, Online classes, or cumulative Overall GPA. Recent research reveals that those with disabilities other than, or in conjunction with, blindness and low vision tend to have lower grades on average than those who are solely BVI (Fichten et al., 2016). Fichten et al.'s results propose that the more disabilities one has, the more academically difficult postsecondary school will be. The current findings from BVI students indicate no significant differences in the grades of BVI students versus their able-bodied peers. This could suggest that the participants in this study were exclusively BVI with no additional disabilities, explaining the lack of difference in GPA between BVI and able-bodied students. However, no question was asked about additional disabilities.

I originally anticipated BVI students would score as Equity Sensitives on the EPQ, presuming that a lifetime of accessibility struggles would lead to an internal emphasis on equitable input to outcome ratios. While a majority (50%) of Low Vision students did score as Equity Sensitive on the EPQ, Blind students scored equally high in both Equity Sensitive and Entitled categories. There is a lack of research on the equity preferences of those with disabilities, so it would be difficult to make any generalizations or interpretations of these findings. However, in a broader sense, these surprising results may be due to shortcomings in the construct of Equity Sensitivity and/or Equity Theory itself. For example, Cropanzano and Folger (1989) argued against using Equity Theory to measure feelings about inequity, instead favoring Referent Cognitions Theory (RCT). RCT investigates the role that decision-making plays in perceived injustice or unfair treatment using a would/should model; "In a situation involving

outcomes allocated by a decision maker, resentment is maximized when people believe they *would* have obtained better outcomes if the decision maker had used other procedures that *should* have been implemented" (p. 293). In the current study, the "decision maker" would be Canvas, and the "other procedures that should have been implemented" would be accessibility accommodations. Perhaps so many Blind students scored as Entitled because they are resentful of the lack of accessibility accommodations in academia in general, and thus feel that "better outcomes" could have been attained if not for the lack of accessibility.

The finding of higher numbers of Entitled Blind participants is particularly relevant, when considering that the majority of BVI respondents had few, if any, negative comments to make about Canvas accessibility. One would assume that those who score higher in Entitlement would be more likely to complain about any inconveniences pertaining to inaccessibility or poor accommodations, but that was not the case. Concerningly for Blind Entitled students, one study (Burgstahler et al., 2000) reported that instructors are resistant to accommodating disabled students who they perceived as being entitled or having a negative attitude, believing that the students were misusing their disability diagnosis to take academic advantages not afforded to their able-bodied peers. Blind Entitled students run the risk of fulfilling stereotypes and experiencing outright discrimination. Alternatively, it is also possible that Blind students are so accustomed to receiving fewer outcomes for their inputs, that it pushes them towards entitlement or desiring more outcomes for fewer inputs.

Building off Equity Theory, I hypothesized that Entitleds would rate Canvas less favorably than did Benevolents, which I assumed would rate the LMS higher. Those who scored as Entitled on the EPQ did in fact rate Canvas significantly lower in Value than did those who scored as Equity Sensitive or Benevolent. Entitleds also rated Canvas significantly lower Overall

than did Benevolents. While the literature is lacking on this particular subject, we do have evidence that Entitled people have lower overall life satisfaction than those who do not score high in Entitlement (Reysen, 2013). If Equity Theory defines an Entitled person as one who desires greater reward (outcome) for less effort (input), it is plausible that this type of person has higher expectations and standards that may be difficult to meet. These higher expectations may be reflected in the lower Value and lower Overall ratings of Canvas given by Entitleds. Previous studies have linked greater Academic Entitlement (AE) with lower overall life satisfaction (Jeffres et al., 2014; Reysen, 2013). Whereas it would make sense that Benevolent people, who prefer to give more inputs and receive less outcome, would be more grateful and easier to please or satisfy. Additionally, this study was conducted in Fall 2020, and thus general dissatisfaction with involuntary distance learning may have impacted Canvas User Ratings, especially for Entitled students. One recent study found that while 51% of students said they were very satisfied with their course prior to going online, after the shift to remote learning, this number dramatically decreased to 19% (Digital Promise et al., 2020). Moreover, prior to the pandemic, only 3% of students identified themselves as being very dissatisfied with their course. After distance learning was enacted, that number jumped to 13% of students identified as being very dissatisfied with their course. Furthermore, more than 300 cases have been filed by lawyers–in the past year alone–on behalf of students and parents demanding tuition refunds for their respective colleges and universities (Lederman, 2021). The plaintiffs assert that the postsecondary schools failed to provide what was promised and instead offered a substandard replacement. Although most of these cases have been dismissed by judges, students and parents of students continue to file lawsuits against their institutions of higher learning. In fact, a recent class-action lawsuit filed against the University of Washington is making headway in court; a

King County Superior Court judge upheld claims against the university just last month, alleging that tuition prices should have been cut with the move to distance learning (Cabahug, 2021). All this is to say that it is very likely that general satisfaction with online learning has decreased within the past year, possibly impacting the results of this study.

While I anticipated students with lower ratings of Canvas would have lower GPAs in comparison to those who rated the LMS more favorably, the data revealed no significant relationship between Canvas User Ratings and student GPA. I had expected lower ratings of Canvas to correlate with poorer student grades, because I believed that those with less satisfaction would be disengaged, disinterested, or students who misunderstood how to utilize the LMS efficiently, reflecting in worse grades. However, this is not what the data indicated.

On a similar note, I anticipated students who engaged with the LMS effectively and efficiently would have more favorable ratings of Canvas, thinking that one who knows the ins and outs of the LMS would have a more streamlined and satisfactory experience. Interestingly, the findings demonstrated no relationship between Canvas Efficiency and Canvas User Ratings. This was another surprising finding, especially when considering the number of participants who specifically mentioned their displeasure with inconsistency in Canvas classroom layouts from one class to the next. One would think that navigating the LMS inefficiently would lead to struggles in class, lower GPA, and ultimately, a more negative perspective of Canvas. In reverse, one would think that someone navigating the LMS very efficiently and effectively would have a more positive experience and rate it more highly. However, this was not the case for this sample.

Shortcomings of This Study

When writing the conclusion to this paper I found a published version of the EPQ adapted for academia; the Academic Equity Preference Questionnaire (AEPQ) was adapted from

the EPQ and published in 2013 (Miller). While the AEPQ is very similar to the adapted EPQ I made for this study, it would have been preferable to use an existing scale rather than adapting one myself.

Findings related to Gender in this study must also be viewed with discretion. Because of the low rate of respondents who identified in the Other category (n=3), findings on that group should not be generalized to the general population.

Furthermore, there was an accessibility issue when collecting data for this study. One respondent, recruited from the reddit threat /Blind, commented that they could not participate in the survey because of a lack of accessibility; “I'll be honest, having to deal with these long format image descriptions is a massive turn-off for me. I navigate Canvas using headings and landmarks and don't know how it looks.” The respondent was referring to the alt text descriptions I had written for the screenshots of the Mock Canvas Classroom. I gave very illustrative – and perhaps quite lengthy – alt text descriptions of the screenshots. In hindsight, I should have done more due diligence in determining the most preferable method of alt text image descriptions. Ideally, before writing an alt text description, one should assess “whether images are functional or decorative, whether information can be gathered from surrounding text, and…provide age-appropriate descriptions…effective image captions describe foreground, background, color, and directional orientation of objects” (Stangl et al., 2010, p. 2).

Initially, this study was intended to be conducted in person, in a laboratory. Students would have come to the lab, access the mock Canvas classroom on the computer, and move through a series of tasks, while screen-capture software tracked their movements. However, due to the COVID-19 pandemic, this study had to be moved online into a survey format. This meant that I had to develop screenshots of a mock Canvas course and ask multiple choice questions

about what the student would do in each case. This is not an ideal scenario when the main population of interest is blind; screen readers cannot show a blind person an image, they merely read off the alt text describing the image.

Additionally, in the lab, the variable of time spent completing Mock Canvas Classroom tasks could have been measured. Time is an important factor in the lives of BVI students. Data in the literature has repeatedly demonstrated that reading braille is significantly more time consuming than reading print; print-reading rates are on average 30-60% faster than braille reading rates (Wetzel & Knowlton, 2000). Similar findings have also indicated that braille readers on average read at half the speed as average print-readers (Pring, 1984, as cited in Dimitrova-Radojichikj, 2015). Moreover, a 2015 study found even larger differences between braille reading rate and print-reading rate; while a reading rate of 150 words-per-minute (wpm) is typically what is expected of jobs that require literacy, braille readers in this study read on average read just 16.6 wpm (Dimitrova-Radojichikj). Another study, this time comparing averagely sighted school children to blind and low vision school children, found that low vision print-readers read 53.55 wpm, braille-readers read 33.27 wpm, and averagely sighted print-readers read 103.98 wpm (Mohammed & Omar, 2011). These results indicated that not only do low vision print-readers read half as quickly as average print-readers, but that braille-readers read at one-third the rate of averagely sighted print-readers. All this is to say, clearly it takes BVI students significantly more time than average to accomplish the same literacy tasks, further demonstrating that BVI students must put forth far more effort (inputs) than their peers.

Screen-capturing BVI student interactions with Canvas would have been beneficial not only for measuring time, but it also could have given more insight on their Canvas navigation strategies. This additional information would have allowed me to determine whether BVI

students were complimentary about Canvas simply because it is do-able, and not because it is truly efficient for them, in both navigation and time usage. Again, it is possible that BVI students are simply accustomed to working harder and expecting less.

Furthermore, BVI students could have accessed and interacted with the LMS while utilizing Assistive Technology, providing more knowledge about how BVI students are navigating Canvas. This would have presented its own set of methodological issues -- e.g., type of ATs, where to access them, differences in accustomed operating systems, differences in accustomed device, etc.-- however, I think that it could have been worth it, as it would have provided more detailed insight into how BVI students interact with and experience Canvas.

The pandemic also impacted this study in that it made it more difficult to find currently enrolled BVI students. The number of respondents in the target population of BVI students (n=19) make findings hard to generalize, although smaller Ns and descriptive rather than inferential statistics, are common in UX research (Dini et al., 2006; Fichten et al., 2009; Stangl et al., 2010).

Topics for Future Study

While reading the literature on this topic, I discovered that most articles were *about* disabled people but did not *include* disabled people. Finding sources that directly focused on people with disabilities and their perspectives was quite difficult. Common themes of articles available included a focus on the mental health and life satisfaction of mothers of disabled children, the life satisfaction of care-workers who work with disabled patients, how teachers feel about teaching disabled students and providing accommodations, how hiring managers feel about disabled workers, and how peers perceive disabled students in class and their perception of disability accommodations, to name a few. While I do believe investigating the lives of those in a

care-giver role is interesting and valuable, the prominence of data on their lived experiences over that of those with the disabilities themselves is troubling. This concern about others' experiences with disabled people rather than with disabled people themselves devalues the lived experiences of people with disabilities and serves to alienate them from society at large. The emphasis on how abled people "feel" about disabled people is based in, and continues to perpetuate, the medical model of disability, as mentioned earlier, which places the "burden" of disability on the individual rather than on the society that fails to provide adequately for a specific subset of the population (Finkelstein, 1990). Further qualitative studies on those with disabilities would be a beneficial addition to the existing literature and aid in our better understanding of this disenfranchised group.

While this study did not reveal any ground-breaking, field changing results, it attempted to directly assess the attitudes and opinions of Blind and Visually Impaired students. If I were to repeat this study, post-pandemic, it would be imperative for me to include longform qualitative interviews with the BVI students to get a more in-depth perspective on their opinions of Canvas, LMSs, and institutions of higher education in general. Not only would interviews provide more detailed information, but it is in-line with the common practices of User Experience research.

In summation, Canvas ratings of Usability did not significantly differ among BVI and able-bodied students, suggesting that Canvas has implemented the necessary accessibility accommodations to fulfill BVI students' needs. However, considering the qualitative feedback of some of the BVI students, further research on Canvas compatibility with various Assistive Technologies on various platforms is needed. Likewise, accessibility goes beyond what is accessible for those who are Blind and Visually Impaired. Further research on the accessibility of Canvas and other LMSs is needed for those with various disabilities, such as those who are Deaf

or Hard of Hearing, those who have motor skill related disabilities, and those with cognitive disabilities.

Tables and Figures

Table 1

In Person GPA as a Function of Gender and Vision

	Vision			
	BVI		Average	
Gender	Mean	Std Dev	Mean	Std Dev
Woman	3.60	.36	3.57	.39
Man	2.90	.14	3.57	.36
Other	3.50	--	3.15	.49

Note. The Other/BVI Category contained only one respondent.

Table 2

GPA Overall as a Function of Gender and Vision

	Vision			
	BVI		Average	
Gender	Mean	Std Dev	Mean	Std Dev
Woman	3.55	.34	3.66	.24
Man	2.96	.33	3.53	.40
Other	3.62	--	3.45	.49

Note. The Other/BVI Category contained only one respondent.

Table 3

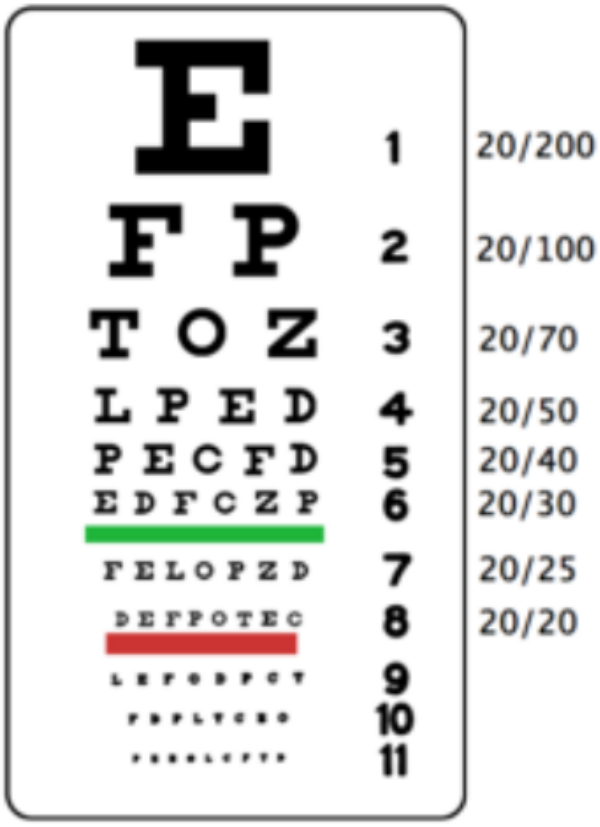
Pearson Correlation Coefficients Among Canvas User Survey Scales, GPAs, and Canvas Efficiency Scores

Measure	Mean	SD	1	2	3	4	5	6	7	8
1. Usability	60.36	9.22		.54**	.64**	.79**	.13	.11	.14	.03
2. Affect	28.78	7.56			.68**	.80**	.18	.13	.11	-.01
3. Value	87.94	24.11				.96**	-.0.05	.10	.08	.09
4. UX Overall	176.80	37.02					.79	.80	.96	.07
5. GPA Online	3.78	1.86	.13	.18	-.05	.03		.56**	.87**	.09
6. GPA In Person	3.54	.39	.11	.13	.10	.37	.55**		.62**	-.03
7. GPA Overall	3.59	.36	.14	.11	.08	.09	.87**	.62**		.06
8. Mock Efficiency	9.58	1.96	.03	-.01	.09	.07	-.07	-.03	.06	

Note. ** indicates significant at the $p<.01$ level, two-tailed).

Figure 1

Snellen Eye Chart



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Conference Presentations

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References

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