UNIVERSAL DESIGN AND ACCESSIBILITY TOOLS IN THE LEARNING MANAGEMENT SYSTEM: SUCCESS STRATEGIES FOR STUDENTS WITH DISABILITIES AT A COMMUNITY COLLEGE

by

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ABSTRACT

With the Americans with Disabilities Act passage in 1990 and the increasing number of undergraduate students with disabilities, there has been very little research done on the efficacy of accessibility efforts compared to the amount of research literature on implementation. This project took the constructivist grounded theory research approach to identify the effects of universal design and accessibility tools are for students with disabilities at the community colleges within Michigan.

The project identified the need for a champion for students with disabilities with the authority to create and implement an institutional policy for accessibility. Mandatory training in accessibility best practices and guidelines are needed for faculty and staff. Training of accessibility tools would be beneficial for faculty, staff, and students. However, more importantly, assessment of accessibility efforts and the usage of accessibility tools is needed for the success of students with disabilities.

KEY WORDS: ADA accessibility, Learning Management Systems, Accessibility tools, Universal Design

DEDICATION

To my late Aunt Elsie, who inspired me to be a life-long learner and to reach for my dreams.

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TABLE OF CONTENTS

Page

LIST OF TABLES vii

LIST OF FIGURES viii

CHAPTER ONE: INTRODUCTION 1
Introduction 1
How Disabilities Can Affect Access 2
Legislation Affecting Access 3
How Campus Websites Affect Access 6
How an LMS Affects Access 7
Blackboard 9
Canvas 9
Moodle 9
Desire2learn (D2L) 9
Blackboard Ally 10
Universal Design 10
Statement of Problem 11
How Colleges Decide on an LMS 11
Overview of the Research Study 12
Research Questions 13
Research Methods 13
Study Participants 13
Definition of Terms 14
Conclusion 14

CHAPTER TWO: LITERATURE REVIEW 16
Introduction 16
Americans with Disabilities Act (ADA) and Education 16
Web Accessibility 19
HTML Code Accessibility Checkers 21
Research on Universal Design 22
Learning Management Systems 25
Research on Institutions' Home Pages 26
Student Success Related to Accessibility 30
Conclusion 32

CHAPTER THREE: METHODOLOGY 34
Introduction 34
Research Methods and Rationale 34

Research Questions 35
Participant Selection 36
Data Collection Process 37
Survey Instrument 39
Interview Process 39
Data Analysis Process 40
Treatment of the Data 40
Study Delimitations and Research Assumptions 42
Delimitations 42
Researcher Bias 43
Validity and Reliability 43
Conclusion 44

CHAPTER FOUR: FINDINGS AND RESULTS 45
Introduction 45
Research Design 45
Research Questions 45
Research Methods 46
Participant Overview 46
Participant Profile 47
Participant and Institutional Demographics 47
Study Results 48
Research Question #1: Results 49
Research Question #1: Analysis 55
Institutional Policy for Universal Design 55
Application of UD Principles 56
Evaluating UD Effectiveness 56
Where UD Affects Student Success 57
Research Question #2: Results 57
Research Question #2: Analysis 59
Conclusion 60

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH 62
Introduction 62
Summary and Discussion of Findings 62
Significance of the Findings 62
Implications of Findings for Colleges 64
Limitations 66
Delimitations and Recommendations for Future Research 67
Delimitations 68
Additional Development and Research Opportunities 69
Conclusion 71

REFERENCES 73

APPENDIX A: WCAG GUIDELINES AND PRINCIPLES 82

APPENDIX B: INVITATION TO PARTICIPATE 85
APPENDIX C: SURVEY QUESTIONS 87
APPENDIX D: INTERVIEW QUESTIONS 91

LIST OF TABLES

Page

Table 1: ADA Coverage 4

Table 2: Section 508 of the §1194.22 Rehabilitation Act Standards 6

Table 3: Size of Survey Respondents' Institution 47

Table 4: LMS of Survey Respondents' Institution 48

Table 5: Survey Participant's Role 48

Table 6: Issues Related to Application of Universal Design Principles 49

Table 7: Institutional Policy Coverage for Addressing UD 50

Table 8: Procedure for Course Evaluation 51

Table 9: Impact of Universal Design on Student Success 53

Table 10: Disabled Student Success Indicators 54

Table 11: Universal Design Tools in an LMS 58

Table 12: Student Learning to Use Universal Design Tools 59

LIST OF FIGURES

Page

Figure 1. Undergraduates with Disabilities, Percentages and Disability Types, 1995-96 1

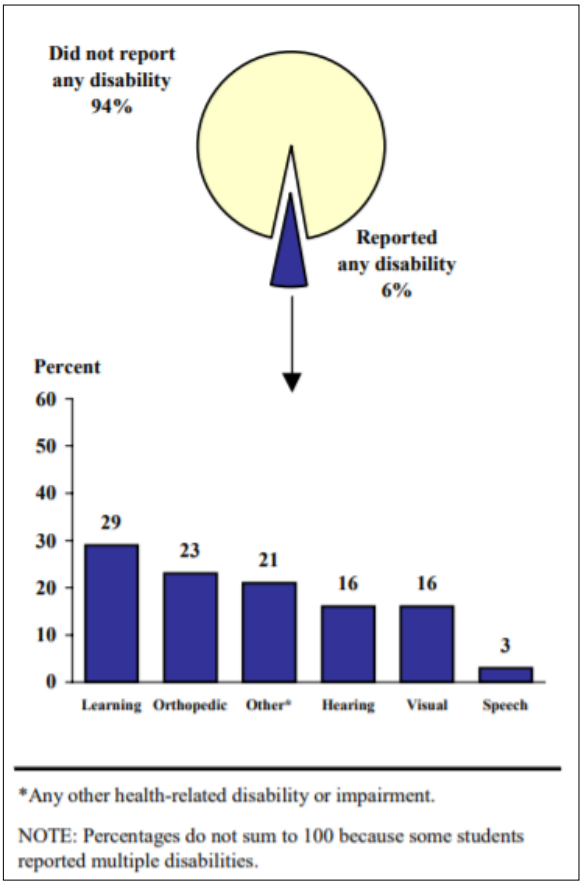
Figure 2: LMS Market Share.....8

CHAPTER ONE: INTRODUCTION

INTRODUCTION

The number of undergraduate students with disabilities keeps growing. According to the U. S. Department of Education National Center for Education Statistics, in 1995-96 the percentage of students with disabilities was 6% as indicated in Figure 1. In the most recent data (2015-16) that percentage was 19%.

Figure 1. Undergraduates with Disabilities, Percentages and Disability Types, 1995-96



Source: U.S. Department of Education, NCES

HOW DISABILITIES CAN AFFECT ACCESS

Brackin (2005) found students with disabilities are not performing as well as students without disabilities. The "digital divide" now refers to disabled students on the "other side of the divide" (Farr, Studier, Sipes, & Coombs, 2008). The Internet or WWW is not inherently inaccessible. However, the WWW has become less accessible for users with disabilities as web page design has evolved from a text-based environment to one that includes images, frames, tables, animated Java applications, and streaming audio and video (Betts, Riccobono, & Welsh, 2013). Accessible web pages allow equal access to information and opportunities (Spindler, 2002; Samuels, 2016; Schmidt, 2017). Rose and Meyer (2002) noted "a website can be just as inaccessible as a building with no ramps or elevators" (Rose & Meyer, 2002). Accessibility tools, such as screen readers, cannot identify images with alternative text, frames pages, or tables without specific HTML coding. Animation, audio, and video need to be closed captioned for blind or low vision students.

There are at least five reasons for web accessibility:

- It is simply the ethical or right thing to do (Schmetzke, 2001a; Katsiyannis, Zhang, Landmark, & Reber, 2009; Burgstahler, 2015).
- It is economically sensible thing to do, considering the extra cost involved in producing multiple alternative versions of instructional materials (Schmetzke, 2001a).
- It is the selfish thing to do (as society ages, senses grow weaker and mobility decreases which then society becomes the beneficiary of it) (Schmetzke, 2001a; May & Zhu, 2009).
- Students with or without disabilities could benefit from content that is accessible, such as to listen to course materials available in downloadable audio formats while commuting to/from work or taking care of children (McAlvage & Rice, 2018).
- The law demands that we do so (Schmetzke, 2001a; Burgstahler, 2015). "The Americans with Disabilities Act (ADA) of 1990 and its 2008 amendments to the Rehabilitation Act mandate that no otherwise qualified individuals shall, solely by reason of their disabilities, be excluded from participation in, be denied the benefits of, or be subjected to discrimination in public programs" (Department of Labor, n.d.).

LEGISLATION AFFECTING ACCESS

The Americans with Disabilities Act of 1990 (ADA) was created to assist individuals with disabilities. The ADA, Section 508, allows for "comparable access to information… be provided, taking the needs of all users and learners into account" (LaGrow, 2017). On July 26, 1990, President George H. W. Bush signed the Americans with Disabilities Act, a civil rights law prohibiting discrimination on the basis of disability. Public Law 110-325, sec. 8, 122 Stat. 3553, 2559 (2008) is the ADA Amendments Act that stated a clearer definition of disability to mean, with respect to an individual:

- a physical or mental impairment that substantially limits one or more of the major life activities of such individual
- a record of such an impairment
- being regarded as having such an impairment (not transitory and minor, where transitory impairment has an actual or expected duration of 6 months or less) (ADA Title III Regulations, 2017; ADA Definition of Disability, n.d.)

To discriminate means to distinguish, single out, or do unequal treatment of an individual (or group) based on certain characteristics, including:

- Age
- Disability
- Ethnicity
- Gender
- Marital status
- National origin
- Race
- Religion, and
- Sexual orientation. (Find Law, n.d.)

The ADA is broken into five different areas or titles. Each area or title has a different claim investigation and/or enforcement agency within the Federal Government. Table 1 identifies each Title, area and enforcement agency.

Table 1: ADA Coverage

TITLE	AREA	ENFORCEMENT AGENCY
Title 1	Employment	• U. S. Equal Employment Opportunity Commission • Office of Federal Contract Compliance Programs
Title 2	Public Services	• U. S. Department of Transportation • U. S. Department of Justice • U. S. Department of Education • U. S. Department of Health and Human Services • Civil Rights Center
Title 3	Public Accommodations	U. S. Department of Justice
Title 4	Telecommunications	Federal Communications Commission
Title 5	Miscellaneous	

Source: Public Law 110-325, sec. 8, 122 Stat. 3553, 2559 (2008)

The Congressional Committee intended that the types of accommodations and services provided to individuals with disabilities should keep pace with the rapidly changing technology of the times, therefore, professional development training activities are required to keep well-informed of the critical issues in the field (Gordon & Keiser, 1998; House Education Committee report, H.R. Rep. 101-485(II), 1990, p. 108 as cited in Simon, 2011).

In 1990, Tim Berners-Lee developed a text-based system known as the World Wide Web (WWW) to navigate the Internet and share information (Hackett, Parmanto, & Zeng, 2005). Constantly emerging technology with multimedia components has created challenges for people with disabilities. Accessible web techniques help make equal educational opportunities available for students with disabilities. The Trace Research and Development Center at the University of Wisconsin at Madison produced the Unified Web Site Accessibility Guidelines which became the Web Content Accessibility Guidelines 1.0 (WCAG 1.0) under the Web Accessibility

Initiative (WAI) of the World Wide Web Consortium (W3C) (Flowers, Bray, and Algozzine, 2001; Spindler, 2002; Thompson, Burgstahler, & Comden, 2003; Hackett, Parmanto, & Zeng, 2005; Veal, Bray, & Flowers, 2005). WCAG 1.0 defined web accessibility so as to allow people with disabilities to perceive, understand, navigate, contribute, and interact with the Web (May & Zhu, 2009; Betts, Welsh, Pruitt, Hermann, Dietrich, Trevino, Watson, Brooks, Cohen, & Coombs, N, 2013). WCAG 1.0, and subsequent 2.0, have distinguished three separate priority levels based upon the impact of accessibility. These levels are:

Priority 1: items on web pages that **must** be made accessible
Priority 2: items on web pages that **should** be made accessible
Priority 3: items on web pages that **may** be made accessible

The WCAG Guidelines and Principles are listed in Appendix A. To reinforce these guidelines and principles, laws were passed: "Section 504, an amendment to the Workforce Rehabilitation Act of 1973, prohibits discrimination on the basis of disability for all state and local governments that receive Federal financial assistance" (Lieu, 2003). Section 508 of the §1194.22 Rehabilitation Act "requires that all organizations receiving federal funds to comply with standards that make electronic equipment and web sites usable by individuals with sight, hearing, and other disabilities" (Flowers, Bray, and Algozzine, 2001 p.476). Within Section 508, standards for electronic and information technology were set forth as requirements for web page accessibility (29USC§794d, 1986). Section 508 requires that all individuals with disabilities have access to, and use of information and data, comparable to that provided to individuals without disabilities, unless an undue burden would be imposed on the institution (Department of Labor, n.d.). These Section 508 standards merged the WCAG 1.0 guidelines and the WCAG 2.0 principles into one comprehensive list. Table 2 lists the Section 508 standards.

Table 2: Section 508 of the §1194.22 Rehabilitation Act Standards

PARAGRAPH	SHORT DESCRIPTION
(a)	Provide alternate text for images
(b)	Synchronize alternates to multimedia presentations
(c)	Convey information displayed solely in color in another way
(d)	Ensure that pages are readable without its style sheet
(e)	Provide text inks for server-side image maps
(f)	Use client-side image map when possible
(g)	Identify headers and footers in all tables except those used for layout
(h)	Identify tables that have two or more rows or columns that serve as headers
(i)	Give each frame a title
(j)	Make sure that the screen does not flicker quickly
(k)	Provide a text only page for a site that cannot be made accessible
(l)	Provide alternate text for scripts that convey information
(m)	Give a link for accessible plug-ins
(n)	Make sure to associate form controls and their labels
(o)	Allow user to skip repetitive navigation links
(p)	Give notification and extensions of timed responses

Source: May & Zhu, 2009

HOW CAMPUS WEBSITES AFFECT ACCESS

Studies show that students with disabilities who receive support are just as successful as students without disabilities, but an alarming number of college students who have a diagnosed disability do not seek support when they get to college; therefore, it is critical for colleges to go above and beyond to make all content accessible.

Studies have shown that postsecondary students with disabilities who receive appropriate support services persist in their studies and graduate at the same rates as their non-disabled counterparts (Horn & Berktold, 1999 as cited in Moisey, 2004; Hurdt, 2018). According to Flowers, Bray and Algozzine (2001), “Assistive technologies or accessibility aids such as Braille output systems, keyboard modifications, screen enlargement utilities, and voice output utilities

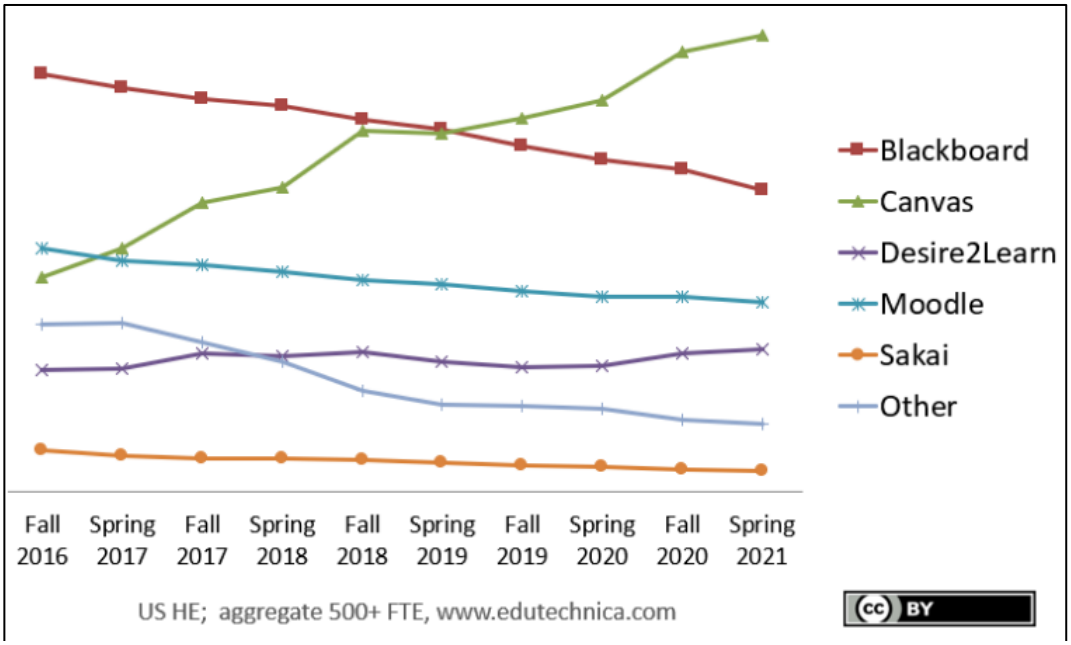
allow individual with disabilities to access information from the WWW" (Flowers, Bray, and Algozzine, 2001 p. 476). Additionally, accessibility also benefits those using low-end technology with lower modem speeds, persons utilizing wireless WWW connections, and the aging. As we age our chances of developing a mild or moderate disability increases. By age 65, most persons have lost at least some of their ability to focus, resolve images, distinguish colors, and adapt to changes in light (Lescher, 2000 as cited in Hackett & Parmanto, 2009).

The "home page" of a website is the uniform resource locator (URL) associated with a person, product, or organization. When entered into the web browser, this is the first page that loads and is viewed. The home page is the entrance to the institution's entire web site (Meyer, 2008). The intent of a home page is the most important page of a website as it creates an identity or first impression, provides a clear navigation into subsequent pages, but more importantly is an indication of the institution's commitment to accessibility (Nielsen, 2002).

HOW AN LMS AFFECTS ACCESS

Learning Management Systems (LMS) have been around since 1960 with the University of Illinois' PLATO (Programmed Logic for Automated Teaching Operations). It was not until the 1990s when the online learning environment better met the needs of teachers and students with SoftArc's FirstClass and the release of Blackboard. A LMS is used for online/distance education or to augment a face-to-face course. The rapidly changing technology requires the software systems to stay up to date. The latest LMS usage data has shown moving away from the legacy LMS systems towards modern user interfaces, especially with built-in accessibility tools (Edutechnica, 2021). Figure 2 shows market share of the current Learning Management Systems in use.

Figure 2: LMS Market Share



Source: https://edutechnica.com/2021/06/21/lms-data-spring-2021-updates/

Learning management systems allow for:

- Classroom management, including lecture notes, learning aids, syllabus, and training administration
- Course management, including tools for feedback, evaluations/testing, tracking, grading, and discussions
- Curriculum management, including tools to use to identify common attributes across courses
- Learning management, self-directed learning, centered around the learner, to access the course at different times and rates depending on the learner
- Community management, allowing for multiple learning contexts and organizations. (Chaubey & Bhattacharya, 2015; Pappas, 2015)

There are accessibility tools within most LMSs to assist faculty in the creation of accessible pages per the ADA and section 508, as well as accessibility tools within most LMS to assist students in their learning. Students (disabled or abled) can use the accessibility tools within the LMS course.

Blackboard

Blackboard Learning Management System websites have an accessibility checker that tests web pages as they are being developed. This A-Checker Online evaluates web pages for compliance of several W3C guidelines (Blackboard, n.d.). Also available is the WAVE Accessibility Tool to evaluate web content. On the student side of the LMS, Blackboard contains Blackboard Ally. This additional tool focuses on making digital course content more accessible and can be added to other non-Blackboard learning management systems.

Canvas

The Canvas LMS strives for WCAG 2.1 Level A/AA and Section 508 conformance. Regular testing is conducted to identify conformance issues by Instructure and WebAIM according to WCAG 2.1 standards. Testing is regularly conducted using automated tools, assistive technology (such as screen readers, keyboard testing, etc.), and coding best practices. Mechanisms are in place for logging and fixing accessibility defects (Canvas, n.d.). Blackboard Ally is available as a plug-in for Canvas for students' accessibility.

Moodle

There is an accessibility checker built into the LMS pages as the Instructor creates the pages based upon the WCAG 2.0 guidelines. An additional software plugin allows user to change text size and color scheme. Moodle is used by US Government agencies (Moodle, n.d.). Blackboard Ally is available as a plug-in for Moodle for students' accessibility.

Desire2learn (D2L)

Brightspace (D2L) is a partner of the National Federation of the Blind's Strategic Nonvisual Access Partnership (SNAP) program which has now been redesigned as their Centre

of Excellence in Nonvisual Access (CENA). Accessibility and Universal Design for Learning (UDL) are incorporated into D2L's entire development process. Faculty can even use a built-in accessibility checker for content, quizzing and discussions (D2L, n.d.). Blackboard Ally is available as a plug-in for D2L for students' accessibility.

Blackboard Ally

In 2016 Blackboard purchased Fronteer, a UK-based company that created an accessibility tool called Ally (Kelly, 2016). Ally allows faculty members to improve overall accessibility in their course, including comprehensive reporting of course content accessibility. There are eight alternative formats within Ally from which the students can access content. These alternative formats include a text-to-speech tool, mobile-friendly HTML, tagged PDF, e-pub, and electronic Braille. (Blackboard Help, n.d.). Blackboard Ally is available as a plug-in for Moodle, Canvas, D2L, and other non-Blackboard products.

UNIVERSAL DESIGN

Universal design was developed in the early 1980s for the engineering and architecture fields to design products and environments to be useable by all people. The basic principles of universal design include:

- Equitable use
- Flexibility in use
- Simple and intuitive to use
- Perceptible information
- Size and space for approach and use
- Tolerance for error

- Low physical effort. (Gutierrez & Long, 2001; Burgstahler, 2015)

However, it was 1997 when Universal Design was extended to include academic environments. UD is the process of making additional accessibility decisions while materials are being developed to assure that it will be accessible to potential students with a wide range of abilities, disabilities, learning styles, and other characteristics (Burgstahler, Corrigan, McCarter, 2004). UD is especially important when it comes to resources, especially educational materials, found online.

STATEMENT OF PROBLEM

Little research has been done to identify the extent community colleges know how universal design or a LMS with built-in accessibility tools affects the level of success of a student with or without disabilities. It is imperative that institutions understand the importance of accessibility tools for success of disabled students. Accessibility problems prevent access to features and functionality of an LMS and the WWW (Babu & Singh, 2013).

This study will focus on the accessibility practices at community colleges within Michigan, specifically associated with the Learning Management System at that institution.

How Colleges Decide on an LMS

Making the decision on which LMS to purchase for a college takes an average of six months to make, thoroughly evaluating all factors and alternatives (Ash, 2013; Pappas, 2015). There are many factors an institution considers when choosing a learning management system. Each institution has its own wants and needs. All faculty, administration, IT department, and support services need to create a wish list and conduct a needs analysis. The following list might be part of that process:

- Is my LMS user friendly for students, faculty, and IT?
- What is the learnability and usability of the LMS?
- What key features do I need for my learners?
- Does my LMS provide customizable features?
- Will my new LMS solution be mobile-ready?
- Has my LMS security and reliability been tested?
- Does my LMS have customer support and IT support?
- Is my LMS competitively priced?
- Does my LMS monitor progress in learning?
- Is my LMS compatible with the current student information system?
- Is ADA accessibility one of the factors being considered?
- Will my LMS meet my future needs? (Pappas, 2015; Schaffhauser, 2015; Muhammad, 2017; Sultana, 2021)

Ford (2014) identified federal disability legislation to be ambiguous, controversial and/or complex for many faculty and administration. Through an investigation of case and complaint analysis, Ford (2014) created process maps to be incorporated into the respective institutions' policies and trainings. Do these process maps extend to purchasing?

OVERVIEW OF THE RESEARCH STUDY

The plan for this grounded theory qualitative research study is to survey each of the 28 community colleges in Michigan as to the use of accessibility tools within their respective learning management systems. These community colleges within Michigan are a convenience sample of institutions of various sizes and demographics spread throughout the 83 counties in the state.

Research Questions

The survey and interviews were to answer the following research questions, which are guiding this study:

- Research question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address Universal Design in the institution's learning management system for the educational success of students with disabilities?
- Research Question #2: Which tools do community colleges use to make information accessible within the institution's learning management system; how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change?

Research Methods

This grounded theory qualitative research plan contains an iterative process to answer the two research questions. The questions were specific and context free (Leedy & Ormrod, 2018).

The web-based survey tool, SurveyMonkey, was used to capture the first set of data. The data was analyzed and coded to identify any patterns or themes that would emerge. The web-based video conferencing tool, Zoom, was used to interview participants to get a better, more in-depth look at the themes or patterns identified with the first set of data. Selective coding grouped data according to the original themes. Additional interviews were conducted, also using Zoom, to further explore or interpret by allowing the personal viewpoint to be heard (Glaser & Strauss, 1967) and more clearly align the data to the resulting theory.

Study Participants

The study was directed to the Accessibility Office or Officer within the community colleges found in Michigan to identify a deeper understanding of the current usage of accessibility tools within their LMS. Initial emails were sent to the accessibility offices at each institution; however, subsequent emails were sent to other staff and administration to be

redirected to appropriate accessibility personnel. The results and future implications would be a guide for the respective administration and/or decision makers.

DEFINITION OF TERMS

To augment the understanding of this study, terms that are pertinent to this dissertation and are subject to multiple interpretations are defined as follows:

Assistive technology – as defined by the Americans with Disabilities Act as "any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities" (IDEA Act, 2004; Nichols & Larson, 2016; Koch, 2017).

Disability - Blind, other visual impairments, specific learning disabilities, mobility impairment, hearing impairment, speech impairment, cognitive, language, learning, and neurological disabilities. (Burgstahler, 2015; https://www.w3.org/TR/2008/REC-WCAG20-20081211/ definition of accessibility)

Learning Management System (LMS) – a web based or cloud-based software application for the administration, documentation, tracking, reporting, and delivering by e-learning education courses or training program (Ellis & Ryan, 2009 as cited in Chaubey & Bhattacharya, 2015). An LMS is also known as Personal Learning Environment (PLE), Integrated Learning System (ILS), Course Management System (CMS), Virtual Learning Environment (VLE), and E-learning Courseware and Training Management System (TMS).

CONCLUSION

This dissertation contains five chapters. The introduction set the stage of the research, the methods, participants, and specific research questions. Following this chapter is a literature review of the current research on ADA and accessibility tools within an LMS. Chapter 3 is reviewing the methodology for this research, the rationale for use, the rationale for the research questions and participants, and addressing validity, reliability, assumptions, and researcher's bias. Chapter 4 will address the two research questions and the survey answers supporting each

question. The final chapter will discuss interpretations of the findings and conclusions. Recommendations for future research will be listed at the end of that chapter

CHAPTER TWO: LITERATURE REVIEW

INTRODUCTION

This literature review will include a review of research related to the Americans with Disabilities Act and its effect on web accessibility. Research and investigations on universal design, software, including learning management systems, will identify how educators can be compliant. A review of the research conducted on websites will lead into the topic of student success.

AMERICANS WITH DISABILITIES ACT (ADA) AND EDUCATION

In the beginning, the ADA went into effect in 1990 and educators focused its effects on education. Barnard-Brak, Lechtenberger, and Lan (2010) completed a study with 5 students with disabilities. It was found that to improve a disabled student's college experience, the student needs to request accommodations from the disability services office of the institution. Acknowledging the disability, and requesting assistance helped the student succeed.

In 2012, Mamiseishvili and Koch completed a longitudinal study using the Beginning Postsecondary Students (BPS:04/06) of 2003. Half of the 890 students failed to persist, transfer, or complete by the end of the third term. It was identified tutors and having assistance with exams were the most frequently received accommodations. However, having disability advisors to help navigate the college system within the first year supported in persistence of students with disabilities. Mamiseishvili et al. (2012) also noted the depression led to non-completion.

Research by Reinschmiedt, Sprong, Dallas, Buono, and Upton (2013) surveyed 116 students at four universities to identify to what extent accommodations assisted the student with

disabilities. Technology, testing with accommodation, academic counseling, tutors, and classroom accommodations were found to be the most help and led to high satisfaction ratings.

Hong (2015) had 16 students with disabilities complete journals for 10 weeks. Reflective journaling was used daily to capture experiences of these students. The themes that emerged from these journals included faculty perceptions, appropriate advisor knowledge and responsiveness, stressors and quality of support services. Stressors included physical, mental, emotional, and social stigmatization.

In 2018, Knight, Wessel, and Markle conducted a longitudinal study of different cohorts of incoming freshmen students with disabilities starting at Ball State University in 2004 through 2012 to identify if a disability influences the time to degree completion. Using yearly cohorts with a total of 32,187 students with or without disabilities, of which 2% were identified as students with disabilities. Students with disabilities that registered with the Disability Services were identified as the students with disabilities. Some students with disabilities did not register and was grouped with the students without disabilities cohort. The cohort that graduated in four years consisted of 35.2% students without disabilities and 29.7% students with disabilities. The cohort that graduated in six years, 56.1% were students without disabilities and 59.1% were students with disabilities.

Madaus, Gelbar, Dukes, Lalor, Lombardi, Kowitt, and Faggella-Luby (2018) completed a systematic literature review of 1,036 articles about postsecondary disability services and found more than 40% of these articles did not present data or were literature reviews. The majority of articles were about students with disabilities, disability services, faculty, and support services. There were 71.4% conducted within the United States, 12% in Great Britain, and the remaining were from other countries. Madaus et al. (2018) found with all of these articles, there is a lack of

depth and methodological rigor to support appropriate successful practices for students with disabilities. Many of the studies were using small sample sizes, which does not lend research to validation.

Another literature review by Kutscher and Tuckwiller (2019) looked at 16 qualitative "view" studies and 10 quantitative "effect" studies. A comparison of these studies was done to major factors such as personal characteristics, academic and social engagement, and accommodations.

Herbert, Coduti, and Fleming (2020) used 26 students within focus groups to identify what supports are successful for students with disabilities. The conclusion for this research was that even though the Americans with Disabilities Act is almost 50 years old, most faculty have limited knowledge of the law and how to accommodate a student with disabilities. However, those students that have connected with faculty and staff persist, and students who utilize disability services are more likely to persist.

In brief, Madaus et al. (2018), Kutscher and Tuckwiller (2019), and Herbert et al. (2020) came to the same conclusion as Peña (2014) that there has been very limited research on successful support systems for students with disabilities. Barnard-Brak et al. (2010), Mamiseishvili and Koch (2012), Reinschmiedt et al. (2013), and Knight et al. (2018) recognized the need for accommodations and/or disability services for students with disabilities to be successful. Additionally, it was found that research on students with disabilities compared to students without disabilities, there is no other distinct diversity mentioned (gender, race, age, etc.).

WEB ACCESSIBILITY

Another focus of research related to accessibility of educational resources was institutional websites. Thompson, Burgstahler, and Comden (2003) evaluated 1,013 websites from 102 public universities for accessibility. At the first part of the study, the software Bobby was used to evaluate accessibility. After that evaluation, the researchers went through the same web pages manually to evaluate accessibility to identify any correlation between an automated software approach and a manual evaluation. The correlation between the two evaluations was about 0.6, or strongly correlated. However, the researchers noted accessibility should be checked by both procedures as a few sites were totally inaccessible and a few sites were totally accessible. Alam (2014) confirmed the need for dual accessibility testing with 54 web pages of educational institutions.

A qualitative study with 10 library and information science (LIS) faculty members in 2014 found that all thought accessibility was important but had very little knowledge of how to implement it (Mulliken and Djeno, 2017). Mulliken and Dieno found that the participants, LIS faculty members, were divided as to the need to add accessibility to the LIS curriculum, even though the Office of Civil Rights requires it.

Yesilada, Brajnik, Vigo, and Harper (2015) did a qualitative study on perceptions and pre-defined definitions of what accessibility is. The researchers were not from the United States; however, the surveys were sent to web accessibility-related mailing lists, which included W3C Web Accessibility Initiative Interest Group, Mozilla web accessibility, CHI announcements, SIGACCESS announcements, and WEBAIM mailing lists. Over 300 people in responded to their survey with 49% of the respondents from the United States and 32% were from Europe. Yesilada et al. (2015) found web sites that are accessible and usable are beneficial to all people,

abled and disabled. The majority of respondents noted accessibility, usability, and user experience are interrelated qualities as checking web accessibility needs to be complemented with user testing.

Bai, Stray, and Mork (2019) used a multiple methods research approach to checking web accessibility. There were 53 participants, web developers and testers, using the following 6 different methods to evaluate accessibility:

- WCAG 2.0 walk-through
- SiteImprove accessibility software
- Cambridge Simulation Glasses to simulate visual impairments
- Screen Reader
- Dyslexia Simulator, a Google Chrome extension
- Personas or users with different challenges. (Bai et al. 2019)

The results of the various methods showed web accessibility evaluations should not be a once-used single method. To get a clear picture, it would be best to use multiple methods to evaluate and complete the evaluations often.

Web accessibility is a human experience. While HTML code checkers can be used to have a better analysis of accessibility, it is best to add the human analysis. Thompson et al. (2003), Yesilada et al. (2015), and Bai et al. (2019) included both software and human accessibility evaluations. These studies recognized this need to get a true picture of the phenomenon.

Bruyère (2008) went a bit further with the accessibility policy and looked at the practices of these institutions. This research was a survey of 700 public and private two-year institutions for the policy of and/or guidelines for web page design and accessibility. The focus was on

admissions forms, terminology used, navigational ease, and the use of headings and other design elements. Only 51% of the institutions had an accessibility policy and/or guideline.

Another dimension of web accessibility is the institution's policy on educational material. Bradbard, Peters, and Caneva (2010) attempted to gather the accessibility policies of the 58 land-grant institutions in the United States. Only 50 institutions had visible policies. These policies were analyzed per the WebAim's criteria for accessibility to identify the extent of coverage. The policies needed to be clear in the coverage, who was responsible for compliance, time frames for implementation, budget implications, and risk mitigation. Schmetzke (2001) said an accessibility policy is essential for compliance.

To recap this research: HTML code checkers are able to check most websites; however, a student with disabilities would give accessibility evaluations the needed human perspective. Thompson et al. (2003), Bruyère (2008), Bradbard et al. (2010), and Bai et al. (2019) concluded lack of knowledge, cost, and the time to implement were the main barriers for compliance.

HTML CODE ACCESSIBILITY CHECKERS

There are online code checkers (software) that analyze the source code of the web pages by using algorithms to measure compliance to the 508 standards, the WCAG guidelines, or the WCAG principles. Several online code checkers are available to assist in evaluation of accessibility of a webpage. The following is a sample of available online code checkers:

- TIDY - http://infohound.net/tidy;
- Bobby - ibm.com/able/dynamic-assessment-plug-in.html - webxact.watchfire.com;
- Cynthia Says - http://cynthiasays.com;
- Accessibility valet - http://valet.webthing.com/access/url.html;
- A-Checker - https://achecker.ca/checker/index.php

- University of Stanford's Web Accessibility Checker - https://soap.stanford.edu/;
- Functional Accessibility Evaluator - https://fae.disability.illinois.edu/anonymous/?Anonymous%20Report=/
- SortSite - https://accessibility.oit.ncsu.edu/sortsite/
- WAVE - https://wave.webaim.org/ (Mifsud, 2011)

Although automatic tools are convenient, they do not identify all accessibility issues. Research on the efficacy of HTML code accessibility checkers found human testing is always necessary because accessibility is about the human experience (WebAIM, n.d.). A knowledgeable individual and individuals with disabilities will need to examine the website to ensure clarity of language and ease of navigation. Schmetzke (2001b) confirmed this as specifically accessibly designed Web pages ensure that all people have access to Web-based information (p. 35). Michael Cooper, the design and technical lead for Bobby, says the program benefits all people who use the Web, disabled and unimpaired (as cited in Carnevale, 1999). Hackett et al. (2005) found website content changes on an average of every 100 days. These researchers stressed that testing accessibility of a website is a constantly moving target.

Once again, Schmetzke (2001b) and Hackett et al. (2005) confirmed the need for the software code checkers and the human perspective on evaluating accessibility of websites.

RESEARCH ON UNIVERSAL DESIGN

Universal design was developed in the early 1980s; however, it was 1997 when North Carolina State University defined universal design for educational purposes (Burgstahler, Corrigan, McCarter, 2004). The Center for Applied Special Technology (CAST) and The National Center for UDL developed universal design guidelines to allow faculty to design an instructional environment that promotes learning by all students, yet preserves the integrity of the

course (Katsiyannis, Zhang, Landmark, & Reber, 2009; Betts, Welsh, Pruitt, Hermann, Dietrich, & Trevino, Watson, Brooks, Cohen, & Coombs, 2013). The guidelines identified learning environments would use multiple means of representation, multiple means of action and expression, and multiple means of engagement.

Research has been done on the efficacy of Universal Design for Learning. The National Center on Universal Design for Learning looked at the 31 different checkpoints identified by Center for Applied Special Technology (CAST). Extensive reports are available for each of these checkpoints on the CAST website. All confirm the credibility and effectiveness of UD.

Several literature reviews were done focusing on Universal Design with some conflicting results. Roberts, Park, Brown, and Cook (2011) looked at 200 studies done after 2000. The conclusion was that only eight studies were true research studies rather than guidelines or practical tips on how to implement UD of Instruction. Roberts, et al. concluded there has been very little research to support UDI as evidenced by GPAs, retention rates, and/or graduation rates.

Mangiatordi and Serenelli (2013) followed Roberts et al. (2011) with 80 different peer-reviewed studies of Universal Design for Learning. Only 19 of those studies had results that were true research. The other papers were situational, guidelines, or communication. The research was limited to the years 2000 through 2012 and using only abstracts.

Rao, Ok, and Bryant (2014) were not convinced the previous research was extensive enough. Rao et al. conducted a review of literature from 2012 to 2015 with Universal Design to identify its success. Within the research of 200 articles, only five were true research. These five showed the use of UD to be effective for the K-12 education institutions, as well as the post graduate institutions.

Al-Azawei, Serenelli, and Lundqvist (2016) wanted to build on the research from Mangiatordi and Serenelli (2013), and Rao et al. (2014). The research focused on UDL; however, it was unclear on the exact usage of that term. The research included 17 peer-reviewed articles about learner environments rather than learner limitations dated 2012 to 2015. The results of this study enforced that UDL is an efficient approach to designing accessible learning content for all students.

Studies by Roberts et al. (2011), Mangiatordi and Serenelli (2013), Rao et al. (2014), and Al-Azawei et al. (2016) used the terms Universal Design, Universal Design for Learning, Universal Design for Instruction, and many other variations thereof. All noted the misuse of these terms in the research. Koch, Hennessey, Ingram, Rumrill, and Roessler (2006) identified the interchanging of terms were used in multiple situations. The result was a possible defect in the research in universal design, in all its variations.

McGuire-Schwartz and Arndt (2006) completed a qualitative study on pre-service teachers of early childhood classrooms using Universal Design for Learning. The study was focused on two sets of teachers and their experiences with young learners. The results indicated that UDL would be helpful for all students, abled and disabled.

The research by Spooner, Baker, Harris, Ahlgrim-Delzell, and Browder (2007) used an experimental research method with a pre-test and post-test on a control group and an experimental group. The focus was UDL in pre-service teachers and lesson plan development. The quantitative analysis found a one-hour training on UDL for these 72 teachers significantly improved the lesson plan development. The teachers were able to make curriculum accessible for all students.

Moore, Smith, Hollingshead, & Wojcik (2018) focused their research on the pre-service teachers and how to use UDL. Teaching the six teachers, even with some technology, resources, and funding constraints, found improved student retention and accessible education.

In summary, universal design for educational purposes was defined in 1997; however, researchers have been using many different varieties of terms for the same concept. When the terminology was used consistently, better results were confirmed.

LEARNING MANAGEMENT SYSTEMS

An Educause report in 2009 stated almost 90% of the American universities and colleges use a Learning Management System for educational materials in their classes. Many research studies, including De Smet, Bourgonjon, De Wever, Schellens, and Valcke (2012), and Babu and Singh (2013) discussed the key role that learning management systems play in today's educational landscape.

The American Foundation for the Blind (2008) conducted a survey of 100 people to find out how accessible online educational tools really are. Nearly 70% of the respondents used Blackboard and 50% had used WebCT. The results of this study identified people using accessibility tools, such as screen readers or screen magnification software, rarely accessed educational materials without difficulty.

De Smet et al. (2012) surveyed 505 teachers from secondary schools in Belgium to find 93% of learning management system usage was for document publishing and 72% of the LMS usage was for communication from/to teacher and students. Based upon ease of use and support availability increased instructor use of other functionalities within the LMS.

Babu and Singh (2013) found there was little research on the accessibility of these systems. This allowed for the creation of a task-oriented, user-centered, multi-method evaluation

(TUME) technique to evaluate and improve accessibility within an LMS. This research included six blind or visually impaired students and five web developers using a think-aloud observation method to complete specific tasks within an LMS. This qualitative approach allowed the web developers to understand how and what the students were interpreting on the screen information and commands. Babu and Singh (2013) concluded the TUME approach is valuable to evaluate accessibility, but that more research would need to be expanded.

A conclusion of much of the research is that LMSs are relatively new to the educational world. Technology is constantly changing and the LMSs are always evolving to assist the learning. With each new version of an LMS, there are increased opportunities for ADA accessibility to be integrated into the system (Betts, Welsh, Pruitt, Hermann, Dietrich & Trevino, 2013).

RESEARCH ON INSTITUTIONS' HOME PAGES

Extensive research has been conducted on the homepages of community college websites, universities, or the library web pages as an indication of the college's commitment to ADA and accessibility. As research by Flower, Bray, and Algozzine, (2001) and Hurdt, (2018) have emphasized community colleges, with open access and opportunity, are leaders in educating members of special populations therefore the focus of this research. Research by Byerley and Chambers in 2002 focused on academia's responsibility of accessibility as postsecondary institutions keep up with technological changes (Byerley & Chambers, 2002, p. 5). College websites must be made accessible so that students with disabilities are afforded the same benefits of online services as their nondisabled peers (Erickson, Trerise, VanLooy, Lee & Bruyère, 2009).

Flowers, Bray, & Algozzine (2001) completed a study of the home pages of 253 randomly selected community colleges throughout the United States using Bobby 3.2 software. It was found that only 23% of the home pages were fully accessible according to the WCAG Priority 1 checkpoints. Most of the errors (86%) were moderate or easy to fix, such as adding alternative text to images (Flowers et al., 2001; Wisdom, White, Goldsmith, Bielavitz, Davis, & Drum, 2006).

Schmetzke (2001) looked at 1,051 community college home pages within Wisconsin using Bobby and found that only 29% met the Web content accessibility Priority 1 guideline checkpoints. Later Schmetzke looked at 13 University of Wisconsin home webpages, the errors went from 48% in 1999 with no policy to 62% in 2004 with a university policy in place.

Wisdom, White, Goldsmith, Bielavitz, Davis, & Drum (2006) took a different approach after reading the research by Schmetzke in Wisconsin. Wisdom, et al. conducted interviews with 46 employees from 14 of the 17 community colleges in Oregon. The research questions pertained to the employees at Oregon Community Colleges and not the websites thereof. This approach was meant to identify the knowledge level of web site accessibility and the laws pertaining to it. About half of the information technology managers, web developers, disability support services staff, and instructors of these institutions were somewhat familiar with Section 508 of the Rehabilitation Act. Also, some of the schools used Bobby to check the accessibility of their pages and self-identified an average of 3.4 on a scale of 1 to 5 (5 indicating ideal accessibility) when rating their school's web site.

While there is clearly a need for community colleges to improve their web accessibility, Comeaux and Schmetzke's (2007) work indicated that establishing institutional policy regarding accessibility can influence the percentage of accessible web pages. Erickson, Trerise, VanLooy,

Lee, and Bruyère (2009) found a gap between having an institutional policy or guideline and actually having an accessible website when a survey was sent to community colleges across the U.S. and received 696 responses identifying the existence of some type of guidelines governing web site design. A vast majority (72%) said their college did have a guideline. As subsequent research of those colleges by Erickson, Trerise, Lee, VanLooy, Knowlton, and Bruyère (2013) found none of the 30 college websites tested were ADA accessible.

Reynolds and Lennex (2009) used TIDY to evaluate 32 webpages of Morehead State University (MSU) faculty members, 168 Kentucky school districts, and 65 teacher sites for accessibility from August 2006 through December 2007. MSU faculty are not required to be trained in accessibility; however, MSU did recommend the webpages to be checked with Cynthia Says. TIDY was used for this research which resulted in 84% of the faculty members' webpages to be approved for web accessibility. Reynolds and Lennex (2009) found none of the high school teachers' sites to be accessible. A survey was also conducted with a response rate of 7% of the school districts' technology coordinators. Most respondents stated there was no guideline or policy for web accessibility for the webpages.

May and Zhu (2009) looked at the home pages of 1,117 websites within the Texas public school system using Bobby from October 2007 through January 2008. May and Zhu found less than 13% of the websites passed the Section 508 Guidelines and less than 17% of the websites passed WCAG Priority 1. It was noted that the Texas public school system did not have a policy or standard for web accessibility at that time. The State of Texas has since adopted Texas Administrative Code 206.70 to require websites of state-funded postsecondary institutions to be accessible (Thompson, Comden, Ferguson, Burgstahler & Moore, 2013).

Whitney (2009) looked at the websites of 12 Illinois universities with the Illinois Board of Higher Education accessibility policy and how accessibility changed from January 2006 through January 2007. At that time, students with disabilities constituted 10% of the student body (Whitney, 2009). Whitney used the University of Illinois at Urbana-Champaign Functional Accessibility Evaluator (FAE) to evaluate the accessibility of the homepages of the universities. The evaluator used a pass-fail rate, no matter how many errors were on the page. The average pass rate for accessibility for the websites was 85% and the average fail rate was 13.5%. The Illinois Information Technology Accessibility Act passed in 2007; therefore, this pass-fail rate was a pre-Act assessment (Thompson et al, 2013).

Forgione-Barkas (2012) completed a collective case study of websites for 102 postsecondary institutions in North Carolina with a minimum enrollment of 1,000 students using SortSite. It was found that only two sites meeting a minimum of 80%-page compliance.

Thompson et al. (2013) focused on 4,365 higher education institutions in the United States. Their research included the top 10 HTML pages and top 10 .pdf files within each institution's domain. They found 77.9% of the sites had headings and 60.4% had alternative text tags on images. It was noted that the California State University system, Texas state system, and Illinois state system had state accessibility laws and policies for over 10 years. The accessibility for those states were between 30% and 40%, whereas the other states' institutions rated on an average of 7%.

McGough (2016) looked at the University of Washington and 33 of its peer research institutions' websites, specifically comparing the disability services offices and the admissions webpages. Web Accessibility Evaluation (WAVE) was used to evaluate the sites. Only one page

was found to be without error, which coincidentally had recently been investigated by the Department of Justice for accessibility.

According to research by Betts, Cohen, Veit, Alphin, Broadus, and Allen (2013) there are no statistics on the frequency of using an HTML code accessibility checker on a regular basis. It is hoped that instructors regularly check the content of their course within an LMS for accessibility.

In brief, research has been done on the external websites of educational institutions, either home page or library, which is often an indication of the institution's commitment to accessibility. However, very little research has been on internal institutional web pages. The learning management system within the institution is the day-to-day interface with the students and can have a direct impact on student success.

STUDENT SUCCESS RELATED TO ACCESSIBILITY

Accessibility is the key to success for students with disabilities. However, accessibility is defined in many different ways. A better understanding of what students want for them to be successful is needed.

A literature review conducted by Peña (2014) using the top four journals of higher education found that research pertaining to disabled students and accessibility was critically low from 1990 to 2010. The following peer-reviewed journals were used in this research:

- The Review of Higher Education
- The Journal of Higher Education
- Research in Higher Education
- The Journal of College Student Development

The search terms used were accessibility, disability, disabilities, handicapped, special education, special needs, and special populations. The search found 25 articles, representing only 1% of the total articles even though 10% of all students in higher education have a disability.

Strayhorn (2012) identified the sense of belonging and campus involvement to be a contributing factor to persistence and academic success. Vaccaaro, Daly-Cano, and Newman (2015) completed a grounded theory research project with eight students who had self-identified as having a disability. Other studies have been done on college students, but not specifically those with a disability, and the sense of belonging. Vaccaro et al. (2015) identified a link between self-advocacy and the sense of belonging their study.

Hurdt (2018) found students with a disability had a higher retention rate and higher academic performance (as shown in graduation rates, retention, and GPA) than students without a disability as long as accommodations were received. The study took all students at a community college in North Carolina from 2010 to 2014, abled or disabled, did quantitative analysis to match the abled and the disabled. It has been found that distance-education students with disabilities already have access to the equipment they need to make up for their impairments (Carnevale, 1999).

In 2007-08, according to the National Center for Education Statistics, 10.9% of students enrolled in higher education had a disability. In 2015-16 that percentage jumped to 19.5% (Newman, Madaus, Lalor, & Javitz, 2021). Newman et al. (2021) used the data from the National Longitudinal Transition Study in 2001 and compared it to the data from the National Longitudinal Transition Study-2 in 2009 on 2,330 students. The research was focused on the universally available programs (tutors or writing centers) compared to the disability-related supports. The results showed the 75% of the disabled students who used the general student body

schoolwork supports persisted. Whereas 51% of the disabled students who used only disability-related supports persisted. The study did not identify how many of the disabled students used the support services. Unfortunately, Newman and Madaus (2015) identified that only 35% of the students who received special education services in high school reported their disability to their college or university.

A case study with photo-voice process was done with six participants with disabilities in California to find how community colleges could help students with disabilities succeed (Brophy-Felbab, 2021). The participants shared that having a dedicated disabled student services center (DSPS) with counselors and a testing center would help support students with disabilities. A similar study was done in Oklahoma with 13 students with disabilities (Kissling, 2021). The need for academic and mental health support were added to the Brophy-Felbab findings (Kissling, 2021). However, a main factor with students with disabilities dropping out or leaving early is uncaring or insensitive instructors.

Even with the need for more research, as the number of students with disabilities is growing. However, these students are aware of what is needed for them to succeed in higher education. Learner academic support, whether counselors or specific center with testing, and peer support to encourage academic engagement will help students with disabilities feel encouraged to succeed.

CONCLUSION

This literature review started with a review of studies focusing on the Americans with Disabilities Act and then on web page accessibility more specifically. There have been many software applications created to check accessibility of web pages and a few were listed. Universal Design and Universal Design for Learning were introduced, followed by a general

look at Learning Management Systems. Putting these together, a review of the literature that has been conducted to look at educational institutions' web accessibility compliance.

CHAPTER THREE: METHODOLOGY

INTRODUCTION

This chapter will review the research methodology used, identify the rationale for use, review the participants and their selection, and provide an overview to the data collection and data analysis processes. Researcher bias will be acknowledged, as well as data integrity for this study.

ADA accessibility guidelines and principles were created for the success of students with disabilities, as well as all students. Compliance to these guidelines and principles is a confirmation that students with disabilities can and will succeed in education and become contributing individuals to society.

RESEARCH METHODS AND RATIONALE

Qualitative research is a process of understanding a social or human problem, using a fully rounded picture with words describing the setting and understanding the phenomena from the viewpoints of the participants (Creswell & Creswell, 2017). This research began with two general research questions. The data collected was in the form of words or descriptions that reflected the phenomena in the study. The descriptions assisted in building or interpreting a theory.

The grounded theory qualitative research methodology was used for this study. As a constructivist approach to this research, active codes and concepts were used when collecting data (Charmaz, 2014). The iterative process of grounded theory allowed for the creation of a new theory from the ground up, inductively from the raw data (Glaser & Strauss, 1967). Grounded

theory research starts with broad research questions and through multiple phases of data collection, refining themes, identifies interrelationships from the data. From the relationships, a theory is derived.

Constructivist grounded theory research methodology was used as very little research had been done on the topic of ADA compliance within an institution's learning management system. The research that had been done to date was focused on the external facing home pages of institutions' websites and not the internal facing learning management systems. The learning management system with built-in accessibility tools directly affects the level of success of a student with or without disabilities.

Constructivist grounded theory is not linear. As the data is collected, analyzed, and coded multiple theories may surface. Each iteration of data collection, analysis, and coding is then compared to the previous set of data and codes. This iterative process allows for a clearer picture, or reality, of the phenomena and allows for a theory to be identified.

This cross-sectional study used a non-probability sample, convenience sampling, for ease of access. The study used all of the community colleges within Michigan to, closely as possible, represent the community colleges throughout the United States. Both time and sampling strategy were constraints for this study. The study started with a short quantitative survey within SurveyMonkey and was reinforced with qualitative interviews. Since this topic has not been studied before, the grounded theory approach helped interpret reality.

RESEARCH QUESTIONS

The following two research questions guided this constructivist grounded theory research.

- Research question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address

Universal Design in the institution's learning management system for the educational success of students with disabilities?

- Research Question #2: Which tools do community colleges use to make information accessible within the institution's learning management system; how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change?

PARTICIPANT SELECTION

Participants were identified through a convenience sampling using the 28 community colleges within Michigan. This nonprobability sampling technique is a commonly used technique as it is quick, cost effective, and uncomplicated compared to other types of sampling (Leedy & Ormrod, 2018). The variety of demographics in the 28 community colleges was used as a sample of the demographics of the 1,047 community colleges throughout the United States.

A search within each institution's website to find the Accessibility Officer, disability office, or accessibility office with a contact name and/or hyperlink was the first step. There were 34 individuals or offices from this search of the 28 community colleges. The treasurer of MI-AHEAD (Michigan Association of Higher Education and Disabilities) was contacted to share a list of members at community colleges within Michigan. There were 22 individuals on the list.

In order to identify more potential participants, additional emails were sent to other individuals in the community college, in hope to be re-directed to appropriate individuals in the accessibility offices. An Invitation to Participate was sent to the members of Educational Technology Organization of Michigan (ETOM). There were 20 institutions on this list. The final contact list was using the Advisory Board of the Michigan Colleges Online. There were 47 individuals identified on the Advisory Board website at community colleges within Michigan. An email was sent to each group with an Invitation to Participate. Also, these emails included a request to be forwarded to another person or office with the most knowledge or direct access to

ADA accessibility at that community college. There were ten duplications of 126 names and/or contacts within the emails sent.

The target audience was the accessibility officer and/or someone within the accessibility office at each community college. That position responsibility could have been held solely by an individual or as a part of the job description of an individual. Appendix B has a copy of the email for inviting participation. A deadline for submitting responses was set for participants.

DATA COLLECTION PROCESS

When the participants responded to the Invitation to Participate email, they received an email containing the Informed Consent information with a link to the web-based survey tool, SurveyMonkey (now Momentive) questionnaire. The survey questions are listed in Appendix C.

The Invitation to Participate and subsequent emails were designed to be brief, consistent, and courteous so as to have a positive initial impression to the research. The emails thanked the recipients for their time and consideration. The test pilot study of these documents suggested an offer to view the results of the research.

The survey had general questions from which to glean a true picture of the phenomena. The questionnaire was in the form for SurveyMonkey, a computer software system designed for questionnaires. The construction of the questions allowed for specific selections and an additional "other" category for responses not among the selections. The survey collected quantitative data that some researchers would find "rich medium for discovering theory" (Glaser & Strauss, 1967). However, Glaser and Strauss (1967) go on to say the data is merely "plausible suggestions" (p. 185) to finding a theory. The questions were stated in a clear, concise language so as to not be misleading, biased, or arbitrary.

The pilot process for the questionnaires included having two individuals answer the survey and give feedback. The first individual is an instructional designer for a learning management system in Michigan, but not within a community college. The second individual is a member of a disability services department at a community college, not in Michigan. The feedback given included small tweaks to the questionnaire and were immediately incorporated into the final product.

Upon completion of the survey, participants were invited to participate in the phone interview or video conference call. The Interview questions are listed in Appendix D. The interviews were based on open-ended questions so as to expand on and explore participants' responses. These responses assisted in reconstructing actual experience for the participant. The interviews were short in length at 10 to 15 minutes. The interviews were timed to be held within a couple of weeks of the survey so as to keep the interest of the participant. Seidman (2013) said this short interval also reduces the potential of idiosyncratic interviews, where the individual might be having a bad day or distracted. The interviews were recorded within Zoom and transcribed. The recordings and transcriptions will be stored in a password-protected central computer system the researcher's home institution for seven years.

The pilot process for the interviews was similar to the pilot process for the questionnaires. The same individuals volunteered to test the interview questions. Small tweaks were suggested and incorporated into the questions.

The iterative process of grounded theory was needed to construct more clearly and align the data to the resulting theory (Charmaz, 2014). Three additional interviews were conducted, also using Zoom, to further explore or interpret results by allowing the more personal viewpoints to be heard (Glaser & Strauss, 1967).

Survey Instrument

The survey instrument used in this research was the online software application called SurveyMonkey (now Momentive). SurveyMonkey was used to capture the first set of raw data which was then analyzed and coded to identify any emergent patterns or themes (Seidman, 2013; Creswell & Creswell, 2017). The instructions for the survey were clear and specific to assure respondents of their confidentiality, and an assurance that respondents can quit at any time. Each question was individually displayed for the respondent. The survey questions included specific answer choices, as well as an "other" for fill-in-the-blank answers that were not found in the list of given choices. There was no time limit for the respondent to answer each question. Appendix C has the complete survey given to the respondents.

Interview Process

The last question in the survey was for the respondent to leave their name and contact information to volunteer for a follow-up video conference interview. The volunteer respondent was contacted within 24 hours to set up the interview. The interviews were conducted at a mutually convenient time for the interviewer and interviewee using the online video conferencing software, Zoom. The Zoom sessions were recorded to ensure complete and accurate analysis of responses. Appendix D has the list of interview questions asked.

Each interviewee was thanked for their participation and assured of their anonymity and confidentiality. Phone interviews or video conference calls followed the questionnaire in order to clarify and/or get a more complete picture of the current environment within the particular community college. Focused coding, or axial coding, was used to test the new data against the initial codes to identify if the story was consistent throughout the research.

During each interview, additional notes were taken. Charmaz (2014) said this memoing, or chronicling, allows the researcher to analyze ideas or thoughts as the research process is progressing. As comments were made during the interview, memo-writing keeps the researcher actively engaged in the process and materials. All memos and notes will be stored in a password-protected space to keep interviewer and interviewee confidentiality and anonymity.

DATA ANALYSIS PROCESS

Treatment of the Data

The research questions guided the data analysis process. Little research has been done on this topic to date; therefore, the need to explore current practices from the ground up (inductively) assisted in creating a theory.

The quantitative data within SurveyMonkey started the process. The data was simultaneously analyzed so as to focus on the concepts, and where the data would lead the research. The data was systematically collected and analysis delimited, or reduced, the original list of categories when coded so as to more clearly focus on resulting theory. After the first five responses, the data was downloaded from the software to create the base line. The analysis of each question included:

- Reviewed the aggregate of the responses, rather than individual responses
- Coded the answers for each question separately
- Reviewed the "other" category for additional responses for each question
- Coded these responses separately, if needed
- Any additional notes or memos were written, if needed.

After the initial base line download of responses, the data was downloaded after two additional responses were given. The data of the additional responses were compared to the base line responses for any adjustments or corrections to the codes given the base line responses. Any additional notes or comments were captured. This process continued after each successive two additional responses.

Clear categories emerged from the initial coding. These categories were relevant and explained the behavior of respondents under study (Glaser & Strauss, 1967). Selective coding grouped data according to the original themes. Content or thematic codes surfaced from this constant comparison of data. These codes served as the base for the grounded theory research. The memos or comments taken along the way were written so as to not forget key thoughts and ideas as the comparison/contrasting was being done. There was no specific software used in this analysis.

The qualitative data came from the interviews done via Zoom video conferencing software. The script of questions can be found in Appendix D. Each interview was recorded within Zoom. Additional notes were taken during each interview. At the end of the interview, any additional comments or concerns were noted. The analysis of each question included:

- Transcript of the recording
- Coded each transcript separately
- Captured any notes or memos while transcribing so as to not lose thoughts
- After each interview, compared the codes from the transcripts to the baseline quantitative analysis
- Adjusted codes where needed to reflect a clearer, more specific explanation
- Compared the notes from the transcriptions with the base line analysis notes
- Used the coded data to create a theory from ground up, inductively. (Charmaz, 2014)

Ethical treatment of the research data and participants was followed (Seidman, 2013; Leedy & Ormrod, 2018). The survey and interview data were kept completely confidential and anonymous. The researcher had sole access to the name of the participants (Seidman, 2013). Participant identity was coded so no participant could be identified with specific data or identifying characteristic of participant could be recognized. Original records and research documents will be kept in an encrypted and password protected secure storage network at the researcher's home institution for a period of seven years. Privacy of respondents was maintained by choosing interview locations out of the public environment so as to meet the privacy and confidentiality needs of the participants.

STUDY DELIMITATIONS AND RESEARCH ASSUMPTIONS

Delimitations

The 28 community colleges within Michigan were chosen as a convenience sample. There is no state-wide governance of these schools. These institutions are independent and individually governed. Each institution has its own structure to address accessibility. There is a state-wide collaboration where the institutions help each other on common problems. The institutions range from single campus rural population to multi-campus mega-urban population. Based upon the Carnegie Classification of Institutions of Higher Education, n.d.) the institutions were classified as small (1,999 students or less), medium (2,000 to 4,999 students), or large (5,000 students or more). The spread of institution classifications responding to the survey closely represents the spread of institution classifications throughout the state.

Researcher Bias

Bias is inherent in all research (Leedy & Ormrod, 2018). Attention to the influence of any respondent data distortion was taken with using the survey instrument asking the same question to all respondents in the same manner, asking the same interview questions to all respondents in the same consecutive manner, and setting up the instructions to the survey and interviews in exactly the same format. The number of questions on the survey and questionnaire were short to reduce bias. The standardized procedure of using a multiple-point scale was used rather than a yes/no option to reduce agreement bias.

Researcher bias is always present (Leedy & Ormrod, 2018). The researcher was employed at a Michigan community college when the Department of Justice issued a letter of non-compliance of ADA website practices to her college. Upon initial investigation, other colleges were issued similar letters, and other researchers have since investigated the home pages of college websites. The researcher was not employed in a position of authority and/or responsibility for ADA adherence at the college. The initial research focus and research questions came out of curiosity of adherence beyond the home pages of the colleges' websites and more specifically the learning management systems of the colleges. There was no intentional researcher bias, even though it is a natural behavior (Leedy & Ormrod, 2018).

An assumption was made that all responses to the survey and the interviews were truthful and adequately reflected reality at each respective institution. Intentional misleading information is always a possibility in research.

Validity and Reliability

Merriam & Tisdell (2016) identified "ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner" (Merriam & Tisdell, 2016,

p. 237). Reliability, or repeatability, in qualitative research is extremely hard to ensure. The potential of repeating the same answer to the same question from the same participant is rare as the situation, or environment, surrounding the participant may be completely different at each point in time. Reliability was strengthened by clarifying the interview transcript with the respondent, and keeping an audit trail of research activities, or memoing, in a research diary (Charmaz, 2014). The constantly comparative research methodology of grounded theory reinforces the coding and subsequent theory identified will increase reliability (Glaser & Strauss, 1967).

Seidman (2013) identified validity could be accomplished with a three-interview structure. The theory trustworthiness was ensured by the inductively creative iterative process of grounded theory research methodology (Charmaz, 2014).

CONCLUSION

This chapter reviewed the research methodology used in this project. The participants, and the selection thereof, was reviewed. The constructivist grounded theory research methodology and process was identified, along with the data analysis protocol. Researcher bias, delimitations of the study, and other limitations were identified. The next chapter will review the findings of the research and the results produced.

CHAPTER FOUR: FINDINGS AND RESULTS

INTRODUCTION

Chapter Four will present the findings of the research. The chapter will start with review of the research design, questions, and methods used in this research. This will be followed with a profile of the participants and their respective institutions. The data collected from the SurveyMonkey survey and Zoom interviews will follow. Key findings will be identified, as well as themes or patterns.

RESEARCH DESIGN

The constructivist grounded theory was the methodology for the research design of this study. The results from a survey, via SurveyMonkey, taken by 16 participants representing the 28 community colleges within Michigan, and the subsequent interviews of 9 participants was the basis of a theory of this non-existent or under-studied phenomenon.

Research Questions

There were two research questions guiding the study. The focus of this study was the 28 community colleges within Michigan.

- Research Question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address Universal Design in the institution's learning management system for the educational success of students with disabilities?
- Research Question #2: Which tools do community colleges use to make information accessible within the institution's learning management system; how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change?

Research Methods

Charmaz (2014) outlined the data collection protocol in the constructivist grounded theory research methodology. The grounded theory methodology was used as there was inadequate and/or nonexistent research to date. The systematically collected data in this research was initiated by a short survey within SurveyMonkey. The data was collected and coded. The codes were constantly compared to identify any themes, patterns, or connections between the codes.

The interviews using Zoom video-conferencing software captured the participants thoughts, feelings, and viewpoints. These were coded and actively compared to the previous set of coded data. This constant comparison allows a more robust theory to be developed and based upon the constructivist grounded theory approach.

Participant Overview

The focus of this research was ADA accessibility at the 28 community colleges within Michigan. There were 116 emails sent to those 28 institutions, with an Invitation to Participate. The responding individuals were sent an email with an Informed Consent information and a link to the SurveyMonkey survey. The responding individuals were employees of the community colleges, holding various roles and responsibilities.

The last question on the survey was to participate in a subsequent video conference. Those responding individuals indicating their willingness to participate in the video conference received an email to identify date and time for a mutually convenient time for the conference. These individuals had previously taken the survey and were familiar with the research topic.

PARTICIPANT PROFILE

A total of 16 people responded to the Invitation to Participate email, each representing a different institution. This response represented 57% of the 28 community colleges in Michigan. Not all of the respondents answered all of the questions, which was permissible based on the survey instructions. The last question provided respondents with the opportunity to have a phone/video interview to follow-up on the survey questions. Nine individuals volunteered for the phone/video interviews. This response represented a 56% of the 16 survey participants contributed to the additional details from the survey. The interviews were conducted to support the survey questions and to get more in-depth information from the participants.

Participant and Institutional Demographics

The survey respondents characterized their institution into three size classifications: small, medium, or large based upon The Carnegie Classification of Institutions of Higher Education (n.d.). Table 3 reveals the survey respondents were from an equally distributed institution size. From these survey respondents, three interviewees were from medium colleges and six interviewees were from large institutions.

Table 3: Size of Survey Respondents' Institution

INSTITUTION SIZE	# OF RESPONSES	%
Small (1,999 students or less)	5	31
Medium (2,000 to 4,999 students)	5	31
Large (5,000 students or more)	6	38

Table 4 reveals the LMS used at each of the survey respondents' institution. The four top market share holders were equally distributed between the respondents.

Table 4: LMS of Survey Respondents' Institution

INSTITUTION'S LMS	# OF RESPONSES	%
Blackboard	5	31
Canvas	4	25
Desire2Learn	3	19
Moodle	4	25
Other	0	0

The majority of the 16 respondents (71%) were unsure of the ratio of disabled students per total students for their institution. The remaining respondents (29%) identified between 5% and 11% of their students were registered disability students. Only 19% of the respondents were directly involved with the disability office or as an ADA Coordinator to know that ratio. The remaining respondents were part of the LMS administration, distance learning administration, or an instructional designer for the LMS. Table 5 shows the breakdown of which institutional role each survey respondent self-identified.

Table 5: Survey Participant's Role

PARTICIPANT ROLE	# OF RESPONSES	%
Role within Disability Office	3	19
LMS or Distance Learning Administrator	6	25
Instructional Designer/Technologist for LMS	6	25
Other - unstated	1	6

STUDY RESULTS

The research design has been reviewed. The participants have been identified. Now the research questions will be investigated based on the results of the surveys and interviews. The details of the results will be presented first, with an analysis of the results to follow for each of the research questions.

Research Question #1: Results

The focus of this section is to present the results for research question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address Universal Design in the institution's learning management system for the educational success of students with disabilities?

Since respondents could choose as many responses as they deemed important, the most important Universal Design concept identified by the survey respondents (75%) was that the student has access to accessible educational material. Other important factors were to have an institutional policy addressing UD accessible material, mitigation of potential lawsuits, and the availability of technology or technological support for faculty and students. Potential lawsuits would be from the U.S. Department of Justice following an ADA accessibility complaint filed for non-compliance. The ADA law require accessible material be made available for those students requiring accommodations. Table 6 lists the survey responses received and the importance of each.

Table 6: Issues Related to Application of Universal Design Principles

RATIONALE FOR APPLICATION OF UNIVERSAL DESIGN PRINCIPLES	# OF RESPONSES	%
Student access to educational material	10	75
Institutional policy	6	50
Potential lawsuits	7	50
Available technology or technological support	6	50
Address a complaint/concern (reactionary)	5	44
A Task Force dedicated to Universal Design	5	38
Social justice models of disability or best practices	2	25
Stakeholder access to information	2	12
None of the above or Institution does not have a policy on UD	3	25

One interviewee said their institution received a Department of Justice non-compliance letter. The institution's reactionary focus was to establish an institutional policy to make available accessible material to all students. Another interviewee said their institution recently adopted an institutional policy and a task force was created to design a Universal Design action plan in response to that new policy

Table 7 below shows a list of possible WCAG Guidelines and Principles an institution would have in their current institutional ADA policy. The survey respondent chose all that applied to the respective institution's educational material found in the LMS. All respondents answered this question; however, only 50% indicated to have a current policy regarding ADA.

Table 7: Institutional Policy Coverage for Addressing UD

GUIDELINES IN CURRENT ADA POLICY	# OF RESPONSES	%
Captioning	8	50
Transcription Services	8	50
Accessible documents or .pdfs	7	44
Alternative tags/text for images	6	38
Open Educational Resources	4	25
Non-English / multiple language versions	0	0
Simplified language ("plain language")	0	0
Unknown	0	0
My Institution does not currently have a policy	8	50

Higher Education Emerging Relief Fund (HEERF) grant money was a Coronavirus (Covid-19) emergency grant for postsecondary educational institutions. One interviewee said their institution used the HEERF grant money to hire a transcription service to make all educational material ADA accessible. The institution suggested to faculty to work with the transcription service as much as possible during the Covid-19 shutdown. The interviewee went

on to say “not all faculty took advantage of this service, however, we made great progress” towards captioning all videos and educational materials.

Another interviewee said their institution during the Covid-19 shutdown, instead of laying off, or furloughing, the department and/or faculty secretaries, this employee group was trained to assist faculty in making all documents ADA accessible, including the use of alternative text. This same institution had another employee group assist in making institutional documents accessible, “particularly for the human resource department and marketing department.”

With 50% of the responses indicating institutions have a policy referencing universal design in place, what procedures are in place to evaluate universal design efficacy on a regular basis? The majority of responses (42%) identified a procedure to evaluate universal design efficacy on a regular basis only when online courses the first time it is offered. The procedure included a rubric based upon Blackboard Ally, Higher Learning Commission, Quality Matters, and/or Michigan Colleges Online standards. The evaluation of a course for Universal Design when an accommodation request comes in appeared in 17% of the responses. A part of a boot camp training, online teaching certificate training, or a workshop includes the instructor completing an accessibility review of their course was mentioned in 25% of the surveys. No formalized procedure was the response in 17% of the results.

Table 8: Procedure for Course Evaluation

WHEN IS A COURSE EVALUATED FOR UNIVERSAL DESIGN	# OF RESPONSES	%
When online course is first offered with rubric	5	42
Part of a training, certification, or workshop	3	25
When an accommodation request is made	2	17
No formalized procedure	2	17

The frequency of specific procedure varied greatly from every three years to inconsistent. Whenever an online course was being developed was the most consistent answer at 43%, or when an accommodation request was made was 24% of the responses. The remainder of the responses included regularly, every two years, or every three years.

The person or position responsible for completing the evaluation in the majority of cases were a combination of faculty and instructional designers/educational technology team. Only 25% of the responses identified a dean or assistant dean completed the evaluation.

One interviewee said, “we are paying more attention to the creation of an accessible online course but do no (or very little) assessment on subsequent semesters or face-to-face courses.” Most respondents acknowledge the need for an institutional policy but only one responding institution has a newly formed committee to create that policy. Training in Universal Design and ADA accessibility is mandatory in 44% of the respondents. This training includes a Quality Matters rubric, a rubric from Michigan Colleges Online, and/or Blackboard Ally from which to guide the creation of the course. Two respondents mentioned using a template or “simple accessible” syllabus to start the course.

In order to gain a more macro-view of the institution, survey respondents were asked to identify which aspects of student success the use of universal design would impact. A Likert scale of 1 to 5 was given, with 5 being the most important aspect to be assessed. Table 9 below shows persistence, completion, grades, and the entire student experience to have the most impact to an institution. An option for not measuring the impact was also given (N/A). Not all respondents answered this question as indicated with the “n” designation because not all institutions assess these student success factors when universal design is used. Of the institutions in the study, 50% identified as having an institutional policy requiring universal design.

Table 9: Impact of Universal Design on Student Success

Effect of University Design	N	Low Impact	2	Moderate Impact	4	High Impact	N/A
Persistence	12	0 0%	0 0%	0 0%	4 33%	5 42%	3 25%
Completion	12	0 0%	0 0%	1 8%	3 25%	6 50%	2 17%
Grades	12	0 0%	0 0%	2 17%	5 42%	3 25%	2 17%
Anecdotal (casual, informal, personal testimony)	12	0 0%	1 8%	2 17%	4 33%	1 8%	4 33%
Holistic (entire student experience)	12	0 0%	2 17%	0 0%	3 25%	5 42%	3 25%
Unsure	8	1 13%	0 0%	0 0%	0 0%	2 25%	5 63%

One interviewee acknowledged their institution does not have a universal design policy and does not assess the impact of universal design on these factors. Also, the institution does not look at these student success factors together: “Very little assessment is done at the institution beyond the course common outcome assessments required by the Higher Learning Commission.”

Many areas or departments within a community college impact all students’ college experience. Table 10 identifies the impact universal design has on some areas specifically for students with disabilities. In each of the following areas, on an average almost 70% of the responses were that the institution did not assess the efficacy of universal design for students with disabilities.

Table 10: Disabled Student Success Indicators

Indicators of Disabled Student Success	N	Low Impact	2	Moderate Impact	4	High Impact	N/A
Admissions	12	1 8%	1 8%	2 17%	0 0%	0 0%	8 67%
Retention	12	0 0%	1 8%	2 17%	2 17%	0 0%	7 58%
GPA	12	0 0%	1 8%	0 0%	2 17%	0 0%	9 75%
Engagement in extra-curricular activities	12	1 8%	0 0%	1 8%	1 8%	0 0%	9 75%
Graduation	12	0 0%	1 8%	1 8%	2 17%	0 0%	8 67%

As one interviewee stated, “we do not have a policy and we do not assess universal design.” Another interviewee said the “institution has a policy, but no assessment of that policy has ever been done.”

The responses given for assessing the principles of Universal Design for Learning were the same. The three principles include:

- Multiple means of representation
- Multiple means of action and expression
- Multiple means of engagement

All interviewees agreed it would be a good idea to assess based upon those three principles, however, only “the multiple means of representation principle was used in their mandatory training” as one interviewee stated. At the time of the interviews, no responding institution did an assessment of these principles. As one interviewee said, “it is a great idea to assess, however, it is pedagogical and up to faculty with academic freedom.” Another interviewee said, “if an assessment is done, it is sporadic with no clear expectations.”

Katsiuannis, et al. (2009) and Betts, et al. (2013), along with the CAST group encourage these Universal Design concepts for Learning.

Research Question #1: Analysis

Research question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address Universal Design in the institution's learning management system for the educational success of students with disabilities? The focus is on the institutional policy of Universal Design, the application of UD principles and evaluating the effectiveness, and where student success is affected when UD is used. Each of these items will be further analyzed.

Institutional Policy for Universal Design

As survey question #1 results shown in Table 6, an institutional policy relating to Universal Design was found in 50% of the respondents' institutions. Rose, et al. (2006) and Burgstahler (2017) found in their research the majority of institutions did not have an institutional policy specifically related to UD. In an earlier study, Burgstahler (2015) identified using accessible material is an ethical and legal issue, as all nine interviewees agreed "institutions should have a policy about universal design."

Research has shown where there is a policy, the accessibility rating is higher. When Schmetzke (2001) evaluated Wisconsin community college home pages, there was a difference in accessibility rating of 48% in 1999, and when an institutional policy was put in place in 2004, the rating was 62%. Reynolds and Lennex (2009) looked at institutions within Kentucky and found a lack of guideline or policy had an adverse effect on accessibility ratings. May and Zhu (2009) identified the Texas public school system did not have a policy. Where a policy has been adopted, accessibility ratings have shown to increase. This increase in accessibility was

confirmed with Comeaux and Schmetzke (2007) and Erickson, Trerise, VanLooy, Lee and Bruyère (2009) when there was a policy in place.

Application of UD Principles

All students, disabled and abled, having access to universally designed educational materials was a high priority in 75% of the survey respondents, as shown in Table 6. Also noted in survey question #1 was the importance of mitigation of potential lawsuits, and the use of technology and/or technological support were high priority issues when UD principles were applied. As shown in Table 6, these two factors were present in 50% of the surveys taken.

Rose, et al. (2006) and Burgstahler (2017) addressed the necessity of applying universal design principles within an institution. Schmetzke (2004) and later Comeaux & Schmetzke (2007) stressed the importance of using WCAG guidelines and principles when creating an institutional policy. Table 7 identifies the different components of the WCAG principles and the respective importance of the survey respondents for survey question #2. Captioning, transcription of videos, accessible documents or .pdfs, and the use of alternative text or tags for images were rated high in the responses. Flowers et al. (2001), and Wisdom, White, Goldsmith, Bielavitz, Davis, & Drum, (2006) found the majority of accessibility errors in institutions' home pages was in the missing alternative text to images. One interviewee stressed the importance of using alternative text and captioning. The HEERF grant funds were spent on making educational material accessible.

Evaluating UD Effectiveness

Betts, et al. (2013) suggested the courses be evaluated for accessibility often. However, Table 8 shows most of the 16 responding institutions did not complete course evaluations on a regular basis. According to survey question #7, 5 of the 16 institutions evaluated courses when

the course was being offered online for the first time. One interviewee said it would be a good practice to evaluate courses at least once a year, however, that institution does not have a formal policy or procedure to evaluate courses other than when an accommodation request was made.

Flower, et al. (2001) and Erickson, et al. (2009) emphasized the importance of evaluating educational material, especially for special populations so that students with disabilities have the same opportunities as abled students. Institutional home pages are a 'front door' to the institution and an indication of the level of importance accessibility is to that institution (Nielsen, 2002).

Where UD Affects Student Success

How universal design affects student success was addressed in survey question #5 and question #6. The results are shown in Table 9 and Table 10. Persistence, completion, and grades are highly influenced, or impacted, when using universal design within the educational material. Carnevale (1999) and Hurdt (2018) found students showed success by completing the course with good grades and continued with their studies when the materials were made accessible.

The other areas within an institution are indicated when a disabled student is successful. Applications, admissions, retention, overall GPA, advising, student life, graduation, and course materials all make up areas that affect a student. Survey question #6 and the follow-up interview questions #2 and #3 found most institutions do not assess these areas. One interviewee said there was only so much time and not enough money to do the things that should be done for accessibility. Another interviewee said there was very little assessment done at the institution, even though a lot of money is spent in these areas.

Research Question #2: Results

The focus of this section is to present the results for research question #2: Which tools do community colleges use to make information accessible within the institution's learning

management system, how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change? Answers from survey question #4 and #8, supported by the answers to interview question #1, will be presented here.

The importance of universal design tools in a learning management system was measured with a simple Likert scale, with a rate of 5 for the most important. Table 11 shows the number of responses to each aspect, as not all questions were answered. Almost 90% of the respondents identified the important UD tools within an LMS are those that help instructors provide accessible course content. A little over 80% of those institutions used instructional designers to assist faculty in course development and use of accessibility tools. Of the institutions responding, 80% identified accessibility tools helping students with using course material to be a factor. The reason given for not answering this question was the choice of LMS was made before Universal Design was considered and/or discussed, and UD tools are not used at that institution.

Table 11: Universal Design Tools in an LMS

Universal Design Tools	N	Low Impact	2	Moderate Impact	4	High Impact
Help Instructor	9	1 11%	0 0%	0 0%	1 11%	7 78%
Help Instructional Designers	10	2 20%	0 0%	0 0%	2 20%	6 60%
Help Student	9	1 11%	0 0%	1 11%	2 22%	5 56%

All nine interviewees agreed that if there are accessibility tools available to help faculty, students, and staff then the tools are important. None of the interviewees could name or identify a tool at the time of the interview.

Survey respondents identified how students learn to use UD tools. Who assisted the student, as well as, additional avenues to learn accessibility tools were identified. Only 14 respondents answered this question out of the 16 responding to the survey. The following table shows there is no one specific avenue for students to learn how to use the tools, however, relying upon all resources to learn to use the tools is best.

Table 12: Student Learning to Use Universal Design Tools

ANSWER CHOICES	# OF RESPONSES	%
Accessibility office	3	29%
Instructors	4	29%
Self-taught	6	50%
All of the above	6	57%

Other avenues to learning how to use tools included training from an elearning department, and resources within the LMS. One interviewee said, “I have no idea how students learn to use accessibility tools. I have never given it a thought.” Another interviewee said it would be great idea for students to be trained on these tools from a variety of sources.

Research Question #2: Analysis

Research question #2: Which tools do community colleges use to make information accessible within the institution’s learning management system, how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change? The focus of this research question was the use and the effectiveness of the accessibility tools found within an LMS. Also examined were how these tools could be changed and/or improved.

Table 11 shows the results of survey question #4 identifying the impact of using the tools. In each of the categories (Instructor, Instructional Designer, and Student) over 80% of the respondents indicated the tools have a high impact. Babu and Singh (2013) created the TUME evaluation tool to assess the impact of these tools. As one interviewee said there was no assessment of accessibility or any of the tools used in an LMS.

Table 12 shows where the students learn how to use the UD and accessibility tools. Survey question #8 shows a range of answers, including the accessibility office, instructors, self-taught, or a combination of these. The tools are new and ever changing with the technological advances. While there has been no research on these tools to date, this is something that needs to be addressed. The lack of awareness, or the fact of not addressing these tools, is significant when looking at the LMS from faculty training to student use. There are only anecdotal comments found in the Blackboard Ally user group forums. The user group forums are not academic research; however, it is significant to know how this group looks at the details of tool usage.

CONCLUSION

This chapter looked at the pursuit of the research data. The collection protocol was reviewed, followed by the participant profile including the size of the institution and learning management system used. Each research question was supported by the results of the surveys and interviews. An analysis of each research question followed. All participants agreed ADA accessibility is important, as well as the law. However, Universal Design is misunderstood, not well explained/taught, and use is not enforced nor assessed. Accessibility tools for faculty, staff, and students were rated highly impactful. However, to know what tools are needed, the use of, and the efficacy of their use could not be identified.

The next chapter will highlight discussions and conclusions from the research data, and any recommendations for future work found in this data.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

INTRODUCTION

This chapter will conclude the study by reviewing the key research findings in relation to the research questions, as well as the contribution to the body of knowledge and practice thereof. It will also review the limitations and delimitations of the study and propose opportunities for future research.

SUMMARY AND DISCUSSION OF FINDINGS

This study aimed to investigate the practice of providing accessible educational material while implementing universal design within a learning management system to improve accessibility for students with disabilities. There were two questions leading the research:

Research Question #1: How do community colleges address/implement Universal Design of instruction, and what issues are most important to them when they address Universal Design in the institution's learning management system for the educational success of students with disabilities?

Research Question #2: Which tools do community colleges use to make information accessible within the institution's learning management system; how do they rate their effectiveness and efficacy for students with disabilities, and what areas would they like to improve/change?

Significance of the Findings

The results show that 75% of the survey respondents, or 10 of the responding community colleges in Michigan, indicated availability to accessible educational material for disabled students was important to the institution. However, only 50% of the responding institutions

indicated that they have a policy about accessibility. Institutions with a commitment to accessibility have clearly stated policies related to accessibility, and their focus on making educational materials as accessible as possible are clearly evident. Related to this issue was the reason that many participants gave related to their institution's implementation of Universal Design Principles: 50% indicated that their institution identified UD as important either in response to potential lawsuits and/or address a complaint and/or concern. The institution's reactionary response of covering their assets rather than a proactive response to assist students is indicative of the importance accessibility holds for the institution.

Another key finding of this study was the presence of a procedure for evaluating educational materials for their accessibility: 50% of the institutions noted the existence of a policy; however, 42% of these indicated that the evaluation was completed primarily the first time the online course was offered. No additional evaluations evidently were completed. In 17% of the institutions, accessibility evaluations were completed only when accommodation requests were received. The evaluations were based upon rubrics containing WCAG guidelines and principles, an identified ADA accessibility standard per Section 508 of the §1194.22 Rehabilitation Act. Considering the ADA law covers all institutions receiving federal funds, these statistics show the community colleges within Michigan are grossly lacking in adherence, especially when no formal procedure for assessment was found in 17% of the institutions.

Training for accessibility, universal design, or WCAG principles in general was found not to be offered or available on a consistent basis, and trainings were not mandatory. Tools to assist in making material accessible were of high importance for instructors in 78% of the responses, for instructional designers in 60%, and for students in 78% of the responses. However, the assessment of the efficacy of accessibility, or universal design, was not completed

for the educational materials or other institutional materials, even though it has been shown accessible materials and tools are important for student success. Time and money are spent for the training and tools; thus, it is imperative to understand the efficacy of that time and money.

IMPLICATIONS OF FINDINGS FOR COLLEGES

There are several key conclusions to this research. Not only is accessibility the law; it is a best practice of educational institutions to provide readily accessible education and materials. It is imperative to have a champion within the institution with the authority and responsibility to create an institutional policy on accessibility. This policy needs to include mandatory training on accessibility and periodic assessment of the efforts.

First, this study's results emphasized the importance of identifying a specific person or position within an institution to be the "champion" of accessibility. Without someone guiding and pushing the efforts — and keeping the need for accessibility in the center of student success — it becomes too easy for an institution to do the bare minimum, or less, that meets state and/or federal guidelines, and neglects stringent assessment and enforcement. The consequence of not meeting these guidelines have drastic implications for success of all students not just those with disabilities, as well as the institution's accreditation and future funding.

A champion is essential for all institutions to ensure access for all students, no matter the size or location of the institution. As the responses to the survey indicated, the smaller the institution, the less probability there is of that institution having an institutional policy or a specific person or position responsible for ADA. Only 38% of the survey responding institutions, the ones identified as large institutions of 5,000 students or more, identified such a role.

Second, institutions need to have a guiding policy about accessibility, including a timeline to achieve full implementation for all materials to be made accessible. This policy

should cover all educational materials, not just the online course work. This policy should cover all areas of the institution, including admissions, marketing, student life, advising, and extra-curricular activities. Internal materials should also be analyzed, including materials used in all departments. This policy should also include periodic assessment of all materials within the institution with the software checkers and individuals with disabilities.

The accessibility software checkers are good; however, as pointed out by Thompson et al. (2003), Yesilada et al. (2015), and Bai et al. (2019) students with disabilities need to be involved in the assessment of these materials. The accessibility policy should include a procedure for periodic evaluation of institutional material and how well it meets accessibility standards. This procedure should include both the frequency and the person or position responsible for the assessment. The constantly evolving and changing of material would require the assessment to be completed annually. To be effective, the assessment must follow the then-current WCAG guidelines and principles, as well as the three universal design for learning principles.

Third, this study also indicated that training in accessibility, universal design, and the accessibility tools within a learning management system is lacking, or non-existent, at most of the educational institutions in Michigan. This weakness does not simply cover training for faculty to develop accessible materials, or eLearning staff to evaluate them, but it also extends to training the students on how to use the tools for accessibility. This inefficiency includes the assessment of the training for faculty, staff, and students. The review of the literature supports this conclusion: There was little to no research on the use of accessibility tools, the training in the use thereof, and the assessment of these tools in the higher education environment. Can this statement be made for areas outside of education? With the increasing population with disabilities, should training, and assessment, of accessibility tools be expanded?

Peña (2014) was the first researcher to confirm that very little research has been done in the area of accessibility, training, and the assessment of accessible educational materials. If colleges and universities are committed to increasing student success — success of all students — then additional focus, resources, and energy need to be committed to this aspect of educational access. We need to determine if the steps we are currently taking are working. Are the current univeral design principles enough to help students with disabilities? Do materials that meet UD standards and accessibility guidelines make a difference for student success? Do tools help students? This study confirms the lack of research and assessment of accessibility efforts for the success of the students with disabilities. Are students with disabilities achieving success without the benefit or endorsement research would provide?

LIMITATIONS

This study was designed to answer two key research questions related to accessibility of educational materials and the use of nationally defined and accepted Universal Design principles aimed to improve this accessibility. The following limitations were encountered during the research.

Of the 28 community college representatives who received the study's initial survey request, 16, or 57%, completed the survey. From these 16 survey respondents, 9 agreed to participate in follow-up interviews. Schonlau, Fricker, and Elliott (2002) state that responses to a convenience sample might not be statistically significant, however, would be useful in identifying a hypothesis in early exploratory research. Also, convenience samples using the internet are as valid as other modes of data collection (Schonlau et al., 2002). Morton, Bandara, Robinson, and Carr (2012) found response rates alone might not be a sufficient evidence of acceptable study validity. The 57% response rate to the survey was higher than expected;

however, it still led to a less than satisfactory results and an unclear picture of the full range of accessibility practices in Michigan.

The research was done for this study in the middle of the Covid pandemic: the summer of 2021. In the year immediately prior to this research, March 2020, found the State of Michigan and the entire world shut down for the Covid-19 pandemic. The effects of the pandemic on higher education were many. From a complete shift to online delivery of courses to reduced staff in many college offices, both of these potentially affected the study's survey results. Staff was involved in fervently converting educational materials to web-accessible materials. Faculty and staff were adapting face-to-face classes for online delivery. Most employees found this maximum workload capacity allowed not enough time or energy for staff to complete surveys or participate in research studies.

The Covid-19 pandemic had an impact on the research methodology used in this study as well. After the survey responses were gathered, follow-up interviews were completed via web-based meeting software (Zoom). Interviewing allowed the interviewee the opportunity to tell the story of their experience in their own words (Seidman, 2013). This research study used a best practice of interviewing as an opportunity to dig deeper into the world of each institution to prompt more and valuable information.

DELIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The following delimitations were key to evaluating the research of this dissertation as well as suggesting opportunities for further research.

Delimitations

Population: The study delimitations include the population from which the sample was taken. The 28 community colleges in Michigan were identified for the study, representing a cross-section of institutions based upon the Carnegie Classification of Institutions of Higher Education, with 19% of the potential participants being from small institutions, 43% from medium institutions, and 38% were from large institutions (IPEDS, n.d.). While the 28 community colleges within Michigan were used as a convenience sample to represent the 1,047 public community colleges in the United States, additional research in other states would potentially provide more information and depth.

Region: The use of Michigan community colleges represents a demographic that represents the northern Great Lakes region of the country. Each of the community colleges in the state are independent of each other. Additional research studies would be an opportunity for a larger sample size, other states, and/or other regions in the United States. This would allow for a broader view of accessibility practices in other parts of the country. Some states have state-wide college systems where the funding would be different and policy coverage would be different.

Study Methods: The survey and subsequent interviews were to dig deeper into the phenomenon of accessibility within the institution based upon Charmaz's grounded theory research methodology. Additional research would separate these components for an opportunity to bring in a broader perspective of the research. Each institution would have an opportunity to identify the perspective and expertise of faculty, staff, and administration on accessibility.

Study Timing: Timing of the research was also a planned factor for the study. The initial invitation emails were sent to the 28 community colleges in what is typically the summer semester. The intent of this timing was to reach the institutions during a part of the academic year with the lightest student population was taking classes, allowing respondents time to answer

the survey questions and participate in the interviews. While the invitations were directed towards college staff responsible for ensuring effective online course delivery, rather than 9-month faculty, the timing might inadvertently have caught some potential respondents during typical vacation months. While the researcher intended to extend the invitation over a number of months to broaden the response rate, the original study approvals by the Institutional Research Board were limited to these summer months. Additional research would allow other institutions more time to identify the appropriate person or position holder to answer the survey questions and not put the participation request aside. Conducting the research during a different semester would also potentially allow the appropriate person or position holder additional time to review their institution's policies and statistics more thoroughly allowing them to answer the survey questions more completely and accurately.

Additional Development and Research Opportunities

Based on the research findings, additional research opportunities were identified.

First, as noted above, the need for an accessibility champion would allow for one point person to manage or coordinate the institutional efforts to adopt a policy and to have all educational materials be evaluated on a consistent basis. This champion would need to be in a position of authority and responsibility to emphasize the importance of having a policy and to mandate training for faculty and staff. The institutional WWW home page is an indication to potential students, parents, and community of the institution's commitment to accessibility. It is imperative to have the material on the institution's website be accessible. Faculty have academic freedom to create their own coursework and need to understand the importance of accessible material for all students. Training would allow the faculty to learn and test their own coursework

and identify where changes are needed for the material to be accessible. Students with disabilities and students without disabilities would benefit from all materials being accessible.

Additional research is needed to identify what effect universal design principles have on students' ability to use and/or understand educational materials. The research would include students with disabilities and students without disabilities to evaluate all institutional materials, not just materials in their courses. The HTML checker software is good; however, studies show the human evaluations are also critical.

This research focused on disabled students with universally designed educational materials within a learning management system. However, ADA accessibility is not just for disabled students. While there is no research to date that explores accessibility for a broader audience, future research should include abled students as well as disabled students to ascertain the effect of UD principles for all.

Another important area for research would expand on the work of McAlvage and Rice (2018) to include accessible textbooks and other course materials. This study could investigate the efficacy of the ADA guidelines and principles for students with disabilities. Simulated labs are gaining popularity in education; however, without closed captioning the material is inaccessible. The research, then, should expand the focus of educational materials into these new, exciting venues and modalities.

Knight, Wessel, and Markle's (2018) work, focusing on cohorts of incoming freshmen students with disabilities, examined retention as a factor in how long it took disabled and abled students to graduate. Their study should be duplicated to evaluate the efficacy of UD designed materials within the learning management system. Using the GPA of students with disabilities in a UD-designed course and comparing it to the GPA of students with disabilities without UD

accessibility would identify the efficacy of UD. The research could also be extended to using the GPA of students without disabilities in a UD-designed course and comparing it to the GPA of students without disabilities and without UD accessibility.

Babu and Singh's (2013) foundational study created the task-oriented, user-centered, multi-method evaluation (TUME) technique to evaluate accessibility within an LMS based on the perceptions of six disabled students and five web developers. Additional research using the TUME technique would validate its approach. Additionally, it would help design/develop principles for accessible and usable educational materials within a learning management system.

CONCLUSION

In conclusion, this research study acknowledged the findings from the survey and interviews on the state of accessibility practices within the community colleges in Michigan. The increasing number of undergraduate students with disabilities entering community colleges underscores the need for community college leadership to be aware of the situation. It has been found that students with disabilities are as successful at the community college as students without disabilities, if there is assistance. It is imperative for institutions to have an accessibility policy to guide the efforts of the college. There needs to be a champion or leader within the institution to manage the efforts towards mandatory training in ADA accessibility, universal design, and accessibility tools for faculty and staff. All materials, internally and student-facing, need to be ADA accessible, with consistent periodic assessment of the materials. The existence of an accessibility office and knowledgeable staff are essential for students with disabilities to be successful.

Accessibility tools within a learning management system are as necessary as elevators or curb-cuts for students with disabilities. All faculty, staff, and students would benefit with training

of these tools to better assist all students. Most importantly, assessment of the efficacy of efforts for ADA compliance is needed to ensure educational success of the disabled student.

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APPENDIX A: WCAG GUIDELINES AND PRINCIPLES

WCAG 1.0 was recommended in 1999 with the following guidelines, within each had several items assigned priority level:

Guideline 1	Provide equivalent alternatives to auditory and visual content
Guideline 2	Don't rely on color alone
Guideline 3	Use markup and style sheets, and do so properly
Guideline 4	Clarify natural language usage
Guideline 5	Create tables that transform gracefully
Guideline 6	Ensure that pages featuring new technologies transform gracefully
Guideline 7	Ensure user control of time sensitive content changes
Guideline 8	Ensure direct accessibility of embedded user interfaces
Guideline 9	Design for device independence
Guideline 10	User interim solution
Guideline 11	Use W3C technologies and guidelines
Guideline 12	Provide context and orientation information
Guideline 13	Provide clear navigation mechanisms
Guideline14	Ensure that documents are clear and simple

WCAG 2.0 was adopted in 2008 to include twelve guidelines within four principles.

Principle 1: Perceivable	Guideline 1.1	Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
	Guideline 1.2	Provide alternatives for time-based media.
	Guideline 1.3	Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
	Guideline 1.4	Make it easier for users to see and hear content including separating foreground from background.
Principle 2: Operable	Guideline 2.1	Make all functionality available from a keyboard.
	Guideline 2.2	Provide users enough time to read and use content.
	Guideline 2.3	Do not design content in a way that is known to cause seizures.
	Guideline 2.4	Provide ways to help users navigate, find content, and determine where they are.
Principle 3: Understandable	Guideline 3.1	Make text content readable and understandable.
	Guideline 3.2	Make web pages appear and operate in predictable ways.
	Guideline 3.3	Help users avoid and correct mistakes.

Principle 4: Robust	Guideline 4.1	Maximize compatibility with current and future user agents, including assistive technologies.

Source: WCAG (https://www.w3.org/TR/WCAG20/)

APPENDIX B: INVITATION TO PARTICIPATE

Invitation and/or recruitment email

Dear ____

My name is Judy Matteson, and I am a faculty member at Oakland Community College. I am also a doctoral student working on a dissertation as part of the Ferris State University Doctorate in Community College Leadership. I am conducting research for my dissertation regarding ADA Accessibility tools found within learning management systems.

You are invited to participate in a voluntary research study. If you choose to participate, you will be asked to complete an electronic survey. The survey will take approximately 10 minutes to complete. **Taking part in this study is completely voluntary**.

You are eligible to participate in this study because you have been identified as a Michigan Community College employee responsible for ADA accessibility for your Institution. If you agree to be part of this study, you will be asked to identify the learning management system at your institution and efficacy of the ADA accessibility tools found within that system. The survey will take approximately 10 minutes to complete. Additionally, there will be an opportunity for a follow-up phone/video interview. This interview will take approximately 15 minutes to complete. Both parts are completely voluntary.

If you are willing to participate in this study, please respond to this message. I will send to you the Informed Consent form, with complete details and instructions.

Thank you for your time.

Judy Matteson

DCCL Student and Researcher

APPENDIX C: SURVEY QUESTIONS

- Survey question #1: What factors do your institution consider when developing successful Universal Design practices? Choose all that apply.)
    - Institutional policy
    - Potential lawsuits
    - Address a complaint/concern - Reactionary
    - A Task Force dedicated to Universal Design
    - Student access to educational material
    - Stakeholder access to information
    - Available technology or technological support
    - Social justice models of disability or best practices
    - None of the above, Institution does not have a policy on UD
    - Unsure
    - Other (Please state) _____

- Survey question #2: Does your institution have a policy for addressing Universal Design? Which of the follow aspects does it cover? (Choose all that apply.)
    - Alternative tags/text for images
    - Non-English / multiple language versions
    - Simplified language ("plain language")
    - Captioning
    - Transcription Services
    - Accessible documents or .pdfs
    - Open Educational Resources
    - Other (please state) _____
    - Unknown
    - My Institution does not currently have a policy.

- Survey question #3: Which LMS is in use at your institution?
    - Blackboard
    - Canvas
    - Desire2Learn
    - Moodle
    - Other (please state) _____

- Survey question #4: Which Universal Design tools were important factors in your institution's choice of Learning Management System? (Rate each using the Likert scale, 5=most important)
  1 2 3 4 5 Those that help instructors provide accessible course content
  1 2 3 4 5 Those that help course instructional designers assist faculty in course development
  1 2 3 4 5 Those that help student locate and use course material
  1 2 3 4 5 Other (Please state) ____ ✓ here if you do not use any UD tools

- Survey question #5: Of the following indicators of student success, please weigh the impact of Universal Design on each. (Weigh each using the Likert scale: 1=no impact, 5=significant, N/A – not yet measured)

1 2 3 4 5 N/A Persistence
1 2 3 4 5 N/A Completion
1 2 3 4 5 N/A Grades
1 2 3 4 5 N/A Anecdotal – casual, informal, personal testimony
1 2 3 4 5 N/A Holistic – the entire student experience
1 2 3 4 5 Other (Please state) _____
1 2 3 4 5 Unsure

- Survey question #6: As a result of Universal Design, to what extent have you seen improvement or students with disabilities in the following areas (Weigh each using the Likert scale: 1=no improvement, 5=significant improvement, N/A – not yet measured)
  1 2 3 4 5 N/A Admissions
  1 2 3 4 5 N/A Retention
  1 2 3 4 5 N/A GPA
  1 2 3 4 5 N/A Engagement in extra-curricular activities
  1 2 3 4 5 N/A Graduation

- Survey question #7: What procedures do you have in place to evaluate Universal Design efficacy on a regular basis? --

What is the procedure?	How often is it used?	Who is responsible for using it?

- Survey question #8: How do students primarily learn to use tools that implement Universal Design that are available for their courses? (Choose all that apply.)
  - Accessibility office
  - Instructors
  - Self-taught
  - Other (Please state) _____
  - All of the above

Tell us about your Institution:

- What is the size of your Institution?
  - Small – 2,000 students or less
  - Medium – 2, 000 to 5,000 students
  - Large – over 5,000 students

- What is the ratio of registered disability students to the total student population? _____
- What is your role in your Institution? _____
  - ___ In a disability services office and/or a position related to ADA? (check if yes)
  - ___Not connected with disability services and/or ADA (check if yes)

- Final: Would you be willing to do a personal interview (via phone or teleconference) as a follow-up to this survey?
  - Name: _____

- Phone: ______________________________
- Email: ______________________________

APPENDIX D: INTERVIEW QUESTIONS

- Interview question #1: What Universal Design tools are currently implemented at your institution?
    - (Please elaborate) _____
- Interview question #2: As a result of Universal Design, to what extent have you seen improvement or students with disabilities in the following areas (Weigh each using the Likert scale: 1=no improvement, 5=significant improvement, N/A – not yet measured)
  1 2 3 4 5 N/A - Admissions
  1 2 3 4 5 N/A - Retention
  1 2 3 4 5 N/A - GPA
  1 2 3 4 5 N/A - Engagement in extra-curricular activities
  1 2 3 4 5 N/A – Graduation

- Interview question #3: To what extent is there a difference in student success for students with a disability and those without a disability who utilize Universal Design tools?
    - Admissions/application materials
        - Significant for disabled students, no difference for abled students
        - Significant for disabled students, significant for abled students
        - No difference for disabled students, no difference for able students
        - No difference for disables students, significant for abled students
        - Other (Please state) _____
    - Course Materials
        - Significant for disabled students, no difference for abled students
        - Significant for disabled students, significant for abled students
        - No difference for disabled students, no difference for able students
        - No difference for disables students, significant for abled students
        - Other (Please state) _____
    - Advising Materials
        - Significant for disabled students, no difference for abled students
        - Significant for disabled students, significant for abled students
        - No difference for disabled students, no difference for able students
        - No difference for disables students, significant for abled students
        - Other (Please state) _____
    - Student Life Materials
        - Significant for disabled students, no difference for abled students
        - Significant for disabled students, significant for abled students
        - No difference for disabled students, no difference for able students
        - No difference for disables students, significant for abled students
        - Other (Please state) _____

- Interview question #4: Please comment on how you have implemented the following UD principles? What impact have you seen with the implementation of the following UD principles?
    - Multiple means of representation – give learners various ways of acquiring information and knowledge
    - Multiple means of action and expression – provide learners alternatives for demonstrating what they know

- Multiple means of engagement – tap into learners' interests, offer appropriate challenges, and increase motivation