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An Investigation of Postsecondary Centers for Teaching Excellence Support for Universal Design for Learning

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AN INVESTIGATION OF POSTSECONDARY CENTERS FOR TEACHING EXCELLENCE SUPPORT FOR UNIVERSAL DESIGN FOR LEARNING

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By

David Adam McGeehan

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AN INVESTIGATION OF POSTSECONDARY CENTERS FOR TEACHING EXCELLENCE SUPPORT FOR UNIVERSAL DESIGN FOR LEARNING

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Approved October 30, 2020

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ABSTRACT

AN INVESTIGATION OF POSTSECONDARY CENTERS FOR TEACHING EXCELLENCE SUPPORT FOR UNIVERSAL DESIGN FOR LEARNING

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Dissertation supervised by Joseph C. Kush, Ph.D.

This research examined the factors related to support for Universal Design for Learning (UDL) in faculty professional development training programs offered by Centers for Teaching Excellence (CTE) in postsecondary institutions in the Commonwealth of Pennsylvania. The factors examined were: administrative support, i.e., general, fiscal, staffing for CTEs, CTE staff characteristics, CTE level of use of technology, CTE directors' education, and the espoused support for students with disabilities in university mission statements. The researcher hypothesized that each of these five factors had a statistically significant impact of UDL support provided the CTEs.

Universal Design for Learning is a pedagogical framework that can be used to design and retrofit curriculum to reduce access barriers to course activities and content

for all students, particularly students with disabilities. This is important because students with disabilities are a growing population in postsecondary schools in the Commonwealth and across the country.

The research focused on Centers for Teaching Excellence because these departments are a primary means for postsecondary faculty to gain professional development knowledge and skills. The directors of CTEs are influential in determining the faculty training and support offered by the centers under their control. Therefore, it was the CTE directors that were invited to participate in the research.

An online survey was used to collect the data. The CTE directors were the sample that completed the survey. The research findings presented in this dissertation include descriptive statistics on: postsecondary institutions, Centers for Teaching Excellence, and the CTE directors' demographics. Statistical analyses were conducted to test each of the five hypotheses. The output of this analysis is interrupted and presented with discussions and conclusions. Statistical analysis was performed using ANOVAs and t-tests, which confirmed all five of the hypotheses to be true. The implications of the research suggest the need for augmentation of UDL content in postsecondary faculty professional development training programs and postsecondary school of education programs. Expanding the sample to include other constituencies such as administrators, deans, and similar decision-makers, may be a worthy exploratory subject for extending this research.

DEDICATION

This dissertation is dedicated first and foremost to my wonderful, loving wife Cheryl. She has supported me in this endeavor from the onset, during the years of research and writing, and through its final, successful completion. Words cannot express my gratitude for Cheryl's sacrifices and daily encouragement that enabled and propelled me forward to complete this life-long dream. Thank you Cheryl. I will love you always and forever.

I also dedicate this work to my five children, Adam, Samantha, Abigail, Jacob, and Lydia. They too sacrificed, encouraged, and supported me during the many years required to complete this degree. Thanks kids, I am truly grateful for your help and so very proud of the fine adults you each have become. I love you all.

To my mother Evelyn, a life-long educator and learner, and my father Thomas, watching I'm sure from heaven above, I am indebted to you both for raising me to work hard to achieve my life aspirations, and for my very life itself. I wouldn't be here without you two. Thanks Mom and Dad. I love you both very much.

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I am also grateful for the other committee members, Dr. David Carbonara and Dr. Dorothy Bassett. Dr. Carbonara was more than a helpful committee member; he was also a professor in many of the courses in both my graduate and doctoral degrees. I am very grateful for Dr. Carbonara sharing with me his incredible knowledge and precious time. Thank you Dr. Carbonara. Dr. Bassett provided me with unique insights into the doctoral process, constructive suggestions for my dissertation, and the good humor needed to raise my spirits when needed. Thank you Dr. Bassett. Komal Rizvi, the doctoral program assistant, always answered my many questions about the program logistics in a professional manner. For that I am grateful. Thank you Komal.

I would like to acknowledge that contributions to my learning of the professors at Duquesne University, School of Education, that taught in courses that I have had the privilege of being a student. The knowledge that they imparted formed the base from which I drew to facilitate completion of this work.

I would also like to recognize and thank the Duquesne University Internal Review Board, the team that critiqued my initial pilot survey, and the participants that completed the survey, providing the necessary data to complete chapters four and five. Though the

names are many, and, the data collection instrument being an anonymous survey, are names that I cannot divulge, I appreciate your help in earnest.

Of great importance, I would like to acknowledge the sacrifices, encouragement, and support that my friends and family provided over the years, without which, I would not have been able to complete this degree. To my wife Cheryl, my daughters Samantha, Abigail, and Lydia, and my sons Adam and Jacob, I extend my sincere gratitude.

Most importantly, I want to thank the Lord for listening to my morning, daily, and evening prayers, and being with me through this and all the joys and challenges that He has so richly, and graciously given to me presently, and throughout my entire life. Praise the Lord. Give thanks to the Lord, for he is good, for his steadfast love endures forever. Psalm 106:1

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF ABBREVIATIONS

Architectural Barriers Act (ABA)

Americans with Disabilities Act (ADA)

Association on Higher Education and Disability (AHEAD)

Attention Deficit Hyperactivity Disorder (ADHD)

Center for Applied Special Technology (CAST)

Center for Universal Design (CUD)

Disabilities, Opportunities, Internetworking, and Technology (DO-IT)

Higher Education Opportunity Act (HEOA)

Individuals with Disabilities Education Act (IDEA)

National Center on Educational Outcomes (NCEO)

Quality Matters (QM)

Self-Directed Learning (SDL)

Universal Design for Assessment (UDA)

Universal Design for Learning (UDL)

Universal Design of Instruction (UDI)

Universal Instructional Design (UID)

Chapter I: Introduction

Introduction

This research examined the factors related to support for Universal Design for Learning (UDL) in faculty professional development training programs offered by Centers for Teaching Excellence (CTE) in postsecondary institutions in the Commonwealth of Pennsylvania. The sample focused on directors of Centers for Teaching Excellence because they have the most credible first-hand knowledge of CTE support for universal design for learning. Support for UDL is important because it opens access and improves learning for all students, but students with disabilities in particular (Orr & Hammig, 2009). The student population with special needs attending postsecondary educational institutions continues to grow in volume and diversity. An instructional design framework, due in part to advancements in technology, has emerged that shows great promise in addressing the needs of the growing population of students with disabilities as well as students without disabilities. The framework is called Universal Design for Learning. Universal Design for Learning applied to pedagogy is a framework that anticipates, proactively plans for, and addresses the needs of a broad range of diverse learners (McGuire, Scott & Shaw, 2006) by presenting curricula and materials that are flexible and accessible.

Faculty are often aware of the benefits of Universal Design for Learning and place a high value on UDL (Izzo, Murray & Novak, 2008), but are often not able to implement it in their curriculum due to lack of knowledge and training. Achieving the benefits of Universal Design requires faculty training for effective implementation (Lombardi, Murray & Dallas, 2013; Lombardi, Murray & Gerdes, 2011). There is a

critical need for inclusive design training for faculty (Lombardi, Vukovic & Sala-Bars, 2015). Professional development opportunities for faculty to learn the principles of Universal Design for Learning are necessary to provide professors with the knowledge and skills required for effective remediation of existing courses and proper design of new courses. Centers for Teaching Excellence (CTE) are the primary means for faculty professional development in higher education, and so could therefore play a key role in providing UDL training and support. Understanding the characteristics of CTEs and how they relate to support for UDL would yield valuable insights. These insights could be used to structure CTEs in a manner that more effectively supports UDL. According to the findings of Roberts, Park, Brown and Cook (2011) in their systematic review of empirically based articles on the subject of Universal Design in postsecondary education, there are a limited number of articles addressing this area, leading them to conclude that additional research is needed.

The results of this study provide program directors, deans, and other school administrators with valuable information that can be used for self-evaluation of the faculty professional development, training, and support programs under their direct control with the objective of influencing decision-makers to more fully integrate UDL principles into their training programs.

The number of students in the United States with disabilities in postsecondary schools is increasing, comprising nearly 11% of the overall student population (Rao, Edelen-Smith & Wailehua, 2015). Other studies, such as the National Longitudinal Transition Study (NLTS), indicate that the number of students with disabilities is even higher and has more than doubled from a participation rate of 15% in 1987 to a

participation rate of 32% in 2003 (Newman, 2005). Across the United States 88% of postsecondary institutions have students with disabilities enrolled in courses and 99% of two- and four-year public institutions have students with disabilities enrolled (Raue & Lewis, 2011). The fastest growing and largest sub-population of students with disabilities is students with undisclosed disabilities, typically cognitive and learning disabilities, that comprise 60% of the total college student population (Wagner, Newman, Cameto, Garza & Levine, 2005).

Providing faculty with the necessary training and support to implement Universal Design for Learning in their courses is key to helping this growing student population. "However, despite the positive benefits associated with faculty training in UD principles, recent findings indicate that most postsecondary institutions devote limited resources to faculty training in this area" (Lombardi et al., 2013, p. 222). Postsecondary institutions that do not address this important need will suffer the negative consequences of reduced student retention and corresponding decreased revenues. Further, Moore, Smith, Hollingshead and Wojcik (2018) recently wrote in the Journal of Special Education Technology that, "there is limited research regarding how pre-service teachers are prepared to utilize UDL in their future classrooms and far less regarding how UDL is - or can be - used to teach in higher education with limited work usually taking the form of position papers or calls for research" (p. 2).

It is critical to address the needs of students with disabilities to increase their chances of academic success and improve their graduation rates. The graduation rate of students without disabilities is more than double that of students with disabilities (United States Department of Labor, 2019). Successful college graduation directly impacts an

individual's chance of employment and earning ability. The 2018 unemployment rate for college graduates in the United States was 2.1% compared to the unemployment rate for those with only a high school degree, which was 4.3% (United States Department of Labor, 2018). Further, the median lifetime earnings for men with a bachelor's degree is approximately $900,000 more than men with only a high school degree. The median lifetime earnings for women with a bachelor's degree is approximately $630,000 more than women with only a high school degree (Social Security Administration, 2019). This disparity in unemployment and potential earning power between persons obtaining college degrees and those with only high school degrees underscores the importance of effecting positive change in access to postsecondary education for persons with disabilities.

Further evidence of the criticality of addressing the needs of students with disabilities can be found in the escalation of relevant legislation enacted in the United States of America. A brief chronology of principal civil rights legislation for persons with disabilities begins with the Architectural Barriers Act (ABA) of 1968, mandating access to physical environments. The Rehabilitation Act of 1973, Section 504, includes The Civil Rights of Students with Hidden Disabilities and prohibits discrimination against people with disabilities in all programs receiving federal financial assistance (United States Department of Education, 1995). Particularly germane to this study, the 1990 Americans with Disabilities Act (ADA) mandates equitable access to curricula, courses, and academic programs at postsecondary levels (Higbee, 2009; Rao, Ok & Bryant, 2014). Equally pertinent to this research, the Higher Education Opportunity Act (HEOA) of 2008 specifically recognizes and advocates for the incorporation of Universal

Design in curricula (Edyburn, 2010). Non-adherence to legislation has resulted in lawsuits and tarnished reputations for numerous universities that did not comply with the legal mandates, e.g., Florida State University, California Community College System, New York University, and Northwestern University (Kmetz & Davis, 2014).

The current education system and instructional practices are not sufficient to meet the needs of students with disabilities (Kavale, 2002). It is vital that faculty gain a broader awareness and deeper understanding of inclusive teaching practices (Lombardi et al., 2015). One solution to this problem is for postsecondary faculty professional development entities, such as Centers for Teaching Excellence (CTE), to provide faculty with the necessary resources, training, and support so that they can design their courses to be universally accessible. (Note: for the purposes of this study, the term Center(s) for Teaching Excellence (CTE) is used to cover the departments in universities that are responsible for the professional development of faculty, aka, Faculty Development Unit, Learning Enhancement Center, Teaching and Learning Resources/Center, Faculty Centers for Teaching and Learning, Center for Teaching Excellence and Educational Innovation, etc.). Faculty can design their curriculum to be universally accessible by integrating the principles of inclusive instruction as defined by one of the Universal Design frameworks, e.g., Universal Design for Learning, thereby increasing the likelihood of academic success (Skinner, 2007). Some of the benefits of applying Universal Design for Learning to curricula are: reduced dropout rates (Dallas, Sprong & Upton, 2014), reduced need for compensatory individual accommodations (Finn, Rotherham & Hokanson, 2001), and superior access to an increasingly diverse student population (McGuire et al., 2006).

The origin of Universal Design began in the 1950s in the field of architecture, focusing on physical environments, i.e., buildings access. Advances in technology have opened opportunities to expand Universal Design into other domains, such as education. Silver, Bourke and Strehorn were the first to apply Universal Design to the education realm by developing a framework called Universal Instructional Design (McGuire & Scott, 2006; Orr et al., 2009). Several other Universal Design frameworks were developed around the same time. The Universal Design frameworks are: Universal Design for Learning (UDL), Universal Instructional Design (UID), Universal Design of Instruction (UDI), and Universal Design for Assessment (UDA). Universal Design for Learning is a term coined by the Center for Applied Special Technology (CAST) (Center for Applied Special Technology, 2018). Silver, Bourke and Strehorn (1998) termed their framework Universal Instructional Design. Burgstahler developed and advanced Universal Design of Instruction at the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center. Universal Design for Assessment maximizes validity of inferences of knowledge and performance by the greatest range of students possible (Thompson, Johnstone & Thurlow, 2002). Though each of the frameworks is unique, they share more commonalities than they have differences. This study provides details for each framework, but uses the term Universal Design for Learning to cover all of the frameworks for sake of clarity and simplicity. In addition to thoroughly covering the Universal Design frameworks, traditional instructional design models and learning theories are presented to provide foundational context for the research presented.

It is evident that Universal Design for Learning is an important advancement in the evolution of instructional design to address the needs of an ever-growing

heterogeneous student population. To realize the benefits of this advancement, faculty will require the necessary training and support to understand and effectively apply the principles to their particular course curriculum. Centers for Teaching Excellence can play a vital role in providing the training for UDL to university faculty. The purpose of this research was to analyze the factors that impact postsecondary Centers for Teaching Excellence support for Universal Design for Learning as measured in training offered to faculty in their institution. Understanding the factors that advance or impede UDL training being offered will help decision-makers plan effective programs.

Problem Statement

A systematic review of the literature of previously conducted studies revealed that several factors influenced faculty adoption of Universal Design for Learning principles. The primary factors were related to faculty demographics, e.g., tenure, subject area being taught, and past experience in teaching students with disabilities. Institutional factors such as faculty support, access to instructional designers, and level of university engagement in research, i.e., the degree of emphasis that university administration places on research rather than teaching, also influenced faculty disposition towards integrating UDL in their curriculum. The paucity of literature covering the degree to which UDL is being taught in university Centers for Teaching Excellence necessitated this research study. Roberts et al. (2011) reviewed articles on Universal Design in postsecondary education and concluded, "more research needs to be conducted on the use of UDI, i.e., Universal Design for Instruction, in postsecondary education" (p. 1). This assertion is affirmed by Rose, Harbour, Johnston, Daley and Abarbanell's (2006) earlier research

findings that, “discussion of UDL application in higher education courses is rare, especially at the graduate level” (p. 5).

Studies have shown that faculty place high value on Universal Design for Learning training, expressing interest in more opportunities to learn about UDL (Evmenova, 2018) with some studies ranking UDL training as the top priority among faculty desires for professional development. Faculty expressed particular interest in understanding how to meet the needs of students that choose to not disclose their learning disability, e.g., cognitive learning disabilities (Izzo et al., 2008). Faculty are often aware of the need for, and express the desire for, pedagogical training techniques for disability instruction (Burgstahler, Duclos & Turcotte, 2000). These studies show that faculty value UDL and have a desire to learn more about UDL. Centers for Teaching Excellence can provide the necessary professional development training to educate faculty and improve their attitudes towards the adoption of UDL in their courses.

Faculty attitudes towards providing accommodations for students are impacted by their level of understanding of disability issues and their experience in teaching students with disabilities. These attitudes can be positively influenced through professional development training opportunities. One of Skinner’s (2007) findings in his study to determine faculty willingness to provide accommodations for students with learning disabilities was that faculty’s increased understanding of the necessity to provide student accommodations positively correlated with their willingness to provide the needed accommodations. Rao’s (2004) study investigating postsecondary faculty attitudes also concluded that improving faculty’s understanding of the needs of students with disabilities improved their attitudes toward embracing the principles of Universal Design

for Learning. Lombardi, Murray and Gerdes (2011) found that when faculty were provided with UDL training, their attitudes changed, making them more inclined to provide accommodations for students with disabilities. Though a few instructors may take it upon themselves to learn all that is needed for successful UDL design and implementation, it is clear that the majority of faculty will require assistance to do so. Faculty will need the support of informed institutional departments, e.g., Centers for Teaching Excellence, to act as resources and support for Universal Design for Learning initiatives.

Additional challenges facing Universal Design for Learning adoption in higher education include: faculty often lack formal instructional design training (Moore et al., 2018), are not aware of the civil rights laws for students with disabilities (Baggett, 1994; Villarreal, 2002), and may not have had much experience interacting with students with disabilities (Vasek, 2005). Faculty that teach in university schools of education are typically the only instructors on campus that have formally studied the art and science of teaching. Other faculty may be experts in their own domain, e.g., business, engineering, law, etc., but most faculty are not formally trained in pedagogy, so understanding the myriad, sophisticated considerations and options of UDL can be particularly daunting for those without a solid foundational understanding of the learning sciences (Andurkar et al., 2010; Robinson & Hope, 2013). Given these circumstances, it is easy to see how Centers of Teaching Excellence can play a critical role in advancing instructors' knowledge of best practices for instructional design, and specific to this research, in UDL application and implementation in particular. The Higher Education Opportunity Act of 2008 incorporates and specifically references Universal Design for Learning. Faculty

may or may not be aware of this legislation and often need assistance in interpreting the legal requirements specific to mandated UDL application and implementation (Lombardi et al., 2015). A study by Zhang, Landmark, Reber, Hsu, Kwok and Benz (2010) found that the more faculty understand disability legislation, the more likely they were willing to provide accommodations to students with disabilities. Disability legislation knowledge, along with faculty believing they have adequate institution support, were the two primary predictors of faculty UDL engagement, confirmed in research conducted by Zhang et al. (2010) in examining university faculty knowledge, beliefs, and practices regarding accommodations. Research by Zhang et al. (2010) also found that faculty that had past experiences in teaching and interacting with students with disabilities were more willing to provide accommodations for students with disabilities in general. This experience not only builds faculty understanding of how to support the needs of students with disabilities, but it also typically increases their comfort level in teaching and interacting with students with disabilities, leading to more positive dispositions toward accommodation. Gaining experience is dependent on factors beyond an instructor's direct control, e.g., whether or not a student with disabilities is present in one of their classes, if a student with disabilities discloses his/her disability, and the type of disability students have that may have attended one of their classes. Vasek (2005) found that many of the faculty in their study had little to no contact with students with disabilities. Therefore, Centers for Teaching Excellence and equivalents may be the primary or only means for faculty to gain a greater understanding of disability issues.

The amount of resources for Universal Design for Learning available to faculty significantly impacts faculty's provisioning of accommodations for students (Bourke,

Strehorn & Silver, 2000). Unfortunately the majority of postsecondary institutions do not appear to be dedicating the necessary resources (Lombardi et al., 2013). Focusing on faculty support for UDL implementation Rao and Gartin (2003) stated, "studies did not investigate what information and support services faculty required to provide these, i.e., UDL, accommodation" (p. 7). The types of resources and training available to faculty must be determined and well defined so that Centers for Teaching Excellence can optimize their offerings to effectively support faculty needs. Additional research is needed to determine what types of resources are best suited to achieve this important objective. Understanding postsecondary education institution characteristics, e.g., small vs. large, private vs. public, two-year vs. four-year, that provide superior UDL training and support will provide exemplary models for other institutions to replicate in their own faculty development efforts (Vogel, Leyser, Wyland & Brulle, 1999). Identifying these institutional characteristics in relationship to UDL implementation is one of the focuses of this study.

Faculty personal beliefs play an important role in their willingness to provide reasonable accommodations. Administrative support and understanding of the legal responsibilities directly influence faculty beliefs (Zhang et al., 2010). Understanding how Centers of Teaching Excellence can support and work with faculty on UDL initiatives, then applying that understanding to improve faculty support efforts, will permit support entities to be more efficient, liberating time for the adoption of Universal Design for Learning principles into the overall curriculum.

Additional associated UDL concerns, such as implementation and legal responsibilities, are both important issues requiring further exploration and understanding

(Bourke et al., 2000). Finally, understanding postsecondary education institutes' efforts to scale-up UDL training, support, and implementation is needed, as "there is no articulation of levels of UDL implementation in higher education as exist in K-12" (Moore et al., 2018, p. 45). This research project presents valuable information about the level of training and support provided by Centers for Teaching Excellence in postsecondary educational institutions. The findings may advance the adoption of Universal Design for Learning principles by faculty who teach an ever-increasing population of students with a broad spectrum of abilities.

Student Success

The application of Universal Design for Learning to course curricula improves access to learning for all students. UDL benefits students with disabilities in particular. Minimizing academic barriers for these students is within the control of faculty and the institutions where they teach, whereas other barriers encountered by these students are personal and beyond faculty control. Students with disabilities often have life impediments that non-disabled students do not. For example, students with disabilities typically need more time to attend to daily living and self-care activities in addition to their academic responsibilities. They may also have experienced poor support for the transition from high school and consequently are insufficiently prepared for postsecondary academics.

These barriers and impediments frequently result in delayed graduation, as students with disabilities often require twice the amount of time for graduation than students without disabilities. The delay in time to graduate increases costs (Wolanin &

Steele, 2004) and postpones these students' ability to seek fulltime employment. Due to the impediments that students with disabilities face, prospects for graduating at all are reduced, i.e., students with disabilities graduate at about half the level of students that do not have disabilities (United States Department of Labor, 2019). All of these factors add up to additional expenses for students with disabilities and lost revenue for postsecondary education institutions, i.e., due to increased dropout rates of students with disabilities. Skinner's (2007) research presents evidence that, "providing reasonable accommodations significantly increases the probability of success for these students" (p. 1). Research has provided evidence that faculty lack of knowledge in appropriate design and delivery of accommodations is a contributing factor in the failure of students with disabilities (Orr et al., 2009). Further, faculty professional development experiences positively impact faculty willingness to provide accommodations (Bigaj, Shaw & McGuire, 1999; Lombardi et al., 2015). Faculty professional development staff can provide faculty with the necessary training and tools to successfully implement UDL, but may also provide the rational and importance of UDL. Training faculty in UDL leads to improved attitudes and integration of UDL into curriculum making courses more accessible to students. Universities have an opportunity to not only do what is right for students with disabilities, but to reduce their exposure to lawsuits and tarnished reputations and increase their bottom-line revenue by applying Universal Design for Learning to their curriculum. Dallas, Sprong and Upton (2014) suggest that Universal Design for Instruction (UDI) is a viable means of student retention. They assert that applying UDI as a means of embracing varied student learning preferences and styles reduces the need for individual accommodations. Greater student success can be gained when courses are oriented

toward students' learning strengths and abilities (Izzo et al., 2008). Providing training and support for faculty to learn and apply Universal Design for Learning principles to their curriculum can have significant benefits for students and universities alike. Centers for Teaching Excellence, the primary entities for providing faculty professional development, can play a critical role in support of Universal Design for Learning, and as such, were the focus of this research.

Purpose Statement

The purpose of the research was to analyze the factors that impact postsecondary Centers for Teaching Excellence support for Universal Design for Learning as measured in training offered to faculty in their institution. Universal Design for Learning applied to pedagogy is a framework that anticipates, proactively plans for, and addresses the needs of a broad range of diverse learners (McGuire et al., 2006). The specific factors studied were: administrative espoused and real support for the CTE, CTE staff composition and use of technology, and the CTE's director's background. These variables were analyzed to determine if they impacted a center's level of training and support for UDL. The goal was to provide information to administrators that run CTEs so that they may structure their center to more effectively support Universal Design for Learning and in so doing support a broader range of diverse learners.

A survey was developed and deployed to Centers of Teaching Excellence directors, or their equivalents, asking pertinent questions on the subject. Data from the completed surveys was collected and analyzed to identify factors that impacted a Center for Teaching Excellence's support level for Universal Design for Learning.

Overview of the Methodology

Integration of Universal Design for Learning principles into curricula increases opportunities for learners, particularly for learners with disabilities (Orr et al., 2009), to access and understand the subject matter being taught. Centers for Teaching Excellence and other entities charged with faculty professional development can play a key role in providing faculty with the information, training, and support that they require to implement Universal Design for Learning. This research focused on the issues concerning faculty training and support for Universal Design for Learning in institutions of higher learning. Centers for Teaching Excellence and other professional development support departments for faculty, play critical roles in fulfilling the training and support needs of faculty. Collecting pertinent information from these centers provided data that was analyzed to understand the current state of support for UDL. This research will help administrators make informed decisions to advance the adoption of UDL.

An electronic survey was developed and distributed to administrators of university faculty professional development departments, e.g., directors of Centers for Teaching Excellence, in the Commonwealth of Pennsylvania to determine the level of support and training provided to faculty for Universal Design for Learning. The participants in this study included all postsecondary education institutions that met the study criteria, i.e., institutions that award bachelor's and advanced degrees, in the Commonwealth of Pennsylvania, had a Center for Teaching Excellence, n=51. The institutions were geographically distributed across the Commonwealth with concentrations in the urban areas, e.g., Philadelphia and Pittsburgh. The schools ranged in size from small rural institutions to very large universities with tens of thousands of

students, e.g., Pennsylvania State University, Temple University, University of Pittsburgh.

The sample was geographically constrained to the Commonwealth of Pennsylvania because it well represents a national perspective due to its quantity and diversity of colleges and universities. Further, nationally there are four thousand, five hundred and eighty-three postsecondary Title IV degree-granting institutions (National Center for Education Statistics, 2019) which is an unwieldy and unnecessary volume of schools to include in the research study. Pennsylvania nationally ranks tenth in the number of postsecondary degrees awarded, enrolls over one hundred thousand students, has the nation's number one business school and the seventh top law school (PDCED, 2019). The overall Pennsylvania higher education student demographics are representative of national demographics with regards to gender, minority status, and traditional / adult learner status (Pennsylvania's State System of Higher Education, 2019).

Research Questions

Question 1: Do Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration?

Question 1 Hypothesis: Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration.

Question 2: Do university Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence?

Question 2 Hypothesis: University Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence.

Question 3: Does the level of use of technology by university Centers for Teaching Excellence impact the degree of support of Universal Design for Learning by Centers for Teaching Excellence?

Question 3 Hypothesis: The level of use of technology by university Centers for Teaching Excellence impacts the degree of support of Universal Design for Learning by Centers for Teaching Excellence.

Question 4: Does the level of education of directors of Centers for Teaching Excellence influence the level of support for Universal Design for Learning provided by the Center for Teaching Excellence?

Question 4 Hypothesis: The level of education of directors of Centers for Teaching Excellence influences the level of support for Universal Design for Learning provided by the Center for Teaching Excellence.

Question 5: Do Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for

Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities?

Question 5 Hypothesis: Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities.

Administrative support may take many forms but typically consists of: adequately staffing the department, providing the necessary financial resources, and being an advocate for the center by encouraging faculty to participate in the activities that the center provides. Centers for Teaching Excellence support for Universal Design for Learning is defined as the CTE providing UDL training materials, training sessions, and consultation.

Compilation of Postsecondary Education Institutes List

A definitive list of postsecondary education institutes in the Commonwealth of Pennsylvania was not available, likely due to the variability in criteria for what constitutes a postsecondary educational institute. Due diligence was performed to secure a definitive list by thoughtful definition of criteria, (i.e., schools that are: public, private non-profit, and private for-profit, institutions that award bachelor's and advanced degrees), and information access of authoritative resources. A search was conducted using the National Center for Education Statistics (NCES), (2019), https://nces.ed.gov, Professional and Organizational Development (POD) Network in Higher Education,

https://podnetwork.org, website with the following search definition criteria: State: Pennsylvania, Level of Award: bachelor's & advanced degrees, Institution Type: public, private non-profit, private for-profit, 4-year, 2-year. These search filtering parameters were available on the website as drop-down menu selection options. In addition to the NCES search results, the list was augmented with a Google search on the following terms: Center for Teaching Excellence, center for teaching and learning faculty excellence, center for faculty excellence as well as a search to identify all of the Pennsylvania community colleges. This list of universities and colleges was further filtered to remove technical schools and schools that did not have faculty professional support departments or equivalents.

Acknowledgment of Delimitations

The data collection was conducted in the summer of 2020. The data was collected from program directors, or equivalents, currently employed in schools that provide faculty development via a Center for Teaching Excellence department. Institutions that did not meet the participant criteria were not included in the study, i.e., schools had to be institutions that awarded bachelor's and advanced degrees, and be institutions that had Center for Teaching Excellence units.

The researcher realized that other constituents, e.g., deans, administrators, and directors of disability services departments, may have yielded additional information but including these entities was beyond the scope of the study.

The Significance of the Study

Diligent research was conducted querying reputable journal article databases, i.e., Educational Resources Information Center (ERIC) EBSCOHost, ProQuest Education Database, and Google Scholar on the subjects of Universal Design for Learning, Universal Instructional Design, Universal Design for Instruction, Universal Design for Assessment, postsecondary education, faculty training, and other relevant keyword terms and word strings.

This study intends to reveal the factors that influence the level of integration of Universal Design for Learning in postsecondary education institutions' Centers for Teaching Excellence in the Commonwealth of Pennsylvania. The results of the study provides program directors, deans, and administrators with valuable information that can be used to influence decision-makers to more fully integrate UDL principles into their training programs. It is believed that increased integration of UDL content in faculty professional development, training, and support programs will subsequently increase the use of UDL principles in the curriculum that faculty develop and ultimately benefit the students that they teach, particularly students with disabilities.

Definition of Key Terms

Accommodations. Specific to this research this term is defined as student advocacy in educational environments where inaccessible course materials and delivery are modified to be made available (Edyburn, 2010).

Americans with Disabilities Act (ADA). Federal legislation that prohibits discrimination against people with disabilities. Passed in 1990.

Architectural Barriers Act. Federal legislation that requires access to facilities designed, built, altered, or leased with federal funds. Passed in 1968.

Assistive technologies. "Technologies that are specifically designed to assist individuals with disabilities in overcoming barriers in their environment." Rose et al., 2006, p. 135). "Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability." (Early Childhood Technical Assistance Center, 2019, p. 1).

Association on Higher Education and Disability (AHEAD). Established in 1977, AHEAD is the leading professional membership association for individuals committed to equity for persons with disabilities in higher education.

Attention Deficit Hyperactivity Disorder (ADHD). A chronic condition, found primarily in children, that includes problems in hyperactivity, impulsive behavior, and difficulty sustaining attention.

Backward Design. A model for designing educational curricula that starts with goal definition, followed by material, activity, and assessment definition. The three stages are: identify the results desired, determine acceptable evidence, and plan learning experiences and instruction.

Center for Applied Special Technology (CAST). Founded in 1984, CAST is a nonprofit education research and development organization that works to expand learning opportunities for all individuals through Universal Design for Learning (Center for Applied Special Technology, 2019).

Center for Teaching Excellence (CTE). For the purposes of this study, this term is used to cover departments in universities that are responsible for the professional development of faculty, aka, Faculty Development Unit, Learning Enhancement Center, Teaching and Learning Resources/Center, Faculty Centers for Teaching and Learning, Center for Teaching Excellence and Educational Innovation, Office for Instructional Success, Center for the Enhancement of Teaching, Center for Transformational Teaching and Learning, Center for Faculty Professional Development, and other units responsible for faculty professional development.

Center for Universal Design (CUD). CUD is a national information, technical assistance, and research center that evaluates, develops, and promotes accessibility and Universal Design in housing, commercial and public facilities, outdoor environments, and products.

Cognitive disabilities. Mental functioning limitations that may diminish ability to process information, communicate, socialize, or care for oneself.

Cognitive overload. A mental state when a person's working memory is overwhelmed with too much information being provided in various formats all at once.

Computer-adaptive tests. Customized test delivery based on a student's previous responses to questions.

Construct irrelevant variance. Introduction of extraneous variables in assessment that may result in exam accuracy reduction and reduced validity.

Director. For purposes of this study, the term director is defined as: an individual with the title of director or equivalent for the university's Center for Teaching Excellence or similar department responsible for faculty professional development, the person that

holds the highest rank in such a department, a designee of the director, or the person responsible for faculty professional development.

Disabilities, Opportunities, Internetworking, and Technology (DO-IT). Founded in 1992 by Dr. Sheryl Burgstahler, and headquartered in the University of Washington, DO-IT is dedicated to empowering people with disabilities through technology and education. DO-IT promotes awareness and accessibility in both the workplace and classroom.

Faculty Development Unit. For the purposes of this study, this term is used to cover departments in universities that are responsible for the professional development of faculty, aka, Center/Institute for Teaching Excellence (CTE), Learning Enhancement Center, Teaching and Learning Resources/Center, Faculty Centers for Teaching and Learning, Center for Teaching Excellence and Educational Innovation, Office for Instructional Success, Center for the Enhancement of Teaching, Center for Transformational Teaching and Learning, Center for Faculty Professional Development, and other units responsible for faculty profession development.

Higher Education Opportunity Act (HEOA). 2008 federal law strengthening resources for universities and providing financial assistance to postsecondary students. HEOA specifically references Universal Design by name in the legislation as a, "scientifically valid framework for guiding educational practice. SEC. 762 (G) (SEC. 103(C))." (Roberts, Park, Brown & Cook, 2011, p. 7).

Inclusive teaching practices. Recognizing and embracing student diversity, enabling participation and access to course content, and providing multiple means of demonstrating knowledge mastery are key characteristics of inclusive teaching practices.

Individuals with Disabilities Education Act (IDEA). 1990 federal legislation that ensures K-12 students with a disability are provided with Free Appropriate Public Education (FAPE) that is tailored to their individual needs.

Instructional Design. A science that uses learning and instructional theories to inform the systematic specification and development of effective instruction.

Learning disabilities. Neurological problems making knowledge acquisition difficult.

Pedagogy. The theoretical conceptualization and practical application of teaching.

Postsecondary education. Any education that takes place after high school.

Quality Matters (QM). Founded in 2004, and housed in the Maryland Online University, QM is an international nonprofit organization that provides the structure and an assessment rubric to evaluate and improve online courses. The rubric has a section dedicated to accessibility.

Reasonable accommodation. Altering the environment or curriculum to provide persons with disabilities access.

Rehabilitation Act of 1973, Section 504. The first disabilities civil rights law in the United States. It prohibited discrimination against people with disabilities in all programs receiving federal financial assistance. It set the stage for the enactment of the Americans with Disabilities Act.

Trace Research and Development Center. Founded in 1971 at the University of Wisconsin-Madison, Trace is a pioneer in the fields of technology and disability endeavoring to make the world accessible to people of all abilities.

Universal Design (UD). Designing environments to be understood and accessed, to the greatest extent possible, by a heterogeneous population with diverse needs. Focuses on eliminating barriers through initial designs that consider the needs of diverse people, rather than overcoming barriers later through individual adaption (Rose et al., 2006). "In terms of learning, universal design means the design of instructional materials and activities that makes the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal Design for Learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with differing abilities. These alternatives are built into the instructional design and operating systems of educational materials they are not added on after-the-fact" (Thompson et al., 2002, p.4).

Universal Design for Assessment (UDA). Developed by the National Center on Educational Outcomes, it is the proactive design of assessments, with consideration of both physical and cognitive environments, to improve access to the widest range of students possible.

Universal Design for Learning (UDL). The Center for Applied Special Technology (CAST) defines Universal Design for Learning as a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn. UDL is a scientifically valid framework that can be used to inform the design of instruction to reduce barriers (Edyburn, 2010). The three principles of UDL are: provide multiple means of representation, provide multiple means of action and expression, and provide multiple means of engagement.

Universal Design of Instruction (UDI). Application of Universal Design principles to learning environments to facilitate greater accessibility for all students, including students with disabilities. There are seven principles: identify the course, define the universe, involve students, adopt instructional strategies, apply instructional strategies, plan for accommodations, and evaluate.

Universal Instructional Design (UID). A framework that offers strategies that remove or minimize barriers and provide flexibility to enable students to access instruction based on their diverse needs. There are seven principles: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.

Summary Statement

The purpose of the research was to analyze the factors that impact postsecondary Centers for Teaching Excellence support for Universal Design for Learning measured in training offered to faculty in their institution. The specific factors studied were: administrative espoused and real support for the CTE, CTE staff composition and use of technology, and the CTE's director's background. These variables were analyzed to determine if they impacted a center's level of training and support for UDL. The goal was to provide information to administrators that run CTEs so that they may structure their center to more effectively support Universal Design for Learning and in so doing support a broader range of diverse learners.

Chapter II: Literature Review

Increasing Number of Students with Disabilities in Postsecondary Education

The number of students in the United States with disabilities in postsecondary schools is increasing, currently comprising nearly 11% (Rao et al., 2015) of the overall student population. The National Longitudinal Transition Study (NLTS) indicates that participation of youth in postsecondary schools was even higher with past growth of more than doubled from 1987 having a participation rate of 15% to 2003 having a participation rate of 32% (Newman, 2005). Rao et al., (2011) report that 88% of United States postsecondary institutions have students with disabilities enrolled in courses and that 99% of two and four year public institutions have students with disabilities enrolled. The increase in college attendance of students with disabilities is due in part to improved transition planning, increased availability of federal scholarship funds, better academic preparation (Brinckerhoff, McGuire & Shaw, 2002), advances in assistive technologies that aid students in overcoming impediments associated with their condition (Kmetz & Davis, 2014) a changing demographic of college attendees with greater numbers of first-generation students, minority students, and older students (McGuire et al., 2006), and an increase in cognitive disabilities in the general population.

This enrollment increase of students with disabilities profoundly impacts faculty's course planning and design if they are to meet the needs of this growing population. Unfortunately the education system may lack the necessary attitudes, accommodations, and adaptations to meet the needs of these students (Kavale, 2002). Lombardi et al. (2015) state, "it has become more urgent for college faculty to have a broad awareness of disability and inclusive teaching practices based on the tenets of Universal Design" (p. 1).

Universal Design applied to pedagogy is a framework that anticipates, proactively plans for, and addresses the needs of various learners, particularly students with disabilities (Orr et al., 2009). Skinner (2007) asserts that when instructors provide reasonable accommodation for students with disabilities it substantially increases the likelihood of academic success for this population.

Benefits of Universal Design for Learning (UDL) for Students

With the growing population of persons with disabilities in postsecondary education there is a corresponding increase in the need to effectively address the resulting accessibility issues. A study by Zhang et al. (2010) revealed that faculty are not fully supporting students with disabilities from a best practices or a legal standpoint, i.e., not providing reasonable accommodations, not adhering to the legal mandates of the Americans with Disabilities Act of 1990 nor the Higher Education Opportunity Act (HEOA) of 2008. This lack of comprehensive support has negative impacts on students and institutions. Finding a solution to this problem is necessary to aid students with disabilities so that they have equal opportunities to succeed academically in postsecondary education.

Traditional pedagogy and instructional practices are not sufficient to meet the need of this growing student population. One solution to this problem is for faculty to design their courses to be universally accessible by integrating the principles of inclusive instruction as defined by one of the Universal Design (UD) frameworks. "The paradigm of universal design is widely cited as a framework for assisting students with LD in postsecondary settings. Universal design is based on the premise that proactive planning

to reduce barriers decreases the need for retroactive accommodations, thereby increasing opportunities for positive outcomes" (Orr et al., 2009, p. 192). Students with disabilities may still require special accommodations, e.g., providing a sign language interpreter for students that are deaf, but application of Universal Design principles will none the less be an effective strategy in meeting many needs of students with disabilities, both students that report their disability and students that do not report their disability. Dallas, Sprong and Upton (2014) stated that applying Universal Design for Instruction (UDI) is a means for faculty to design their courses in a manner that addresses a wide variety of student learning styles and accommodation necessities, and reduces the need for individual accommodations, which will result in reduced dropout rates for all students, but students with disabilities in particular. An earlier study by Finn et al. (2001) noted, "if we did a better job of preventing and forestalling education problems, rather than relying on compensatory and remedial activities, disabled children would benefit enormously" (p. 337). McGuire et al. (2006) expound that application of Universal Design for Learning, i.e., providing accommodations and inclusive features into classroom environments and instruction at the postsecondary level, may offer superior access to an increasingly diverse student population that includes students with disabilities.

Applying the Universal Design for Learning framework is a viable solution that would facilitate meeting the needs of students that report their disabilities as well as those students that decline to report a disability. The Universal Design for Learning framework is an inclusive and flexible environment that aids all students, i.e., students with reported disabilities, students that do not report their disabilities, and students with no disabilities at all. Students that do not have disabilities, but may benefit from the application of

Universal Design for Learning and inclusive instruction, may include those with diverse cultural backgrounds, differing levels of ability, different approaches to learning, and students that speak English as a second language (Orkwis & McLane, 1998).

There are various compelling and important reasons for integrating inclusive instruction and Universal Design for Learning into courses. First, implementing inclusive instruction at the onset reduces the need for faculty to make course adjustments when a student with a registered disability enrolls in the course, saving the instructor from performing last minute course changes prior to the start of a semester when time constraints are greatest. Second, incorporating inclusive instruction and UDL may help the course become more accessible to a wider range of students, e.g., students that have historically been underrepresented in college including first generation college attendees, students that have English as a second language, and students of color (of particular importance because all of these groups are at a higher risk of performing poorly (Lombardi et al., 2011), as well as students with differing learning abilities, (Lombardi et al., 2011). Finally, integrative inclusive instruction and UDL may help institutions avoid potentially costly lawsuits if sued based on mandated disability-related laws.

Types of Disabilities

Students with cognitive disabilities comprise a large percentage of the overall population of students with disabilities. The majority of the cognitive disabilities of students attending postsecondary education are 'unseen' psychological Learning Disabilities (LD) such as Attention Deficit Hyperactivity Disorder (ADHD) and mental health disorders (Lombardi et al., 2013). Students with learning disabilities are the fastest

growing and largest sub-population, comprising 46% to 61% of students with cognitive disabilities (Orr et al., 2009; Wolanin et al., 2004). Unlike students with disabilities that are conspicuous, and typically reported to university disability services offices, e.g., low vision, blindness, hearing, mobility, and health impairments (Burgstahler, 2009), the unseen or 'hidden' disabilities, i.e., cognitive disabilities, often go unknown to faculty and school administrators unless the students self-report their condition. Students may be reticent to ask faculty for accommodations because: lack self-advocacy skills, may feel intimidated to approach professors, fear discrimination, fear being stigmatized, may not know about the university support for accommodations that is available to them, and may have had negative past experiences. Also, the experience of approaching faculty can be stressful due to faculty lack of understanding and caring (Elacqua, Rapaport & Kruse, 1996).

Though these cognitive disabilities are hidden and often not reported, they require curricula adaptation to course design, delivery, and assessment to maximize usability and accessibility for this population. This situation presents challenges for faculty and students alike. Unaware of the need for accommodations for these students, faculty will continue to design and deliver their courses as they normally would. As a result, the courses may not be accommodating for these students' needs. Consequently these students may fall behind. Wagner et al. (2005) reported that students with undisclosed disabilities comprise 60% of the total college student population. Wagner et al. (2005) further stated that students have different strengths and weaknesses and learn in different ways. Students use many different means to identify, strategize, and process information. These differences in the learning process have always been and will continue to be

present in all student populations. Al Hazmi and Ahmad (2018) assert that in recent years concerns for providing access to general education for students with intellectual disabilities is growing not just in the United States but also throughout the world.

An increase of students with disabilities in postsecondary education may translate into an increase in student dropout rates if curricula is not adjusted to accommodate these students' special needs. Wagner et al. (2005) indicate that after one year from high school graduation only 5% of students with disabilities in four-year colleges were still enrolled and only 10% of students with disabilities in two-year colleges were still enrolled. The reasons for students with disabilities dropping out of school are varied and numerous, but include: inadequate support for transition from high school to college (Frieden, 2004), deficient academic preparation (Horn, Berktold & Bobbitt, 1999), and the insufficiency of faculty knowledge and application of the proper use of accommodations for the special needs of these students (Malakpa, 1997; Villarreal, 2002).

Accessibility Legislation

Federal mandates exist that require postsecondary institutions to provide access for students with disabilities to the same curriculum accessed by the general student population. Higbee (2009) states, "the ADA (Americans with Disabilities Act) requires not only physical spaces to be accessible, but that courses, curricula, and academic programs be accessible as well for students with all types of documented disabilities" (p. 1). Higbee (2009) continues by pointing out that accessibility mandates are not restricted to the United States, but have an international foundation, citing legislation ratification in

the United Nations, the United Kingdom, and many other countries.

In the United States the chronology of principle civil rights legislation for persons with disabilities begins with the Architectural Barriers Act (ABA) of 1968. The Architectural Barriers Act, one of the first pieces of legislation focusing on the built environment, mandates access to all facilities that are built, altered, designed, or leased using federal funds. The Architectural Barriers Act legislation was followed by the Rehabilitation Act of 1973, Section 504, which prohibits discrimination against people with disabilities in all programs receiving federal financial assistance. The Rehabilitation Act states, "no otherwise qualified individual with handicaps in the United States . . . shall, solely by reason of her or his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." (United States Department of Education, 1995, p. 1).

The Education for All Handicapped Children Act of 1975, now named the Individuals with Disabilities Education Act (IDEA), assures that all students, ages three to twenty-one, with disabilities are offered free, appropriate, public education that is tailored to meet their disability needs. The IDEA legislation does not apply to postsecondary education but is an important piece of legislation concerning students with disabilities. The Americans with Disabilities Act (ADA) of 1990 extended physical access to public and private buildings that did not receive federal funding. The Americans with Disabilities Act also mandates equitable access to curricula at postsecondary levels (Rao et al., 2014). The Americans with Disabilities Act legislation prohibits discrimination of people with disabilities. Americans with Disabilities Act,

Title III – Public Accommodations, §302(b)(2)(A)(ii) defines discrimination as, "a failure to make reasonable modifications in policies, practices, or procedures, when such modifications are necessary to afford such goods, services, facilities, privileges, advantages, or accommodations to individuals with disabilities, unless the entity can demonstrate that making such modifications would fundamentally alter the nature of such goods, services, facilities, privileges, advantages, or accommodations" (United States Access Board, 1990, p. 1).

Additional state and federal legislation has been enacted specifying adherence to Universal Design for Learning standards to be applied to curriculum. The Higher Education Opportunity Act (HEOA) of 2008 specifically recognizes and advocates for the incorporation of Universal Design (Edyburn, 2010), the Race to the Top Assessment Program and the Task Force to Explore the Incorporation of the Principles of Universal Design for Learning into the education systems in Maryland (Maryland State Department of Education, 2011) are all examples of such legislation that focuses on curricula accessibility and faculty training in the discipline of Universal Design (Rao et al., 2014).

Non-adherence to these various legislations may result in negative consequences for institutions. In 2012 the National Federation for the Blind brought a case against Pennsylvania State University to force them to comply with accessibility standards in numerous areas, i.e., the university's learning management system, websites, classrooms, and library. The Pennsylvania State University complied in August 2014. Florida State University, California Community College System, New York University, and Northwestern University are other universities that have complied with accessibility requirements due to lawsuits (Kmetz & Davis, 2014).

Universal Design Background

The origin of Universal Design stems from the 1950s beginning in the United States, Europe, and Japan (Roberts et al., 2011) and is rooted in the field of architecture. The focus of interest was to design physical environments that were functional and accessible to a broad spectrum of the population, particularly people with disabilities. Two individuals in particular were instrumental in defining and advancing Universal Design; Ronald Mace in the United States and Selwyn Goldsmith in the United Kingdom. Ronald Mace, who coined the term Universal Design, was an architect, product designer, and educator. Mace was confined to a wheelchair and founded the Center for Universal Design (CUD) housed at North Carolina State University (Roberts et al., 2011). The Center for Universal Design developed a framework that advocated for products and environments to be accessible to all people, to the greatest extent possible, without special accommodations for specific populations (Scott & McGuire, 2017). Selwyn Goldsmith was an architect afflicted with polio (Telegraph, 2011). Goldsmith wrote a book titled Designing for the Disabled that became the definitive reference for architects intending to incorporate accessible design features into their buildings. The book provides Goldsmith's philosophical approach to Universal Design and specific recommendations for implementation (Goldsmith & Royal Institute of British Architects, 1963).

Universal Design is defined as the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. Curb cuts on sidewalks, which help people in wheelchairs and the public at large, e.g., people pushing baby strollers, delivery persons pulling carts, etc., is a

quintessential example of the outcome of the application of Universal Design in the physical environment, benefiting not just people with disabilities but also the entire population. Additional physical environment considerations are: accessible entryways to buildings, e.g., ramps, using door levers instead of door knobs, lower-level water fountains and ATM machines for wheelchair access, and alternatives to staircases. Beyond architectural and building considerations additional examples of Universal Design are: the use of graphics on signage, e.g., restrooms, that helps people that are non-English speaking or have difficulty reading, and closed captioning on televisions that helps individuals with hearing impairments and people in noisy environments such as restaurants and airports (McGuire et al., 2006).

The Center for Universal Design published seven guidelines for Universal Design: 1. equitable use (has a usable and marketable design for people with diverse abilities, for example curb cuts easing access for persons using wheelchairs or persons pushing anything with wheels), 2. flexibility in use (accommodates diverse abilities and preferences, for example items designed to be functional for both left- and right-handed persons), 3. simple and intuitive use (considers persons with diverse backgrounds, knowledge, and literacy proficiencies, for example restaurant menus that include pictures as well as text), 4. perceptible information (provides information easily discernible regardless of sensory needs, for example, elevators with floor buttons in Braille positioned at a height accessible to individuals in wheelchairs), 5. tolerance for error (minimizes negative consequences for errors, for example computer programs that have undo features and auto-save files as they are being worked on), 6. low physical effort (minimizes effort required to use item, for example a door handle/lever instead of a door

knob), 7. size and space for approach and use (considers and accommodates persons of various heights, shapes, and physical abilities, for example, positioning an office mailbox that is accessible from both a standing and sitting position) (Center for Universal Design, 1997; Roberts et al., 2011). See, Appendix F, Table 3. Principles of Universal Design for sub-section points provided for each of the seven principles.

Embry and McGuire (2011) assert that postsecondary education needs, and is beginning to experience, a new pedagogical paradigm that emphasizes diverse learning environments with learning content and activities sufficiently flexible to be manipulated to meet the needs of a broad spectrum of students. Universal Design for physical environments is wholly applicable to the education domain with consideration of school building access, classroom access, lab and educational materials manipulation, and all other physical spaces and objects students use to engage in their education. Universal Design is also the genesis of several frameworks that have been developed to further extend access to education to an increasingly heterogeneous student population. These frameworks are: Universal Design for Learning (UDL), Universal Instructional Design (UID), Universal Design of Instruction (UDI), and Universal Design for Assessment (UDA). This paper covers each of the Universal Design frameworks in great detail. Next, information on instructional design, human cognition, learning theories, andragogy and Centers for Teaching Excellence, is presented to provide a foundation for analyzing the various instructional design theories and Universal Design frameworks.

Instructional Design

Instructional Design (ID) is a science that uses learning and instructional theories to inform the systematic specification and development of effective instruction. Instructional design is a procedural approach to designing instruction that is reliable, replicable, and efficiently facilitates positive student achievement outcomes. This section presents dominant learning theories and select instructional design models. Most instructional design approaches share common goals and processes but each is also unique. Each model has a particular focus, e.g., student motivation, application of technology, effective process, ease of use, and rapid development, many being compared and contrasted in past studies (Edmonds, Branch & Mukherjee, 1994).

Dozens of Instructional Design (ID) models have been developed from the 1970s to the present time (Andrews & Goodson, 1980). Several of the most widely adopted ID models are detailed here. Though each model has its own unique characteristics, most share the attributes of the ADDIE model, i.e., Analyze, Design, Develop, Implement, and Evaluate.

The ADDIE model was designed for the United States Army in 1975 at the Centre for Educational Technology, Florida State University. It is arguably the most well-known and applied instructional design model. The first step is to *analyze* the learners, learning environment, and probable causes for performance gaps. The *design* phase plans the instructional strategies, assessment approaches, and delivery methods. The learning materials and tests are produced and typically validated via a prototype in the *develop* phase. The learning environment is prepared and instruction is provided to the students in the *implement* phase. Finally, formative and summative assessment is conducted to

assess the learning products and delivery process for identification of areas for improvement in the *evaluate* phase. The following instructional design models touch on many of the same elements present in the ADDIE model (Dousay, 2018; Khalil & Elkhider, 2016).

The Diamond model, developed in 1989, consists of two phases: Phase I, project selection and design, and Phase II, production, implementation, and evaluation for each unit. The Diamond model uses an iterative evaluation process to review and remediate the instructional design strategy. The Dick and Carey model is a systematic approach to instructional design that details the various steps required to develop curriculum. It is a replicable process that identifies instructional goals at the onset, which in turn, guide the development of the curriculum. The PIE (Plan, Implement, Evaluate) model was developed in 1996 by Newby, Stepich, Lehman, and Russell. It focuses on application of technology for learning. The 4C/ID model is best suited for designing learning that deals with complex subject matter. It is comprised of: learning tasks, part-task practice, just-in-time information, and supportive information, while managing cognitive load. 4C/ID presents the student with tasks ordered from simple to complex, building competencies by scaffolding the learning experience (Van Merriënboer, Clark & De Croock, 2002).

All of the instructional design models have merit. That said, none achieve the same level of focus and commitment to providing a learning environment that anticipates and provides options to the widest spectrum of learners possible, particularly leaners with disabilities, as the Universal Design for Learning model. It is for this reason UDL was identified as the most appropriate instructional design model to reference in this study.

By reviewing the background, application, and limitations of the numerous instructional design frameworks, it becomes clear that only the Universal Design for education frameworks fully encompass the varied instructional design considerations associated with providing an accessible learning environment to the broadest student population possible, with a particular emphasis on students with disabilities.

Cognitive Considerations and Learning Theories

Cognitive psychology's current prevailing theory on how humans learn is underpinned by an information processing and retention spectrum beginning with sensory memory, followed by working memory, ending with long-term memory. Sensory memory receives information from the outside world via the human senses, e.g., hearing, seeing. This is the initial phase of information acquisition that Universal Design for Learning considers when planning instruction. Applying human knowledge acquisition theories to instructional design planning effectively accounts for the varied needs of a diverse student population. The next phase in the spectrum is working memory, which has a very limited capacity to hold information yet is where critical mental effort to assimilate incoming information may be applied facilitating the transition to long-term memory via rote (surface/maintenance learning) or elaborative (understanding/deep learning). An objective of instruction is to have students move information along the spectrum into long-term memory. Long-term memory has many benefits such as: categorizes information into schemas, has unlimited capacity, and retains information for future retrieval. Designing instruction mindful of human cognition achieves positive, effective results for all students (Khalil et al., 2016; Pappas, 2017).

There are three dominant learning theories: Behaviorism, Cognitivism, and Constructivism. Behaviorism views learning as the acquisition of a new behavior through objective-based instruction and competency-based assessment in which the student is a passive participant. Students are active participants in the learning process in Cognitivism. This theory emphasizes the acquisition and reorganization of cognitive structures through concept maps and problem solving. With Constructivism, learning is the search for meaning where engaged students learn collaboratively, using role modeling, reflection, journaling, as well as other pedagogical approaches to solve problems. Aligning the appropriate learning theory with the type of instructional materials being presented, and applying pedagogical techniques to improve long-term memory, facilitates instructional designers' objectives to produce optimal learning environments. The following instructional design models may favor one learning theory over another, but all have application for varied contexts and learning goals.

Andragogy

This research focuses on, among other issues, the learning provided by the Centers for Teaching Excellence to faculty. Centers for Teaching Excellence provide training to faculty, who are all adults, therefore, all learning provided is in the adult learning domain, i.e., andragogy. A synopsis of adult learning is next presented to provide relevant context.

Henschke (2015) chronicled the history of adult learning from Plato to present day. Though adult education has been around a long time, educators and researchers only began studying it in earnest since the 1920s. Currently, there is no definitive adult

learning model or theory that has been accepted universally. Examining adult learning through the lens of behavioral psychology, Thorndike, Bregman, Tilton and Woodyard (1928) published a fundamental book titled, 'Adult Learning'. This book helped establish the science of adult education as a subject worthy of study (Merriam, 2001). Two dominant theories emerged simultaneously; andragogy and self-directed learning. Malcolm Knowles, in 1968, labeled his theory of adult learning, 'andragogy'. Knowles prescribed a learning environment that is autonomous and growth-oriented. Knowles puts forth six principles for andragogy; 1. learner's need to know, 2. learner autonomy, 3. learner prior experience, 4. readiness to learn, 5. problem-centered orientation towards learning, and 6. intrinsic learner motivation (Knowles, Holton & Swanson, 1998).

Self-Directed Learning (SDL), like andragogy, focuses on adult learning as distinct from child learning. Tough (1967, 1971) offered the first description for self-directed learning as, systematic yet naturally occurring as part of one's everyday life (Merriam, 2001). Primary goals for SDL are: transformational learning, critical reflection, promotion of emancipatory learning, and social engagement. This learning may take place with or without a teacher present.

Over time adult learning theories and processes have advanced from linear models such as those proposed by Knowles and others. Models with a greater focus on environment and context emerged in the 1980s and 1990s (Merriam, 2001). An additional factor is the role of the teacher. It is recommended that teachers frequently examine their transformed role as facilitator and co-creator of learning experiences. Fundamental to andragogy is a mutually respective relationship between the teacher and students, which invites student involvement in managing the learning process and

experience. When students share in these responsibilities it helps build their efficacy and confidence (Caruth, 2014).

Centers for Teaching Excellence

The genesis of faculty professional development at the postsecondary level was rooted in the 1880s at Harvard University, and shortly thereafter at Cornell University and Wellesley University, by providing faculty with sabbatical leaves for professional skill development (Blackburn, Boberg, O'Connell & Pellino, 1980). Sabbaticals were the primary means of faculty professional development for decades thereafter, followed by a more progressive, multi-phase evolution beginning in the 1950s. This multi-phase evolution of faculty professional development begins with the first faculty development center being established in the University of Michigan. The field evolved in phases: a) phase one, the Age of the Scholar, from the 1950s to the 1960s, b) phase two, the Age of the Teacher, from the 1960s to the 1970s, c) phase three, the Age of the Developer, from the 1980s, d) phase four, the Age of the Learner, from the l990s, e) phase five, the Age of the Network, from the 2000s, to the current phase, f) the Age of Evidence (Haras, Taylor, Sorcinelli & von Hoene, 2017). These phases not only demonstrate the evolution and maturity of faculty development centers, they connote the progressive importance and reach of these centers in advancing institutional goals and ultimately supporting student learning.

Centers for Teaching Excellence are departments within universities and colleges responsible for training and supporting faculty in their teaching practice and other responsibilities. These centers may have other names, e.g., centers for teaching and

learning and centers for faculty development. For sake of simplicity and clarity this paper uses the Center for Teaching Excellence (CTE) moniker to cover all such faculty professional development departments. The centers' efforts primary focus is on providing information and support for pedagogy, technology, and assessment strategies for faculty. Midwestern University Chicago College of Pharmacy center's stated goals are: "be a resource to and support for faculty members in the development of their teaching skills; promote teaching practices that are grounded in scholarship; inculcate academic values; recognize outstanding teaching; facilitate educational research; and provide continuous evaluation of center outcomes" (Andurkar, Fjortoft, Sincak & Todd, 2010, p. 2). These goals are representative of many centers. John Rakestraw, director of Boston's Center for Teaching Excellence, asserts that helping faculty improve pedagogy is central to his institution's commitment to faculty (Lieberman, 2018).

Centers for Teaching Excellence are more likely to achieve their goals if they are effectively supported by the university administration. Administrative support may take many forms but typically consists of: adequately staffing the department, providing the necessary financial resources, providing space and equipment, and being an advocate for the center by encouraging faculty to participate in the activities that the center provides. This administrative support should be persistent to foster the success for the center. The primary constituents of the Centers for Teaching Excellence are the faculty. The support that the CTEs themselves provide to their constituents is professional development, typically in the form of training materials and resources, training programs, and consulting. CTE support for faculty should also be persistent, at least in providing resources and training. Centers vary in ongoing support for faculty depending on their

particular situation and the amount of support the CTE receives from the university administration. Centers for Teaching Excellence that are well supported by university administration are better positioned to support faculty which translates into better support for students.

In a recent study by the American Council on Education (Haras et al., 2017), the authors assert that faculty are one of the most important contributors to student academic self-efficacy, persistence, retention, and graduation rate. The study also highlighted the importance of teaching centers' directors role in training and supporting faculty. Haras et al. (2017) further state, "faculty development centers have served a crucial role in updating instructional practices" and "(are) at the forefront of change" (p. 1), "(for) inclusive practices for students" (p. 2). These faculty development centers are one of the primary means for faculty to learn pedagogy and Universal Design for Learning, which in so doing, translates into greater support for academic achievement for students with disabilities. The achievement gap of retention and graduation between students with disabilities and students that do not have disabilities must be reduced or ideally closed altogether. Therefore, it is critical to understand the factors that may impact a Center for Teaching Excellence's support for universal design for learning. Revealing these factors informs CTEs intending to increase adoption of UDL in their departments.

Background for the Universal Design for Learning (UDL), Universal Instructional Design (UID), Universal Design of Instruction (UDI), and Universal Design for Assessment (UDA) Frameworks

Application of Universal Design to the education domain, afforded through advances in technology, began with the development of several pedagogical frameworks by different entities around the same time. The educational frameworks address both physical and cognitive access to learning environments and materials and take into consideration the variability of student learning abilities, preferences, experiences, and backgrounds. Proactive integration of Universal Design principles makes curriculum more accessible to all students regardless of their disability or lack thereof. To aid faculty in applying Universal Design and inclusive instruction practices various permutations of Universal Design have been developed. The various Universal Design frameworks are: Universal Design for Learning (UDL), Universal Instructional Design (UID), Universal Design of Instruction (UDI), and Universal Design for Assessment (UDA).

Rooted in education neuropsychology Universal Design for Learning was developed by the Center for Applied Special Technology (CAST). It focuses on the 'why' of learning (the affective networks), the 'what' of learning (the recognition networks), and the 'how' of learning (the strategic networks). UDL advocates for providing multiple means of engagement, representation, and action and expression (Center for Applied Special Technology, 2018).

Describing Universal Design for Learning, Rose et al. (2006) state that there are two approaches to addressing accessibility. One approach identifies the students'

inability to access learning materials, activities, and assessment as the 'problem' that requires attention, i.e., a student's disability necessitates course adjustments for accessibility. This approach focuses on the weaknesses and deficiencies of the students. The second approach identifies the design of the learning environment as the area to be addressed, e.g., nonmalleable print-dominated course materials and lack of transparency in assessment approaches. This second approach focuses on the limitations of the learning environment, not the students. It acknowledges and embraces the fact that the student population is a spectrum of individuals with diverse perspectives, needs, and abilities.

The introduction of Universal Design theory to the education domain was first put forth by the writings of Silver, Bourke and Strehorn (Orr et al., 2009). "In terms of learning, Universal Design means the design of instructional materials and activities that allows the learning goals to be achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember" (Orkwis et al., 1998, p. 9).

Silver et al. (1998) declared, "the universal design concept also may be applied to post-secondary educational environments—an approach we have initiated and termed Universal Instructional Design (UID)" (p. 1) and in so doing have become the most widely cited authors of the Universal Instructional Design framework. The UID framework has eight guidelines that cover: the learning environment, course materials, instructional methods, assessment, and instructor-student interaction.

The University of Minnesota has been instrumental in advancing UID via a program called Pedagogy and Student Services for Institutional Transformation (PASS

IT). The University of Guelph in Ontario, Canada, has also meaningfully contributed to advancing UID by developing a list of guidelines of their own, which embrace much of the spirit of the University of Minnesota's guidelines. The University of Guelph also provides UID resources available to the general public on their website allowing educators to learn, understand and apply UID principles to their courses.

Scott, McGuire and Shaw (2001) modified and expanded on the original Universal Design principles set forth by Mace for application in the postsecondary education setting. Burgstahler, who established the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center in 1992, also generated a list of Universal Design for Instruction (UDI) principles based on Mace's original Universal Design principles. Her intent was to increase the numbers of persons with disabilities in postsecondary education.

Universal Design for Assessment is the proactive design of assessments to improve access to the widest range of students possible. UDA reduces barriers to test access and completion by advocating for assessment design that minimizes environmental distractions and extraneous elements that are superfluous to the construct being assessed. UDA is integrated, to various extents, into all of the other Universal Design frameworks, i.e., UDL, UID, and UDI, yet is sufficiently complex to merit special attention all its own.

Though some researchers at times use the terms Universal Design for Learning (UDL), Universal Instructional Design (UID), and Universal Design of Instruction (UDI) interchangeably, there are distinctions between these frameworks, as mentioned above and expanded upon later in this document. That said, the frameworks also have

numerous commonalities. The UDL, UID, and UDI frameworks share five themes: 1. Backward Design, i.e., clearly stated learning objectives defined at the onset of course design with all course materials, activities, and assessment aligned to the objectives, 2. multiple means of presentation, e.g., providing course materials in printed and digital formats, 3. inclusive teaching strategies and learner supports, e.g., small group work, scaffolding, summarizing key points of material covered, 4. inclusive assessment, i.e., designing assessment that permits students to demonstrate mastery of knowledge in various manners, e.g., written word, oral presentations, and 5. instructor approachability and empathy, e.g., posting instructor open office hours, providing assistance to student to access university-wide resources (Orr et al., 2009).

To achieve the goal of Universal Design for education integration, courses should be designed using the Universal Design principles at the onset, not integrated/remediated as an afterthought or response to a particular need that has arisen, e.g., having a student(s) with a reported disability enroll in the course. Key Universal Design for education accommodations include: alternative material and exam formats, extended time for exams, note taking assistance, learning strategies, and study skills strategies (Lombardi et al., 2011). The next section details each of the aforementioned Universal Design frameworks and includes the principles and guidelines for each.

Application of Universal Design in Curriculum

Though there are distinctions between the Universal Design frameworks, the application of Universal Design principles to an educational setting is a commonality that they all share. All of the frameworks inherently provide an inclusive learning

environment that anticipates and embraces the needs of a diverse student body and integrates accommodations into the curriculum benefiting a growing heterogeneous student population.

Orr et al. (2009) conducted a comprehensive literature review of research-based articles on the subject of inclusive curriculum design strategies for postsecondary education for teaching students with learning disabilities. The study synthesized the information and narrowed the focus to the thirty-eight most relevant articles. The review surfaced five dominant themes: Backward Design, multiple means of presentation, inclusive teaching strategies and learner supports, inclusive assessment, and instructor approachability and empathy. These five themes encompass the various principles of the Universal Design frameworks, i.e., Universal Design for Learning, Universal Instructional Design, Universal Design of Instruction, and Universal Design for Assessment. These principles serve as a firm basis for defining a pragmatic means of applying the Universal Design tenets in an educational setting.

Backward Design

Backward Design is an instructional design model that begins with an identification of the mandated and/or desired learning goals prior to defining the instructional methods, content, activities, or assessment strategies. The three key steps, to be conducted in this sequence, are: identify desired results, determine acceptable evidence, and plan learning experiences and instruction. This instructional design model requires thoughtful planning and serves as a sound means for inclusive teaching because the learning objectives, essential course components, and expectations of the learners are predefined and can therefore be made transparent to the students. The instructor can

provide a detailed syllabus that explicitly states course requirements and course material/readings, allowing students to understand at the onset the course breadth and depth as well as the tasks necessary for academic success (Orr et al., 2009).

Multiple Means of Presentation

The long-established teaching approach of printed material and lecture does not effectively address the cognitive, physical, nor perceptual barriers that many students, particularly those with disabilities, may have. Providing multiple means of presentation reduces the impediments of these barriers and allows learners to choose content formats that best suit their particular needs and preferences.

Multiple means of presentation may take the form of: bolstering oral lectures with visual graphics, e.g., PowerPoint and/or Prezi presentations, providing reading materials in digital formats as well as print, which facilitates content access via accessibility technologies such as text-to-speech software applications and enables text manipulation and electronic highlighting and annotation, and acquiring and/or producing videos and/or audio podcasts. A course's electronic Learning Management System (LMS) may serve as an effective means of delivering this content. Subject specific computer programs and education software may have activities such as practice quizzes, flashcards, and other formative assessment exercises that provide immediate feedback allowing students to review content repeatedly, at their own pace, until they acquire the intended knowledge. Selection criteria of computer software applications should take into account the dual coding theory, i.e., of presenting the viewer with too many multimedia elements at once, thereby reducing understanding due to cognitive overload (Orr et al., 2009).

A primary tenet of Universal Design is to provide material in various formats to meet the diverse needs of students. Recommendations to apply Universal Design to curriculum are;

1. Provide all text in digital format
2. Provide captions for all audio
3. Provide educationally relevant descriptions for images and graphical layouts
4. Provide captions and educationally relevant descriptions for video
5. Provide cognitive supports for content and activities:
    a. Summarize big ideas
    b. Provide scaffolding for learning and generalization
    c. Build fluency through practice
    d. Provide assessments for background knowledge
    e. Include explicit strategies to make clear the goals and methods of instruction (Orkwis et al., 1998).

Inclusive Teaching Strategies and Learner Supports

Teaching strategies are not germane to course subject matter, i.e., the construct being taught. Teaching strategies are interventions that aid student self-efficacy in the learning process and can be used across numerous academic disciplines. Examples of teaching strategies are: instruction in task analysis, organization skills, time management skills, strategy selection, scaffolding, and goal definition. Compare and contrast and identification of a given text's main idea are additional effective strategies that help students grasp the overarching concepts of course material. Proofreading and

mnemonics, e.g., paired associates strategy, aid students in writing papers and memorization.

Key learner supports are: inclusive lectures, study aids, and writing assistance. Instructors can incorporate inclusive lecturing techniques such as the pause procedure, where material is presented with periodic pauses for discussion to aid in information clarification and recall. Faculty can produce and provide lecture outlines, lecture notes, and guided notes, i.e., a document based on the lecture content that has provisions for student to write their own notes. Study aids such as reading guides, study guides, book chapter outlines, and graphic organizers help students when they are studying without the instructor being present. Providing clear expectations via explicit, unambiguous assignment instructions with longer lead times aids students in being successful with their writing assignments (Orr et al., 2009).

Inclusive Assessment

"The key task in evaluation is to be clear about the essential components of the course and to consider how students demonstrate mastery of them for the purposes of assigning grades" (Ouellett, 2004, p. 140). Inclusive assessment advocates for varied and flexible assessment approaches that reduce the barriers of demonstration of knowledge mastery for students with disabilities. Assessment variations may take the form of: faculty-student conferences, student produced videos, take-home projects, and journaling (Ouellet, 2004). Providing students with a separate, quiet testing area and extending testing time are two easily implemented approaches that create a more inclusive assessment environment. Finally, allowing students to use voice-to-text technologies aids

students that have disabilities that impair their ability to write effectively (Orr et al., 2009).

Nelson, Dodd and Smith (1990) listed twelve assessment accommodations that can be provided by faculty. These assessment accommodations attempt to minimize the extraneous and confounding test elements to facilitate student understanding of the questions to be addressed. Minimizing superfluous, confusing assessment content and allowing students to demonstrate their mastery of knowledge in a manner that accommodates their disabilities yields a more accurate indication of a student's command of subject matter being assessed. The twelve assessment accommodations are: 1. untimed tests, 2. readers for objective exams, 3. essay exams instead of objective exams, 4. taking exams in a separate room with a proctor, 5. rephrasing questions, 6. oral, taped, or typed responses to exams instead of written exams, 7. alternative methods for demonstrating mastery, 8. avoiding complex sentences, double negatives, 9. alternatives to computer scored sheets, 10. adequate lined paper for poor handwriting, 11. analyzing process and final solution, and 12. allowing a multiplication table, a calculator, and desk references for examinations.

Instructor Approachability and Empathy

A survey of students with disabilities conducted by Graham-Smith and Lafayette (2004) revealed that the most important learner supports are a safe learning environment and a caring instructor. Instructors can foster safe, respectful, and welcoming environments by providing multiple and flexible means of student-teacher engagement so that they may get to know the students better. By getting to know the students, instructors will better understand each student's particular needs, allowing them to tailor

their courses to accommodate the individual needs and preferences of those students. Faculty that understand the use of and welcome the special equipment that students with disabilities use, make students feel comfortable, respected, and part of the learning community (Orr et al., 2009). Faculty attitudes towards students with disabilities and Universal Design play an important role in their willingness to make course adjustments. In the next section, faculty perceptions and the barriers they may encounter when implementing Universal Design practices are detailed.

Faculty Perceptions and Barriers to Providing Accommodations for Students with Disabilities Using Universal Design Practices

Universal Design for Instruction principles are not currently used in the majority of courses in postsecondary institutions in the United States (Dallas et al., 2014). Though faculty may understand and embrace the benefits of Universal Design, they struggle with the practical implementation of the precepts in the classroom and distance learning environments (Rose et al., 2006).

Achieving the goal of greater adoption and implementation of Universal Design for Learning and inclusive instruction practices requires an analysis and understanding of the barriers that confront faculty in doing so. Foremost barriers include: faculty being the primary executors of Universal Design for Learning integration which requires not only knowledge of Universal Design for Learning principles but also instructional design knowledge and skills (McGuire et al., 2006), limited resources to disability support services, limited administrative support, limited or no access to instructional designers, lack of training opportunities, lack of knowledge and/or mandates of legal requirements,

lack of faculty interest, and institutional dispositions that value scholarship over teaching skills (Dallas et al., 2014; Lombardi et al., 2015).

Faculty understanding of the legal requirements is important because there is a correlation between knowledge of legal requirements and faculty implementation of Universal Design/universal accessibility strategies (Rao et al., 2003). Baggett (1994) conducted a survey of four hundred faculty and administrators, which revealed that 75% of those surveyed were not familiar with the accessibility requirements covered in Section 504 of the Americans with Disabilities Act. A different survey of over two hundred university faculty found that nearly half of those surveyed had little or no knowledge of the legal considerations relating to postsecondary students with disabilities (Vasek, 2005).

Faculty adoption and implementation of Universal Design for Learning practices is not limited to curricula design and adjustment. Faculty attitudes and dispositions may also play a role. Faculty personal attitudes, comfort levels when interacting with students with disabilities, and perceived administrative support are additional factors that impact faculty decision making. Zhang et al. (2010) conducted a study analyzing faculty perceptions, attitudes, and application of accommodations for students with disabilities using a model that addressed four constructs. The four constructs were: 1. perceived institutional support, 2. personal beliefs regarding student with disabilities, 3. level of comfort in interacting with students with disabilities, and 4. provision of accommodations. Of special note regarding faculty attitudes is that some faculty believe that providing accommodations, particularly with regards to assessment, puts students without disabilities at a disadvantage (Vasek, 2005) and lowers academic integrity. Some

faculty also feel that it is their responsibility to screen out students that are not, in their opinion, fit for college. Faculty attitudes towards accommodating students are also influenced by the type of disability a student has. Students that have disabilities that are more apparent, e.g., visual impairments, hearing impairments, and mobility limitations, are viewed more favorably. Many students have learning disabilities that are not apparent to the casual viewer. Psychological disabilities are not generally viewed favorably by faculty, which may influence their decisions to provide or deny accommodations (Zhang et al., 2010).

Bourke, Strehorn and Silver (2000) studied the factors that influence instructors' perceptions and dispositions regarding reasonable accommodation. Perceptions of support from administration and the school's office of disabilities services were important factors. Faculty frequently rely on guidance from the office of disabilities services for technical and curriculum adjustment advice on how best to design a course that meet the needs of students with disabilities (Orr et al., 2009). Additional important factors that influenced instructors' perceptions of providing reasonable accommodation were: faculty understanding of the necessity for accommodations, faculty belief in the efficacy of reasonable accommodations in facilitating student academic success, and the number of students in their classes. A higher volume of students in a class equated to diminished positive perceptions of providing accommodations.

Overall, faculty have relatively high positive attitudes regarding providing accommodations to students with disabilities, but there are additional factors that reduce these positive attitudes. The additional factors that negatively influence faculty perceptions of providing accommodations are: course substitutions, course withdrawal

after add/drop date, increased frequency of assessments, providing students with extra credit opportunities, and removal of point/grade deductions for writing mistakes, e.g., spelling and grammar. Two overarching considerations that pervade all of the specific factors are the degree of effort required of an instructor to provide the accommodation and the degree to which the adjustment deviates from the standards established for students without disabilities. The greater the degree of effort and deviation, the less willing faculty were to provide the adjustments (Sweener, Kundert, May & Quinn, 2002).

Izzo, Murray and Novak (2008) identified three consistent themes in their study of faculty in higher education. The three themes are: perceived uncertainty in meeting the learning needs of a student population that is increasing in diversity and technology acumen and expectations, use of instructional strategies, and a need for training and support of educational access promotion. That said, these various studies indicate that faculty are aware of the importance of Universal Design, but due to lack of resources, time, and training, do not always address the issue. Limited resources, time, and training reduce instructors' interest in the application of Universal Design for Learning principles.

Historically, university disability services offices and personnel were ultimately responsible for addressing the needs of students with disabilities, and they continue to be responsible today. But, with the ever-increasing volume of students with disabilities, and especially students with often unreported and unseen cognitive and learning disabilities, the responsibility of addressing these students' needs is increasingly falling on the shoulders of faculty (Lombardi et al., 2013). Faculty need institutional support and training that is specific to meeting the learning needs of students with disabilities so that

they can effectively implement these strategies in their classrooms and distance learning environments (Izzo et al., 2008).

Faculty Characteristics Affecting Dispositions toward Accessibility Accommodation

Research on faculty characteristics that may affect their disposition towards accommodating students with disabilities generally has focused on: disciplinary field, i.e., the subject domain being taught, faculty age, gender, rank, and past experience with teaching students with disabilities. Studies have revealed that the disciplinary field within which an instructor teaches is a factor that is consistent in influencing an instructor's tendency to provide or deny accommodations. Instructors that teach in the disciplines of education, liberal arts, and architecture tend to have favorable dispositions toward providing accommodations for students with disabilities. Instructors that teach in industry, engineering, science, and commerce tend to have less favorable dispositions toward providing accommodations (Zhang et al., 2010). Nelson et al. (1990) found faculty in the colleges of education to be the most receptive to providing reasonable accommodations and faculty in the colleges of arts and science to be the least supportive of providing accommodations.

Most studies show that an instructor's academic ranking, e.g., full professor, associate professor, does not play a role in faculty inclination to accommodate students with disabilities (Rao, 2004). That said, a study conducted by Fonosch and Schwab (1981) showed that academic ranking did influence instructors' attitudes towards accommodation. In the study, full professors were found to have more negative attitudes towards providing accommodations than junior faculty. This may be due in part to the

era within which the faculty was trained to teach. Senior faculty tended to have been taught to use lecture as a primary means of teaching (Zhang et al., 2010).

Studies have shown that the demographic of instructor age is a factor that influences faculty attitudes towards accommodation. Generally, younger faculty have more favorable attitudes towards providing accommodations than older faculty (Vogel et al., 1999). Studies on the role of gender have yielded mixed results. Studies by Baggett (1994); Benham (1997); Fonosch et al. (1981); and Rao (2002), indicate that female instructors have more favorable dispositions towards students with disabilities than do male instructors. Contrasting these findings, studies by Bourke, Strehorn and Silver (2000) and Schoen, Uysal and McDonald (1986), did not find gender to play a significant role in influencing faculty attitudes towards providing accommodations.

Zhang et al. (2010) state that, "institutions of higher education need to focus on changing faculty members' personal beliefs regarding the education of students with disabilities. Therefore, making faculty aware of the potential of students with disabilities can be a way to increase their willingness to support these students. Improving the personal beliefs of faculty regarding the education of students with disabilities is one of the most important ways to enhance the provision of accommodations and supports for students with disabilities" (p. 284). An overview of the various Universal Design frameworks has been presented, as well as foundational information on legislation, instructional design, human cognition, learning theories, Centers for Teaching Excellence, and andragogy. All key considerations regarding faculty dispositions and demographics related to Universal Design for Learning has also been covered. Next,

detailed information about each of the Universal Design frameworks, i.e., UDL, UID, UDI, and UDA is presented.

Universal Design for Learning (UDL) Details

Universal Design for Learning is a term coined by the Center for Applied Special Technology (CAST). Universal Design for Learning is rooted in learning sciences, i.e., education neuropsychology and human development. It is a set of principles that informs and guides educational research and development (Center for Applied Special Technology, 2018). The essence of Universal Design for Learning is the proactive creation of an inclusive learning environment in which a diverse student population, including students with disabilities, is embraced as a continuum of learners with a spectrum of abilities, strengths, and weaknesses in an effort to provide optimal learner support (Orr et al., 2009). Universal Design for Learning has been recognized as an effective means of creating accessible learning environments that address the broad spectrum of learners' abilities. Making curricula accessible to a diverse group of learners is one of the primary goals of UDL (Pace & Schwartz, 2008). As was the case with mandating accessibility for physical environments through the aforementioned Americans with Disabilities Act, legislation was enacted to assure access to instructional environments. The Higher Education Opportunity Act of 2008 references Universal Design in eighteen separate instances. There are three principle tenets of Universal Design for Learning, which are: to provide multiple means of engagement, to provide multiple means of representation, and to provide multiple means of action and expression.

Providing multiple means of engagement is the 'why' of learning. The goal for engagement is to provide learning that is purposeful and motivating for students. Student populations are heterogeneous due to personal, cultural, neurological, and other reasons. Therefore, there is no single optimal means of engagement that will work for all learners. Providing multiple means of engagement increases the likelihood of motivating the greatest number of learners. The UDL guidelines suggest providing options to recruit student interests, sustain their effort and persistence, and promote self-regulation (Center for Applied Special Technology, 2018).

Providing multiple means of representation is the 'what' of learning. The goal for providing multiple means of representation is to produce learners that are resourceful and knowledgeable. Learners are also diverse in their preferences and abilities to acquire information. Sensory disabilities, e.g., deafness, blindness, and learning disabilities, e.g., dyslexia, may limit student access to certain information presentations. For example, students with sight impairments may have difficulty acquiring information presented in a visual format. Presenting information in multiple formats permits learners to choose the format that best meets their specific needs and preferences. The UDL guidelines suggest providing options for students to perceive information that does not rely on a single sense, e.g., sight or hearing, that clarifies language and symbols for greater understanding, and that facilitates comprehension by activating or supplying background information, and highlighting critical features, patterns, and relationships (Center for Applied Special Technology, 2018).

Providing multiple means of action and expression is the 'how' of learning. The goal for action and expression is to develop learners that are strategic and goal-directed.

Student action is facilitated by providing learners with options for physical actions when they navigate their physical learning environment, such as providing alternatives for timing and range of motor skills when interacting with instructional materials and providing keyboard equivalents for mouse activities. UDL guidelines advocate for allowing students to demonstrate what they know via alternative means, e.g., writing, making a video, creating a visual painting or drawing, producing a podcast (Center for Applied Special Technology, 2018).

Universal Design for Learning (UDL) Guidelines

David H. Rose, of the Harvard Graduate School of Education and the Center for Applied Special Technology produced the Universal Design for Learning guidelines to be used as a tool for implementing the UDL framework. The guidelines have three primary categories, which are: provide multiple means of engagement, provide multiple means of representation, and provide multiple means of action and expression. Each of the primary categories has a defined goal, sub-categories, and multiple checkpoints that provide details for accessing, building, and internalizing learning content, delivery, and environments (Center for Applied Special Technology, 2018).

Table 1

Universal Design for Learning (UDL) Guidelines

Provide Multiple Means of Engagement Affective Networks The "WHY" of Learning	Provide Multiple Means of Representation Recognition Networks The "WHAT" of Learning	Provide Multiple Means of Action & Expression Strategic Networks The "HOW" of Learning
	Access	
Provide options for Recruiting Interest (7) Optimize individual choice and autonomy (7.1) Optimize relevance, value, and authenticity (7.2) Minimize threats and distractions (7.3)	Provide options for Perception (1) Offer ways of customizing the display of information (1.1) Offer alternatives for auditory information (1.2) Offer alternatives for visual information (1.3)	Provide options for Physical Action (4) Vary the methods for response and navigation (4.1) Optimize access to tools and assistive technologies (4.2)
	Build	
Provide options for Sustaining Effort & Persistence (8) Heighten salience of goals and objectives (8.1) Vary demands and resources to optimize challenge (8.2) Foster collaboration and community (8.3) Increase mastery-oriented feedback (8.4)	Provide options for Language & Symbols (2) Clarify vocabulary and symbols (2.1) Clarify syntax and structure (2.2) Support decoding of text, mathematical notation, and symbols (2.3) Promote understanding across languages (2.4) Illustrate through multiple media (2.5)	Provide options for Expression & Communication (5) Use multiple media for communication (5.1) Use multiple tools for construction and composition (5.2) Build fluencies with graduated levels of support for practice and performance (5.3)
	Internalize	
Provide options for Self Regulation (9)	Provide options for Comprehension (3)	Provide options for Executive Functions (6)

Promote expectations and beliefs that optimize motivation (9.1) Facilitate personal coping skills and strategies (9.2) Develop self-assessment and reflection (9.3)	Activate or supply background knowledge (3.1) Highlight patterns, critical features, big ideas, and relationships (3.2) Guide information processing and visualization (3.3) Maximize transfer and generalization (3.4)	Guide appropriate goal-setting (6.1) Support planning and strategy development (6.2) Facilitate managing information and resources (6.3) Enhance capacity for monitoring progress (6.4)
	Goal	
Expert Learners who are…	Expert Learners who are…	Expert Learners who are…
Purposeful & Motivated	Resourceful & Knowledgeable	Strategic & Goal-Directed

Source: Center for Applied Special Technology (2018).

Universal Instructional Design (UID) Details

Silver et al. (1998) declared, "the universal design concept also may be applied to post-secondary educational environments—an approach we have initiated and termed Universal Instructional Design (UID)" (p. 47) and in so doing have become the most widely cited authors of the UID framework. The UID framework, like all of the Universal Design frameworks, emphasizes that proactive planning and integration of accessibility best practices into the curriculum design from the inception minimizes the chance of students becoming marginalized or excluded.

The University of Minnesota has been instrumental in advancing UID. They developed a program called Pedagogy and Student Services for Institutional Transformation (PASS IT) with funding from the United States Department of Education (grant #P333A050023ACT1). The PASS IT program develops UD and UID knowledge

and implementation skills for postsecondary faculty, administrators, and staff in workshops. The University of Minnesota developed a list of UID principles (Higbee, 2017). The University of Guelph also developed an extensively cited list of UID principles, but the University of Minnesota list of UID principles is the authoritative list, so is expounded upon here.

The first principle of Universal Instructional Design is to create a classroom climate that fosters trust and respect. This principle can be applied to face-to-face, hybrid, and distance learning courses. There are various means to accomplish the goal of welcoming students and making them feel comfortable. In face-to-face classes an instructor can assure that the classroom is wheelchair accessible and welcome each student as they enter the classroom on the first and subsequent days of class. An instructor can obtain a student roster with students' names and photographs so that she/he may review it in advance of the first day of class in an effort to memorize each student's name. In an online synchronous class the instructor can welcome each student as they individually log into the online course session or make a general welcoming statement to the entire class once all students have logged in. In an online asynchronous class the instructor can provide a discussion board in the learning management system for students to post something personal about themselves and then comment on other classmates' posts. This online social activity can help build a welcoming community of learners. The instructor can use language that models the expected behavior of students, such as referring to students in the first-person, e.g., 'students with disabilities', as opposed to 'disabled students' (Higbee, 2009).

The course syllabus is a prime area for creating a welcoming environment for students. By including a 'welcome to the class' statement as the first item on the syllabus, the instructor conveys the importance of making the students feel welcome as a primary consideration. Further, the syllabus can include statements that stress the importance of embracing a diverse student population (Higbee, 2009). Including practical information such as contact information for the university office of disability services accomplishes both the goals of making students with disabilities feel their needs are recognized at the onset and will be addressed, and provides a pragmatic means of acquiring those particular services. Creating a welcoming and respectful environment at the beginning of a course conveys a positive tone for students with disabilities and produces a solicitous setting that may encourage students with hidden disabilities to self-report their condition thereby improving their chances of academic success. The relationship between an instructor and his/her students, and the students' perception of the instructor's support, are important factors that can positively or negatively impact students with disabilities academic success (Orr et al., 2009).

The second principle of UID is to determine the essential components of the course. Course materials, e.g., reading materials, presentations, etc., are components of most courses. Course design, delivery, and assessment are also common course considerations. Instructors can make courses more accessible to students by critically examining each of these course components and considering alternative formats for each. For example, assuring that learning materials are available in an electronic format makes the reading material accessible to text-to-voice reader software, providing options for course activities and offering various means for students to demonstrate their mastery of

knowledge are appropriate and helpful considerations to achieve the goal of creating an inclusive instructional environment.

Of particular significance and benefit for students is to provide students with extra time to complete exams. Often exam time constraints are dictated by the duration of a class. Though this constraint is practical, i.e., the exam begins at the start of the class and concludes at the time that the class regularly ends, it may not be wholly effective for assessing the degree to which the student has knowledge mastery of the concepts and content being assessed. Extending test time aids students that require more time to process information, such as students with test anxiety, students that speak English as a second language or are not English proficient, and students with disabilities (Higbee, 2009). Instructors can adjust the length of tests so that there is ample time for all students, including those aforementioned, to complete the exam to the best of their ability. This adjustment will help to create a barrier-free, equitable assessment environment that provides all students with an opportunity to achieve academic success.

Indeed, there are numerous assessment strategies and adjustments that faculty can make that may impact a student's ability to effectively demonstrate their knowledge mastery of the subject matter being taught in a course. Examination accommodations include: extended time to take a test, alternative test location, alternative test format, allowing the use of calculators and laptop computers during testing, permitting the use of text materials during exams, providing a scribe for a student, and eliminating penalties for writing mechanics errors, e.g., spelling, grammar (Skinner, 2007).

Communicating clear expectations, the third UID principle, is helpful to all students but is particularly helpful to students with disabilities. The syllabus is the

primary means of communicating course expectations but other documents may be used to provide additional details for students to more fully understand the course chronology and what is expected of them so that they may succeed academically. A content outline can be produced and disseminated so that students understand the scope and sequence of the learning materials that will be covered in the course.

Assessment rubrics detailing the criteria by which exams and learning artifacts are evaluated and graded will provide the necessary, detailed information for students to understand what is required to successfully pass an exam. Engaging students in the process of establishing behavioral guidelines for interpersonal civility will facilitate inclusion and assure representation of diverse perspectives as well as foster student buy-in. Providing these course expectations in various formats, e.g., orally, the syllabus, handouts, email, and the course electronic learning management system will allow students to intake and review the content via preferred modalities and remind students of this critical information (Higbee, 2009).

Providing timely and constructive feedback is an effective means of communicating the instructor's appraisal of a student's academic standing and growth in understanding of the course content to date and permits the student to make connections between learning and demonstration of content knowledge. Providing students with periodic formative feedback enhances the learning process and aids in minimizing the chance that students will fall behind as the course progresses (Higbee, 2009).

UID principle four, incorporating natural supports for learning, may take the form of conventional reinforcements such as study guides and course handouts. Technology is ever increasing in importance in supporting learners with disabilities and learners that do

not have disabilities. Technological supports can be effective means of aiding students if implemented properly. Effective implementation requires instructors to be savvy in the application of technology and aware of the capabilities and limitations of assistive technologies, e.g., screen readers and talking calculators.

Principle five is to provide multimodal instructional methods. This principle encourages instructors to design teaching approaches that consider students' diverse learning styles, abilities, ways of knowing, and previous experience and background knowledge so that they may reach and engage the majority of their students. Consideration for all learning styles does not need be present in all courses but an awareness of the various learning styles increases the chances that multiple forms will be contemplated and integrated. The learning styles are: visual (spatial), aural (auditory-musical), verbal (linguistic), physical (kinesthetic), logical (mathematical), social (interpersonal), and solitary (intrapersonal) (Diaz, 2019). Courses designed that consider various student learning styles and student prior experience, background, and knowledge embrace the Universal Instructional Design framework's primary premise of addressing a diverse student population.

Creating multiple ways for students to demonstrate their knowledge, principle six, requires critical analysis of the course activities and assessment strategies. Course activities and assessment instruments should consider students' diverse abilities and various means of demonstrating knowledge mastery. Course activities that generate learning artifacts may take many forms: multimedia presentations, written papers, artwork, and group projects to name but a few. Assessment strategies can be equally diverse and may embrace: exams with true/false, multiple choice, fill-in the blank,

written essay responses, problem-based assessment, laboratory practicums, and end-of-course capstones (Higbee, 2009).

Using technology to enhance learning opportunities is the seventh UID principle. Advancements in technology have permitted the varied and useful accessibility affordances which has propelled the inclusion movement forward. This principle encourages the continued integration of technology in the classroom to enhance learning opportunities for all.

Promoting faculty-student and student-to-student interaction, the eighth and final UID principle, creates a welcoming learning environment, promotes social learning (Vygotsky, 1978) and increases students' sense of belonging. Instructors can foster interactions between themselves and students in numerous ways. Promoting this relationship building should begin on the first day of class or ideally prior to the start of the course. Instructors can proactively reach out to students via email, talk with them at the end of class, or get to know students by reading their course journals and papers. Instructor open office hours is also a traditional means of encouraging instructor-student interactions. Instructors can promote student-to-student interaction by intentionally designing their course activities with this goal in mind. For example, instructors may integrate small group or paired activities that create settings for interpersonal exchanges. Having students interact on a personal, intimate level, cultivates empathy and acceptance of students with different backgrounds, ethnicities, abilities, and social identities (Higbee, 2009).

Universal Instructional Design (UID) Principles

A review of the literature reveals that there is ambiguity regarding the Universal Instructional Design principles. A number of different lists are referenced and presented. Further, UID and UDI are at times presented as synonymous, though they are unique frameworks. The two UID principle lists most frequently referenced are from the University of Minnesota, originally written by Fox, Hatfield and Collins (2003), and from the University of Guelph. The authoritative list of principles is the list generated by the University of Minnesota. Both UID lists of principles from each university are included here for sake of being comprehensive.

Table 2 shows principles as defined by faculty at the University of Minnesota. The faculty synthesized Universal Design principles from Chickering and Gamson's (1987) 'Seven Principles for Good Practice in Undergraduate Education' and North Carolina State University College of Design's (2019) 'Principles of Universal Design' to generate the list in Table 2 (Fox, Hatfield & Collins, 2003). The UID principles are not rigid mandates, but are guidelines for UID implementation.

The list of UID principles listed in Table 3 was generated at the University of Guelph. It embraces much of the spirit of the principles in Table 2 but is none-the-less distinct. The University of Guelph has meaningfully contributed to UID due in part to funding they received from the Provincial Government's Learning Opportunities Task Force in 2002 to undertake a study of UID principles. The University of Guelph has applied the UID principles to a number of the courses that they offer. The university also provides UID resources to instructors and the general public on their website (Palmer & Caputo, 2006).

Table 2

Universal Instructional Design (UID) Guidelines (University of Minnesota)

1. Create a classroom climate that fosters trust and respect.
2. Determine the essential components of the course.
3. Provide clear expectations and feedback.
4. Explore ways to incorporate natural supports for learning.
5. Provide multimodal instructional methods.
6. Provide a variety of ways for demonstrating knowledge.
7. Use technology to enhance learning opportunities.
8. Encourage faculty-student contact.

Source: Fox, Hatfield and Collins (2003). Developing the Curriculum Transformation and Disability (CTAD) workshop model. In J. L. Higbee (Ed.), *Curriculum transformation and disability: Implementing Universal Design in higher education* (pp. 23-39). Minneapolis: University of Minnesota, General College, Center for Research on Developmental Education and Urban Literacy. http://cehd.umn.edu/CRDEUL/books-ctad.html

Table 3

Universal Instructional Design (UID) Guidelines (University of Guelph)

1. Be accessible and fair.
2. Be straightforward and consistent.
3. Provide flexibility in use, participation and presentation.
4. Be explicitly presented and readily perceived.
5. Provide a supportive learning environment.
6. Minimize unnecessary physical effort of requirements.
7. Ensure a learning space that accommodates both students and instructional methods.

Source: Universal Instructional Design, University of Guelph (2019). https://opened.uoguelph.ca/student-resources/Universal-Instructional-Design

Universal Design of Instruction (UDI) Details

The Center on Postsecondary Education and Disability at the University of Connecticut developed nine principles of Universal Design for Instruction (Scott et al., 2001). The underlying precepts for Universal Design for Instruction emphasize: intuitive instructional practices that are flexible and easily understood, presentation of learning materials in a variety of formats to accommodate students' preferences and ability levels, and creation of a classroom environment that meets the needs of a diverse student population having a range of physical space requirements to facilitate mobility, accessibility, inclusiveness, and communication interchanges, promoting a sense of community, and high academic expectations for all students (Orr et al., 2009).

Using focus groups that included students with learning and other cognitive disabilities McGuire et al. (2006) corroborated the assertion that proper application of the Universal Design for Instruction framework may positively impact student learning. The study revealed that effective teaching methods, e.g., presenting information in multiple formats, using diverse assessment strategies, establishing clear expectations, providing advanced organizers, giving frequent formative feedback, and positive instructor attributes, e.g., able to connect with students, being approachable, being focused on the course subject matter, and having high expectations of students, were greatly valued by the students being studied as evidenced by these elements being frequently noted.

The principles of Universal Design for Instruction are intended to be used as guidelines, not rigid directives, to help faculty plan and deliver instruction. The framework encourages and supports faculty reflection as they develop their pedagogical approach to designing their curriculum. "UDI is viewed as a tool for reflective practice that can lead to more inclusive instruction in an increasingly diverse population of college students" (McGuire et al., 2006, p. 169).

Universal Design of Instruction (UDI) Guidelines

Burgstahler (2009) and Scott et al. (2001) used the Center for Universal Design's seven guidelines for Universal Design of products and environments as a basis to define Universal Design for Instruction principles by expanding on them and manipulating them for an education setting. Burgstahler established the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center in 1992. Based in the University of

Washington, DO-IT is committed to increase the numbers of persons with disabilities in postsecondary education. Burgstahler's list of UDI principles is presented in Table 4.

Table 4

Universal Design for Instruction Principles

Principle	Definition
Class climate	Adopt practices that reflect high values with respect to both diversity and inclusiveness. Example: Put a statement on your syllabus inviting students to meet with you to discuss disability-related accommodations and other special learning needs.
Interaction	Encourage regular and effective interactions between students and the instructor and ensure that communication methods are accessible to all participants. Example: Assign group work for which learners must support each other and that places a high value on different skills and roles.
Physical environments and products	Ensure that facilities, activities, materials, and equipment are physically accessible to and usable by all students, and that all potential student characteristics are addressed in safety

	considerations. Example: Develop safety procedures for all students, including those who are blind, deaf, or wheelchair users.
Delivery methods	Use multiple, accessible instructional methods that are accessible to all learners. Example: Use multiple modes to deliver content; when possible allow students to choose from multiple options for learning; and motivate and engage students-consider lectures, collaborative learning options, hands-on activities, Internet-based communications, educational software, field work, and so forth.
Information resources and technology	Ensure that course materials, notes, and other information resources are engaging, flexible, and accessible for all students. Example: Choose printed materials and prepare a syllabus early to allow students the option of beginning to read materials and work on assignments before the course begins. Allow adequate time to arrange for alternate formats, such as books in audio format.
Feedback	Provide specific feedback on a regular basis. Example: Allow students to turn in parts of large

	projects for feedback before the final project is due.
Assessment	Regularly assess student progress using multiple accessible methods and tools, and adjust instruction accordingly. Example: Assess group and cooperative performance, as well as individual achievement.
Accommodation	Plan for accommodations for students whose needs are not met by the instructional design. Example: Know campus protocols for getting materials in alternate formats, rescheduling classroom locations, and arranging for other accommodations for students with disabilities.

Source: Burgstahler, S., Universal Design of Instruction (UDI): Definition, principles, guidelines, and examples. https://www.washington.edu/doit/universal-design-instruction-udi-definition-principles-guidelines-and-examples

Universal Design for Assessment (UDA) Details

Universal Design for Assessment is the proactive design of assessments, with consideration of both physical environments and cognitive abilities and limitations, to improve access to the widest range of students possible. It advocates for the creation of assessment environments and instruments that are amenable for students with disabilities

by reducing barriers of assessment interpretation and response, thereby providing equitable learning opportunities for all students. This is achieved by constructing assessments that have multiple, individually tailored means of access and completion which match a student's particular needs. Effective application of Universal Design for Assessment procures accurate test data on student knowledge, skills, and subject mastery for the widest possible range of a diverse student population in the general education setting. Thompson et al. (2002) stated, "universally designed assessments are designed and developed from the beginning to allow participation of the widest possible range of students, and to result in valid inferences about performance for all students who participate in the assessment" (p. 6).

Accurate evaluation of student knowledge is a fundamental objective of Universal Design for Assessment. Key to accomplishing this objective is the elimination, to the extent possible, of factors that negatively influence the evaluation of student knowledge in the domain being assessed. "Universally designed assessments remove all non-construct-oriented cognitive, sensory, emotional, and physical barriers" (Thompson et al., 2002, p. 8). For example, if a student that speaks English as a second language or has low reading skills is taking a mathematics examination, their ability to succeed on the exam may be impeded by written instructions or word problems, thereby yielding an assessment score that does not accurately represent the student's mathematics knowledge. Readability and legibility are two additional elements to consider when designing an assessment. Readability addresses copy organizational logic, sentence structure clarity, and vocabulary (see Appendix H, Recommended Readability Guidelines). Legibility addresses the physical appearance of text, graphs, tables, and illustrations. The

dimensions to consider for legible text are: type face, contrast, type size, character spacing, leading, line length, justification, and blank space on the page (Thompson et al., 2002).

The means of completing/interacting with the assessment, i.e., the delivery mechanism, may also introduce obstacles that minimize the effectiveness of accurately testing a student's knowledge causing construct irrelevant variances in student outcomes. "Assessment instructions and procedures need to be easy to understand, regardless of a student's experience, knowledge, language skills, or current concentration level. Instructions need to be presented in a simple, clear, consistent, and understandable language, so that, "test takers can respond to a task in the manner that the test developer intended" (Thompson et al., 2002, p. 13). For example, a student may lack the refined motor skills necessary to fill-in bubble chart exams causing delays resulting in reduced scores. Providing the student with response mode options could minimize this obstacle. Reducing non-construct reliance and test completion access issues through individualized accommodation yields more precise inferences about student abilities and knowledge of the targeted subject matter domain.

Proper application of the Universal Design for Assessment framework yields a flexible testing environment that identifies student deficiencies in requisite access skills and delivers items that are customized to meet the needs of that particular student. The individual needs are identified via a pre-test process that may include surveying the student, parents, and/or teachers, as well as pre-test exercises embedded in the test itself. The customized test is delivered using access modalities aligned to individual student competencies and abilities. For example, if a student has a visual impairment, the test may be delivered using a larger font with greater contrast. In this case, the student

benefits most from the accommodation because it is specifically tailored to meet his/her particular need.

Technology affords the greatest potential for flexible, customizable assessment accommodations. Computer software applications and hardware peripherals have the capacity to allow students to interact with the testing environments in a manner that best suits their abilities, e.g., voice responses to questions can be captured via voice recognition software, cursors can be manipulated via minute muscle movements, eye tracking devices, or mouth wands, and cognitive issues can be addressed via computer-adaptive tests that deliver exam items based on the correctness of prior responses.

The most beneficial accommodations are those best suited to a student's individual needs. Allowing students to access information through written or auditory means and providing redundancy of material are means of providing customized accommodations. Having the capacity to manipulate the display of type or providing it in a format that can be accessed by tools that convert text to Braille will aid visually impaired students (see Appendix G, Designing Material to Be Accessible to Braille Text Converters for details). Broadening the range of acceptable responses to exams allows students to demonstrate their mastery of knowledge by means that are of their preference and within their range of abilities. Permitting students to submit responses to assessments in formats such as: written word, videos, spoken word recordings, PowerPoint presentations, and other media, provides a range of options that reduces barriers to students while maintaining test integrity and rigor.

Designing and developing exams that embrace the tenets of Universal Design for Assessment requires the skills of a team of experts, such as professionals in:

psychometrics, special education, Universal Design, computer technology, assistive technology, and the domain area being tested. The Universal Design for Assessment development process follows that of traditional test development processes but also deliberately considers the diverse needs of students with disabilities at the onset. The first step is to clearly define the construct/subject matter being tested so that extraneous variables can be minimized. Assessments' instructions should be written with clarity and conciseness. The means by which students will engage with the material should be well formulated. Pragmatic considerations such as delivery platform, equipment cost, and maintenance should be deliberated and decided upon at the onset. Once the test is drafted, it should be examined for reliability, validity, and accessibility of the computer interface. The test should be field tested with representation of the targeted population. The test may also be reviewed by stakeholders, e.g., administrators, teachers, parents. Surveys and focus groups can solicit and provide valuable information to improve the assessment. Assessment formation and validation diligence will more likely provide an unbiased, accessible test to students and furnish meaningful data to decision makers (Axelson, 2005; Ketterlin-Geller, 2005).

Universal Design for Assessment (UDA) Design Elements and Development Steps

The National Center on Educational Outcomes (NCEO), based in the University of Minnesota, developed seven elements of universally designed assessments with the intention of increasing assessment validity and accessibility as well as five steps in develop of universally designed assessment. Many of the design elements have similar characteristics to the principles in the other, aforementioned, various frameworks. Being

considerate of designing for a spectrum of learners, minimizing access barriers, and increasing user empowerment are all hallmarks of both the UD frameworks and universally designed assessment. The development steps advocate for inclusion by seeking the input of stakeholders and considering the impact on those responsible for implementation.

Table 5

Universal Design for Assessment Design Elements and Development Steps

Seven Design Elements
1. Inclusive assessment population.
2. Precisely defined constructs.
3. Accessible, non-biased items.
4. Amenable to accommodations.
5. Simple, clear, and intuitive instructions and procedures.
6. Maximum readability and comprehensibility.
7. Maximum legibility.
Five Development Steps
1. Assemble a group of experts to guide the transformation.
2. Decide how each accommodation will be incorporated into the computer-based test.
3. Consider each accommodation or assessment feature in light of the constructs being tested.
4. Consider the feasibility of incorporating the accommodation into the computer-based test.
5. Consider training implications for staff and students.

Source: National Center on Educational Outcomes (2016).

Accessible Curricula and Organizations Supporting Students with Disabilities

Numerous organizations have played, and continue to play, key roles in advancing the causes supporting students with disabilities. One example is the Association on Higher Education and Disability (AHEAD) that was founded in 1977. It has 3,000 members representing all fifty states in the United States as well as ten other countries. AHEAD offers conferences, workshops, webinars, publications, and consultation services. AHEAD's mission statement is, "Through progressive, visionary leadership, grounded in social justice principles, AHEAD: develops, shares, and provides relevant knowledge; strategically engages in actions that enhance higher educational professionals' effectiveness; and advocates on behalf of its membership, their institutions, their work, and those they serve ensuring full, effective participation by individuals with disabilities in every aspect of the postsecondary experience" (Association on Higher Education and Disability, 2019, p. 1).

The Center for Applied Special Technology (CAST) is a nonprofit organization that was founded in 1984. It is an education research and development organization that works to expand learning opportunities for all individuals through Universal Design for Learning. CAST coined the term Universal Design for Learning, which is internationally recognized as an effective framework for designing and implementing inclusive learning environments (CAST, 2019). CAST engaged in a collaborative agreement with the United States Department of Education's Office of Special Education Programs and five other partners to establish a National Center on Accessing the General Curriculum, which creates practical means of improved access to the general curriculum for students with disabilities. CAST also develops resources and tools. One of the tools developed by

CAST was an eReader software application that supported reading by text to speech and visual word highlighting (McGuire et al., 2006).

Disabilities, Opportunities, Internetworking, and Technology (DO-IT) is an organization associated with the University of Washington, College of Engineering, College of Technology, and College of Education. DO-IT serves to increase the successful participation of individuals with disabilities in challenging academic programs and careers such as those in science, engineering, mathematics, and technology. The primary funding for DO-IT is provided by the National Science Foundation, the State of Washington, and the United States Department of Education (Burgstahler, 2009).

Trace Research and Development Center was founded in 1971 by a group of students at the University of Wisconsin-Madison. It was relocated and is now housed in the College of Information Studies at the University of Maryland. The Trace Center is a leader in research and development in the field of technology and disability. The Trace Center's purpose is to prevent barriers and capitalize on opportunities presented by standard and emerging technology, in order to create a world that is as accessible and as usable as possible for as many people as possible. Some of the Trace Center's major accomplishments are: accessibility features built into Windows, Mac, and Linux computer operating systems, web content accessibility guidelines, and EZ Access techniques and hardware for cross-disability access to touchscreen kiosks (Trace Research and Development Center, 2019).

Opportunities to Assess the Application of Universal Design in Postsecondary Educational Courses

In addition to the aforementioned various Universal Design frameworks there are other resources that may aid faculty in designing and quality checking that their hybrid and online courses are universally accessible. Numerous organizations exist that provide guidance for universities looking to adjust their curriculum to adopt Universal Design principles and comply with universal accessibility standards. Quality Matters (QM) is one such organization. Quality Matters is a non-profit, international organization that is recognized as a leader in enhancing online and hybrid course accessibility. Quality Matters produced and maintains a rubric that can be used, for a membership fee, to improve course design usability. The rubric has eight sections, and although all eight sections will benefit a given course's design, one section in particular, the eighth section, Accessibility and Usability, is especially helpful when applying Universal Design for Learning principles. The Accessibility and Usability section is comprised of six specific review standards, i.e., 1. navigation, 2. readability, 3. accessible text and images, 4. alternative means of accessing multimedia content, 5. multimedia ease of use, and 6. vendor accessibility statements. Section eight, i.e., the Accessibility and Usability review standards, of the Quality Matters rubric is a resource that may be used to provide guidance to adjust online and hybrid courses so that they are more accessible to all students, particularly students with disabilities (Quality Matters, 2019).

Chapter III: Methodology

Introduction

Universal Design for Learning (UDL) opens access and improves learning for all students, but students with disabilities in particular (Orr et al., 2009). Achieving the benefits of Universal Design for Learning requires faculty training for effective implementation (Lombardi et al., 2013; Lombardi et al., 2011). Many faculty in higher education are not formally trained in pedagogy and/or andragogy (Andurkar et al., 2010; Robinson & Hope, 2013). Professional development opportunities for faculty to learn the principles of Universal Design for Learning are necessary to provide professors with the knowledge and skills required for effective remediation of existing courses and proper design of new courses. Centers for Teaching Excellence (CTE) are the primary means for faculty professional development in higher education and could therefore play a key role in providing UDL training and support. Centers for Teaching Excellence typically have very small staffs, e.g., one or two fulltime employees. Therefore, the directors of these centers play a critical role in influencing the training and support that a given center provides. Center for Teaching Excellence directors' education, background, and interests were factors studied to determine if they influenced the level of support for UDL of the learning center. The directors of the various Centers for Teaching Excellence are in the best position to know the current and planned commitments of their faculty development programs for Universal Design for Learning. Therefore, they were identified as the optimal sample to provide the data necessary to understand the current situation and identify opportunities for improvement in supporting faculty in understanding and applying Universal Design for Learning in their courses. Understanding the

characteristics of CTEs and how they relate to support for UDL is the basis for this research.

An online survey was made available to directors of higher education faculty professional development programs in the Commonwealth of Pennsylvania. The intent of the survey was to gather information regarding levels of current and future integration of Universal Design for Learning in the faculty professional development program offerings of these centers. Participants in this study included directors of Centers for Teaching Excellence in postsecondary education institutions in the Commonwealth of Pennsylvania. Chapter three presents the sample population, Internal Review Board, research design/instrumentation, methodology, procedures, data analysis and design, efforts to reduce bias and ensure reliability and validity of data garnered via the survey, analysis approach to the collected data, and a summary.

Sample

The study used an expert sample approach. An expert, or judgment, sample is obtained when the researcher pulls their sample from a particular field of study or area of expertise to help best answer the questions being studied. An expert sample is a type of nonprobability sample, a homogeneous sample (Statistics How To, 2020). In this study the directors of Centers for Teaching Excellence comprised the expert sample.

The participants of this research study were directors of university Centers for Teaching Excellence, or equivalents, in postsecondary institutes in the Commonwealth of Pennsylvania. The sample was geographically constrained to the Commonwealth of Pennsylvania because nationally there are four thousand, five hundred, and eighty-three

postsecondary Title IV degree-granting institutions (NCES, 2019), which is an unwieldy and unnecessary volume of schools to include in the study. Further, the higher education environment in the Commonwealth well represents a national perspective due to its quantity and diversity of colleges and universities. Pennsylvania ranks tenth in the number of postsecondary degrees awarded to students in the country, awarding over one hundred and ninety-three thousand certifications, undergraduate, and graduate degrees annually. Pennsylvania enrolls over one hundred thousand students in higher education domestically. It is ranked sixth in the country in attracting foreign students in higher education. The Commonwealth has the nation's number one business school and the seventh top law school, i.e., the University of Pennsylvania's Wharton School and Carey Law School respectively (PDCED, 2019). The overall higher education student population demographics are representative: fifty-eight percent female, forty-two percent male, twenty-one percent of students have minority status, and eighty-one percent are traditional learners, nineteen percent being adult learners (Pennsylvania's State System of Higher Education, 2019).

The list of prospective participants, i.e., the population, was 54. All individuals in the population were invited to participate in the survey. The sample, i.e., the number of people that completed the survey, was n=51. Three criteria for identifying the 'director' were: a) has the title of director or equivalent for the university's Center for Teaching Excellence or similar department responsible for faculty professional development, b) holds the highest rank in such a department, c) is a designee of the director or is responsible for faculty professional development, e.g., an administrator or faculty member that may be located in another area of the university. The participants were all

eighteen years of age or older. The sample was not a protected population. Some examples of a protected population are: prisoners, military personal, and children, i.e., persons under eighteen years of age.

The participant list was developed by accessing the National Center for Education Statistics (2019), https://nces.ed.gov, the College Stats website, https://collegestats.org, and the Professional and Organizational Development (POD) Network in Higher Education, https://podnetwork.org. The following search parameters were used: State: Pennsylvania, Level of Award: bachelor's & advanced degrees, Institution Type: public, private non-profit, private for-profit, 4-year, 2-year. Google searches were also conducted using the following keywords: Center for Teaching Excellence, center for teaching and learning faculty excellence, center for faculty excellence. In additional to consulting the above-mentioned directories, the Pennsylvania community colleges were identified and included in the initial population. Using these search parameters a list of three hundred and ninety-four schools were presented. The list was further refined by removing redundant institutions, which were primarily branch/regional/satellite schools that used the same Center for Teaching Excellence as the main campus. In instances where this occurred, the main campus was used to represent the institution.

The aforementioned websites' search options did not include the ability to screen for only institutions that had Centers for Teaching Excellence. A thorough search was conducted to obtain this critical information, but no existing list was available. Narrowing the list to only institutions that had Centers for Teaching Excellence was accomplished by conducting Internet searches within each school's website as well as general Google searches. Performing these searches provided a much more refined list

by, but additional research was necessary. The researcher sent two additional emails to the population and used email and telephone communications to reach out to the individual schools remaining on the refined list to assure that the schools did indeed have a Center for Teaching Excellence and screened-out those schools that did not have CTEs. This procedure resulted in the final list of prospective participating schools.

Internal Review Board

The Duquesne University Internal Review Board for the Protection of Human Subjects (IRB) reviewed this research study to assure it was in compliance with all applicable laws, restrictions, and guidelines set forth by federal guidelines. To follow proper protocol regarding use of human subjects in research the researcher completed and submitted a 'Protocol for Protection of Human Subjects in Research' transmittal form to the Duquesne University Institutional Review Board. The researcher submitted the protocol under the 'Expedited' category. The protocol was reviewed by the Duquesne University Internal Review Board and approved on February 25, 2020. An amendment to the original IRB protocol to permit the researcher to perform recruitment during the participant screening phase was submitted and approved on March 15, 2020.

Research Design / Instrumentation

A review of the current research indicated there is no existing survey that would adequately meet the data collection needs of this research study. Therefore, a survey (Appendix C) was designed and developed by the researcher. The survey contains fifty-

five questions. The survey content was then transferred to an online survey platform named Qualtrics. The survey takes approximately twelve minutes to complete.

The survey was formally reviewed on two separate occasions. The first review of the survey was conducted by a panel of three education experts. The expert panel reviewed the survey for face validity and content validity. The survey was adjusted based on the recommendations of the expert review panel. The second review of the survey was a pilot study. A broader panel of education experts was used in the pilot study. The pilot study review panel included the three individuals that participated in the first review and four additional education experts (one panel invitee declined participation). The pilot study review panel was comprised of seven education experts. The titles of the pilot study review panel were: professor, associate professor, assistant professor, instructional designer, and dean. The survey was piloted and reviewed online in Qualtrics, i.e., the final deployment technology. The pilot review focused on content reliability. That said, the expert review panel was encouraged to provide any and all feedback that they felt was relevant, e.g., survey content, the online deployment tool, length of survey. Critiques and suggestions from the pilot study review were compiled and vetted by the principle and secondary investigators. The agreed upon edits were made to the online Qualtrics survey. After the edits were completed the survey was reviewed for quality assurance by the principle and secondary investigators. All necessary preparations were made to ready the survey for final deployment.

The research participants were provided a link to the Qualtrics online survey in the invitation and reminder emails sent to them. Accessing the survey link via a web browser, the participant was first presented with an initial ‘welcome’ page. The welcome

page provided: access to the Informed Consent PDF document (see Appendix A), a definition of Universal Design for Learning, and information about the gift card incentive program as well as a text input box for participants to input their unique numeric code (used on a volunteer basis, to participate in the incentive program). There was a single form field on the welcome page with accompanying text. It stated, "By completing and submitting the survey you are voluntarily consenting to participate in this project." The participant had to click a radio button labeled, "I agree" before the remainder of the survey, i.e., the survey questions, was revealed. The informed consent form communicates that participation is: voluntary, participants may withdrawal at any time, and there is no penalty for withdrawal. The consent form also provides the contact information for both the researcher and the Chair of the Duquesne University Institutional Review Board, should the participant have any questions. A measure of requiring a participant to explicitly agree to the informed consent was put into place. Each participant was required to click an 'I Agree' radio button at the beginning of the survey stating that they were voluntarily consenting to participate in the research and that they have agreed to the informed consent presented at the onset of the survey. All of the respondents agreed to the informed consent.

The online survey included a variety of form fields, i.e., radio button options, single-select form fields, multi-select check-box form elements, five-point Likert scale selection options, and a fill-in-the-blank text input form field. The survey consisted of the following sub-divisions: About the Institution, Administrative Institutional Support for Faculty Development Unit, Faculty Development Unit Characteristics, Faculty Development Unit Use of Technology, Background of Faculty Development Unit

Director (or Equivalent), Faculty Development Unit Support for Universal Design for Learning (UDL), and Faculty Interest in UDL. Each sub-division section was prefaced with text that provided context and meaning for the questions that followed.

The sub-divisions of the survey were designed to capture information about: the institutions and their administrative level of support for their faculty development units, i.e., the Centers for Teaching Excellence, the directors' backgrounds and levels of education, the make-up of the Centers for Teaching Excellence, and the level of UDL integration in the centers' faculty professional development and training offerings.

The About the Institution section included six questions that consisted of two radio button options and four drop-down menu selections. The Administrative Institutional Support for Faculty Development Unit section included ten five-point Likert scale questions. Seven of the Likert scale response options were: "Strongly disagree", "Disagree", "Neutral", "Agree", and "Strongly agree". The remaining three Likert scale response options were: "Unimportant", "Slightly Important", "Moderately Important", "Important", and "Very Important". The Faculty Development Unit Characteristics section included eight questions that consisted of: one radio button option, six drop-down menu selections, and one multi-select check-box form element. The Faculty Development Unit Use of Technology section included five questions that consisted of: one radio button option, two multi-select check-box form elements, and two five-point Likert scale questions with response options of: "Strongly disagree", "Disagree", "Neutral", "Agree", and "Strongly agree". The Background of Faculty Development Unit Director (or Equivalent) section included twelve questions that consisted of nine drop-down menu selections and three five-point Likert scale selections. Each of the three

Likert scale questions had it's own unique set of response options. The response options were respectively: "Very Poor", "Poor", "Fair", "Good", "Excellent"; "Never", "Rarely", "Sometimes", "Often", "Very Often"; and "Unimportant", "Slightly Important", "Moderately Important", "Important", "Very Important". In this section the online survey was designed to hide or reveal four of the questions based on the manner in which the participant answered the question, "What is your highest level of education?" Participants that answered, "Bachelor's degree" did not have an opportunity to answer an additional two questions about a master's degree nor two additional questions about a doctoral degree as they were not relevant for that participant based on their education background. Participants that answered, "Master's degree" did not have an opportunity to answer an additional two questions about a doctoral degree as they were not relevant for that participant based on their education background. Participants that answered, "Doctoral degree" had an opportunity to answer all of the questions in this section. The Faculty Development Unit Support for Universal Design for Learning (UDL) section included ten questions that consisted of: four radio button options, three drop-down menu selections, and three five-point Likert scale selections with response options of: "Strongly disagree", "Disagree", "Neutral", "Agree", and "Strongly agree". The Faculty Interest in UDL section included four questions that consisted of two drop-down menu selections and two five-point Likert scale questions with response options of: "Strongly disagree", "Disagree", "Neutral", "Agree", and "Strongly agree". The questions were scored on a question-by-question basis for hypothesis testing.

The survey was deployed via an online resource, Qualtrics (www.qualtrics.com). Qualtrics permits easy form completion for participants, assures anonymity, and provides

automatic data aggregation, processing, and sophisticated reporting functions. The use of Qualtrics allowed for easier collection of the data and a faster response time to the survey, all in a secure, web-based environment and allowed respondents to complete the survey from any Internet accessible computer either at work, school, or at home.

Methodology

The recruitment plan to inform prospective participants of the research study, solicit their participation, and provide the necessary information and hyperlinks to access the survey was as follows. An initial introduction email (Appendix D) was sent to each prospective participant individually. The introduction email communicated the purpose of the research study, request for their participation, and informed them that another email with access to the online survey would be sent to them in the near future. This introduction email also informed the participants that no personally identifiable information would be collected and that all data collected would be anonymous. A second email (Appendix E) was sent several days after the first introduction email. The second email included additional information, primarily about participation and the survey, including informed consent, and that they may withdraw from participation at any time. The second email also included a hyperlink to the Qualtrics online survey and information for opting-out of the survey. The online survey included a hyperlink to the IRB stamped and approved informed consent form for participant review. The informed consent form informed participants that the study was voluntary and confidential. It also communicated the purpose and potential benefits of the research, the ability to withdrawal from the study, the use and storage of data collected, and compensation

information. The online survey had a radio button for the participant to click to acknowledge their agreement to participate in the research.

Participants were provided an option to voluntarily engage in an incentive program. The incentive program consisted of a lottery for four $50 Amazon gift cards. The purpose of the incentive program was to encourage participation in the research study. Participants were under no obligation to engage in the incentive program. The researcher assigned a random number to each participant and provided it to each of them in individual emails. Participants that elected to engage in the incentive program input their code number into a text box form field on the survey. The key used to associate participants with their random numeric code was only accessible to the researcher, kept on a secure computer, and will be destroyed along with the data collected for this research as required by the IRB and as stated elsewhere in this document.

In an attempt to increase participation in the survey, after several days, a first reminder request to complete the survey email (Appendix D) was sent encouraging completion the online survey. Several days after that, a second reminder request to complete the survey email (Appendix D) was sent encouraging participants to complete the survey. As stated in the Sample section of this document, the researcher sent an additional two emails and conducted telephone calls and sent emails to individual schools to encourage prospective participants to complete the study. The data collection period began on June 2, 2020, and closed on June 30, 2020.

Data Analysis and Design

Responses to the surveys were analyzed using both descriptive and inferential statistics. The IBM Statistical Package for the Social Science (SPSS 27.0) for the Macintosh was utilized for data analyses. Descriptive statistics including means, standard deviations, and ranges were collected for all variables of interest.

The specific factors studied were: administrative espoused and real support for the CTE, CTE staff composition and use of technology, and the CTE's director's background. These variables were analyzed to determine if they impacted a center's level of training and support for UDL. The goal was to provide information to administrators that run CTEs so that they may structure their center to more effectively support Universal Design for Learning and in so doing support a broader range of diverse learners.

Chapter IV: Results

Introduction

This chapter presents the data collected from an online survey completed by fifty-one directors of Centers for Teaching Excellence in the Commonwealth of Pennsylvania. The chapter includes: information about the sample, participating schools' demographics, results for each of the five hypotheses, and a summary of the overall findings. All statistical analyses were conducted using IBM SPSS Statistics Version 27 software using a significance level of $p < .05$.

Purpose of Study

The purpose of this study was to examine the factors that impact the training and support of Universal Design for Learning (UDL) in Centers for Teaching Excellence in postsecondary institutions in the Commonwealth of Pennsylvania. The study focused on postsecondary institutions that have a Center for Teaching Excellence (CTE), i.e., dedicated administrative units responsible for providing information and training to full-time and adjunct professors to inform and improve their teaching practices. Administrative support, staff composition, and technological competencies of Centers for Teaching Excellence were examined. The educational background of Center for Teaching Excellence directors was a particular focal point due to the directors' profound impact on the output of the centers that they oversee. The mission statements of participating school's were also examined to determine if espoused support for students with special needs corresponded with the Centers for Teaching Excellences' support for Universal Design for Learning.

Sample

Consistent with the methodology described in chapter three, the population included colleges and universities in the Commonwealth of Pennsylvania. As detailed in the Sample section of chapter three, the population list was assembled from three Internet resources: the National Center for Education Statistics, College Stats, and the Professional and Organizational Development (POD) Network in Higher Education. Internet advanced searches were performed using filters to assure that only those institutions that met the criteria for the research study were included in the search results. The criteria for inclusion in the study were: postsecondary institutions that award bachelor's and advanced degrees and institutions that have a Center for Teaching Excellence department. This effort filtered out the vast majority of postsecondary institutions and, after additional filtering using the Internet, telephone calls, and emails, resulted in the final sample list of prospective participating schools.

Again, consistent with the methodology described in chapter three, the survey recruiting included: an initial announcement email, an invitation to participate email, a first reminder email, a second reminder email, two additional emails beseeching prospective participants to complete the survey, and emails and telephone calls to individuals in instances where the researcher had previously established contact with a prospective participant. As a result, 51 of the 54 institutions responded to the survey. It should be noted, though infrequent, some participants did not answer every question on the survey, resulting in slight variations in data presented in several of the tables.

Demographics

Postsecondary Institution Demographics

Thirty-two of the schools were private institutions. Nineteen were public institutions. Forty-seven were non-profit institutions. Four were for-profit institutions. The majority of the schools, 31.4%, had between 100 and 149 full-time faculty, with the next highest proportion, 27.5%, being schools having 200 or more faculty. The remaining proportion of full-time faculty levels, 41.1%, was distributed over three groups, i.e., less than 50 at 9.8%, 50 to 99 at 13.7%, and 150 to 199 at 15.7%.

The majority of the schools', (68.7%), total student enrollment was between 1,000 and 5,999 students. Of this proportion, 21.6% of the schools had total student enrollment between 2,000 to 2,999 students. Table 6 provides total student enrollment details. Students with disabilities enrollment numbers are presented in Table 7 as percentages of total student enrollment. Two survey participants declined to provide this data.

Table 6

Student Enrollment of Postsecondary Institutions in the Commonwealth of Pennsylvania

	Frequency	Percent
Less than 1,000	4	7.8
1,000 to 1,999	6	11.8
2,000 to 2,999	11	21.6
3,000 to 3,999	7	13.7
4,000 to 4,999	3	5.9
5,000 to 5,999	8	15.7
6,000 to 6,999	3	5.9
7,000 to 7,999	2	3.9
8,000 to 8,999	1	2.0
9,000 to 9,999	1	2.0
10,000 or more	5	9.8
Total	51	100.0

Table 7

Students with Disabilities Enrollment of Postsecondary Institutions in the Commonwealth of Pennsylvania

	Frequency	Percent
Less than 1%	2	3.9
1% to 5%	12	23.5
6% to 10%	16	31.4
11% to 15%	11	21.6
16% to 20%	4	7.8
21% to 25%	4	7.8
Total	49	96.1
Missing	2	3.9
Total	51	100.0

Centers for Teaching Excellence Demographics

Centers for Teaching Excellence are relatively recent additions to postsecondary schools in the Commonwealth of Pennsylvania. Slightly more than half, 52.9%, have been in existence for ten years or less. CTEs that have been in existence for twenty-one or more years accounted for only 15.7% of the sample.

Staffing levels for Centers for Teaching Excellence are low, for both full-time and part-time positions. Of the fifty-one CTEs, thirty-three were staffed by directors, or equivalents, that worked full-time in that capacity. Fourteen of the CTEs did not have additional full-time staff. Nine of the CTEs had a full-time staff in excess of four employees. Table 8 provides details of full-time staffing levels for the CTEs. Seventeen of the CTEs, 33.3%, did not have part-time staff. Another third, seventeen of the CTEs,

had one part-time employee. Table 9 provides details of part-time staffing levels for the CTEs. Few CTEs have part-time staff with 66.6% of them reporting either only one or no part-time staff at all.

Table 8

CTE[1] Full-time Staff of Postsecondary Institutions in the Commonwealth of Pennsylvania

	Frequency	Percent
0	14	27.5
1	11	21.6
2	8	15.7
3	4	7.8
4	5	9.8
5	0	0
6	1	2.0
7	1	2.0
8	3	5.9
9	1	2.0
10 or more	3	5.9
Total	51	100.0

Note 1. CTE = Center for Teaching Excellence

Table 9

CTE[1] Part-time Staff of Postsecondary Institutions in the Commonwealth of Pennsylvania

	Frequency	Percent
0	17	33.3
1	17	33.3
2	9	17.6
3	5	9.8
4	1	2.0
5	1	2.0
6	0	0
7	0	0
8	1	2.0
9	0	0
10 or more	0	0
Total	51	100.0

Note 1. CTE = Center for Teaching Excellence

Directors of Center for Teaching Excellence Demographics

This section provides information about CTE directors' educations and faculty support experience levels in terms of years engaged in such capacities. The majority of CTE directors have high levels of faculty development experience, as measured in years. Thirty-five directors, (68.6%), reported having six or more years experience in faculty development, with fourteen of the directors indicating that they have between six and ten years experience. Conversely the majority of the directors, (52.9%), have three or less years experience in the role of a CTE director.

Table 10

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Experience

	Years in Faculty Development		Years in Role	
	Frequency	Percent	Frequency	Percent
1 year or less	3	5.9	8	15.7
2 to 3 years	5	9.8	19	37.3
4 to 5 years	8	15.7	10	19.6
6 to 10 years	14	27.5	2	3.9
11 to 20 years	16	31.4	10	19.6
21 years or more	5	9.8	2	3.9
Total	51	100.0	51	100.0

Note 1. CTE = Center for Teaching Excellence

The majority, (72.5%), of CTE directors have doctoral degrees. Of the remaining proportion, 25.5% obtained master's degrees and 2.0%, one individual, obtained a bachelor's degree as their highest level of academic degree achievement. This research was particularly interested in revealing the extent to which Universal Design for Learning content was integrated into the courses, at all degree levels, taken by the CTE directors. Recognizing that UDL is not ubiquitous course content, particularly for directors that may have degrees in subject areas other than from a school of education, the extend to which special education content was integrated into the courses was also examined since it directly relates to addressing students with disabilities learning needs. Table 11 details the level of special education course content integration at each degree level. Table 12

details the level of Universal Design for Learning course content integration at each degree level.

The survey questions used to obtain data regarding a director's level of education in the courses that they took in their postsecondary degrees was phrased, 'In your bachelor's/master's/doctoral degree, how many courses included information on special education/Universal Design for Learning?' The importance to note is that the question asks if a given course 'included' information on special education or Universal Design for Learning, i.e., not a course focusing exclusively on one or the other subject. The depth to which special education or Universal Design for Learning was covered in a given course may have been cursory. About ninety percent of CTE directors indicated that the number of courses that included information on special education in their bachelor's, master's, and doctoral degrees was limited to two or less courses (see Table 11). Further, about ninety percent of CTE directors indicated that the number of courses that included information on Universal Design for Learning in their bachelor's, master's, and doctoral degrees was also limited to two or less courses, though the bachelor's and master's degree courses are closer to ninety-four percent (see Table 12). Further, well over half of the directors indicated that none of the courses in any of their degrees included information on neither special education nor Universal Design for Learning.

Table 11

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Courses Completed with Special Education Content

	Bachelor's Degree		Master's Degree		Doctoral Degree	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0 courses	32	62.7	36	70.6	25	49.0
1 to 2 courses	13	25.5	8	15.7	9	17.6
3 to 4 courses	3	5.9	3	5.9	0	0
5 to 6 courses	1	2.0	1	2.0	0	0
7 or more courses	1	2.0	1	2.0	2	3.9
Total	50	98.0	49	96.1	36	70.6

Note 1. CTE = Center for Teaching Excellence

Table 12

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Courses with UDL[2] Content

	Bachelor's Degree		Master's Degree		Doctoral Degree	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0 courses	41	80.4	35	68.6	21	58.3
1 to 2 courses	3	5.9	11	21.6	11	30.6
3 to 4 courses	3	5.9	3	5.9	3	8.3
5 to 6 courses	0	0	0	0	0	0
7 or more courses	0	0	0	0	1	2.8
Total	47	92.2	49	96.1	36	70.6

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Considering the amount of Universal Design for Learning training received by the CTE directors in their postsecondary degrees was indicated as minimal, for such arcane subjects, directors' efforts to obtain this knowledge from training outside of the degree programs is examined next. The survey question asked directors, 'In the past three years, how often have you received UDL training, e.g., webinars, conferences, research?' Table 13 indicates that the majority of directors, 68.6%, have received training from sometimes to very often. Nearly a third, 31.4%, of directors indicated that they received training rarely or not at all in the past three years.

Table 13

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Recent UDL[2] Training in the Past Three Years

	Frequency	Percent
Never	6	11.8
Rarely	10	19.6
Sometimes	19	37.3
Often	14	27.5
Very often	2	3.8
Total	51	100.0

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Directors of Centers for Teaching Excellence answered the survey question, 'How would you rate your knowledge of UDL?' Table 14 reveals their self-rated knowledge of UDL. The directors' responses indicate that the vast majority of them believe that they are at least fairly knowledgeable in UDL, i.e., 90.2%, with 62.7% indicating that their knowledge is good or excellent. Only 9.8% of directors assessed their knowledge of UDL as poor or very poor.

Table 14

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Self-assessment of UDL[2] Knowledge

	Frequency	Percent
Very poor	1	2.0
Poor	4	7.8
Fair	14	27.5
Good	28	54.9
Excellent	4	7.8
Total	51	100.0

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 15 reveals the directors of Centers for Teaching Excellence answers to the survey question, 'How important do you feel it is for faculty to integrate UDL principles into their courses?' The vast majority, 86.2%, of directors indicated that they felt it was important or very important for faculty to integrate UDL principles into their courses. Only 11.7% of directors felt UDL integration was slightly or moderately important.

Table 15

CTE[1] Directors of Postsecondary Institutions in the Commonwealth of Pennsylvania Stated Importance of Faculty Use of UDL[2] in Courses

	Frequency	Percent
Slightly Important	4	7.8
Moderately Important	2	3.9
Important	17	33.3
Very Important	27	52.9
Total	50	98.0
Missing Data	1	2.0
Total	51	100.0

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Results of Hypotheses Testing

Hypothesis 1: Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration.

A stepwise regression analysis of the Center for Teaching Excellence directors' belief that their CTE is generally supported by administration was performed to determine the validity of hypothesis 1. The dependent variable used to demonstrate 'greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration' was 'CTE ongoing UDL course support'. The predictor, 'I believe admin supports CTE generally' variable was statistically significant at a .045 level. Table 16 reveals an R Square of .079, meaning that this predictor accounted for nearly 8% of the variance in the 'ongoing CTE course support'. Therefore, CTE directors' belief that their CTE is generally supported by administration is a valid predictor to substantiate the hypothesis 1 assertion.

Table 16

Regression Model Summary for the Question 'I Believe Admin Supports CTE[1] Generally'

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.282[a]	.079	.061	.415

a. Predictors: (Constant), I believe admin supports CTE[1] generally

ANOVA						
Model		Sum of Square	df	Mean Square	F	Sig.
1	Regression	.728	1	.728	4.222	**.045**[b]
	Residual	8.449	49	.172		
	Total	9.176	50			

a. Dependent Variable: CTE[1] ongoing UDL[2] course support

b. Predictors: (Constant), I believe admin supports CTE[1] generally

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A second stepwise regression analysis of the Center for Teaching Excellence directors' belief that their CTE is generally supported by administration was performed using two different variables to further substantiate, or invalidate, hypothesis 1. In this second regression analysis the dependent variable used to demonstrate 'greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration' was 'CTE currency with technology for UDL training'. This variable was selected because the researcher believed that a CTE's ability

to train and support faculty in UDL is directly impacted by the CTE's knowledge of UDL. The predictor, 'I believe admin supports CTE with staff' was chosen because the researcher believed that an administration that provides staff resources to a CTE is an administration that effectively supports that CTE. The predictor variable was statistically significant (p = 044). Table 17 reveals an R Square of .080, meaning that this predictor accounted for 8% of the variance in the 'CTE currency with technology for UDL training'. CTE directors' belief that their CTE is supported with staff by administration is a valid predictor to substantiate the hypothesis 1 assertion.

Table 17

Regression Model Summary for the Question 'I Believe Admin Supports CTE[1] with Staff'

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.283[a]	.080	.061	1.034

a. Predictors: (Constant), I believe admin supports CTE[1] with staff

ANOVA						
Model		Sum of Square	df	Mean Square	F	Sig.
1	Regression	4.556	1	4.556	4.258	**.044**[b]
	Residual	52.425	49	1.070		
	Total	56.980	50			

a. Dependent Variable: CTE[1] currency with technology for UDL[2] training

b. Predictors: (Constant), I believe admin supports CTE[1] with staff

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A t-test to determine if the directors of Centers for Teaching Excellence believe that their CTEs are generally well supported by administration was conducted. The grouping variable in the t-test was the CTE's ongoing support for UDL determined by the survey question, 'Does your faculty development unit offer ongoing support to faculty while they are in the process of integrating UDL principles into new or existing course designs?', with 'yes' or 'no' as possible answer choices. Table 18 lists the number of responses for each answer, the mean, and the standard deviation. The following variables

(see Table 19) were statistically significant: 'I believe admin encourages faculty for CTE UDL training' (.038), 'I believe admin supports CTE generally' (.045), 'CTE director full-time position' (.009), and 'CTE number of full-time staff' (.006). The findings reveal that CTE directors' perceptions of administrative support and the CTE staffing, including their director positions, were important factors in determining if UDL is supported by their CTE units. Therefore the hypothesis was accepted. All of the variables used in the analysis are listed in Table 19.

Table 18

Means and Standard Deviations for CTE[1] Ongoing UDL[2] Course Support

Group Statistics				
	CTE[1] ongoing UDL[2] course support	N	Mean	Std. Deviation
I believe admin encourages faculty for CTE[1] training	No	12	4.33	.651
	Yes	39	4.05	.857
I believe admin encourages faculty for CTE[1] UDL[2] training	No	12	2.42	.996
	Yes	39	3.21	1.151
I believe admin understands UDL[2] legal	No	12	3.50	1.087
	Yes	39	3.72	1.169
Faculty development training general	No	12	3.83	.835
	Yes	39	3.79	1.128
Faculty requests for UDL[2] help	No	10	.70	1.059
	Yes	38	1.45	1.350
Faculty requests for help with students disabilities	No	10	1.60	1.578
	Yes	38	2.26	1.427
I believe admin supports CTE[1] generally	No	12	3.75	1.055
	Yes	39	4.28	.686
I believe admin supports CTE[1]	No	12	3.08	1.379

with funding	Yes	39	3.36	1.135
I believe admin supports CTE[1]	No	12	2.75	1.215
with staff	Yes	39	2.90	1.188
CTE[1] age	No	12	3.83	2.125
	Yes	39	3.90	1.889
CTE[1] director full-time position	No	12	1.33	.492
	Yes	39	1.74	.442
CTE[1] number of full-time staff	No	12	1.08	1.676
	Yes	39	3.13	3.205
CTE[1] number of part-time staff	No	12	1.33	1.155
	Yes	39	1.31	1.625

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 19

Independent Samples t-tests for CTE[1] Ongoing UDL[2] Course Support

	df	t	p
I believe admin encourages faculty for CTE[1] training	49	1.048	.300
I believe admin encourages faculty for CTE[1] UDL[2] training	49	-2.136	**.038**
I believe admin understands UDL[2] legal	49	-.574	.569
Faculty development training general	49	.109	.914
Faculty requests for UDL[2] help	46	-1.620	.112
Faculty requests for help with students disabilities	46	-1.280	.207
I believe admin supports CTE[1] generally	49	-2.055	**.045**
I believe admin supports CTE[1] with funding	49	-.699	.488
I believe admin supports CTE[1] with staff	49	-.374	.710
CTE[1] age	49	-.100	.921
CTE[1] director full-time position	49	-2.737	**.009**
CTE[1] number of full-time staff	49	-2.899	**.006**
CTE[1] number of part-time staff	49	.051	.960

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

Hypothesis 2: University Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence.

A series of t-tests to determine if Centers for Teaching Excellence characteristics and staff composition influence directors' beliefs that their CTEs are generally well supported by administration was conducted. The t-test used the data from the survey

question, ‘Does your faculty development unit offer ongoing support to faculty while they are in the process of integrating UDL principles into new or existing course designs?’, represented as CTE ongoing support for UDL in the tables.

Table 20 lists the number of responses for each answer, the mean, and the standard deviation. Though the analysis (see Table 21) revealed seven statistically significant variables, there were two, ‘CTE director full-time’ (.009), and ‘CTE number of full-time staff’ (.006) that are directly related to hypothesis 2. It is clear that the CTE directors believe that the number of CTE full-time staff in their departments, as well as their own employment status, i.e., full-time or part-time, impacts the CTE’s support for UDL. Therefore the hypothesis was accepted. All of the variables used in the analysis are listed in Table 21.

Table 20

Means and Standard Deviations for CTE[1] Ongoing UDL[2] Course Support

Group Statistics				
	CTE[1] ongoing UDL[2] course support	N	Mean	Std. Deviation
Public or private	No	12	1.67	.492
	Yes	39	1.62	.493
For-profit or non-profit	No	12	1.83	.389
	Yes	39	1.95	.223
Current all student enrollment	No	12	4.17	2.588
	Yes	39	5.15	3.013
Current students with disabilities enrollment	No	12	3.50	1.243
	Yes	37	3.24	1.300
Number of full-time faculty	No	12	3.83	1.337

	Yes	38	3.24	1.283
Number of adjunct faculty	No	12	3.75	1.913
	Yes	38	5.05	1.676
I believe admin supports CTE[1]	No	12	3.08	1.379
with funding	Yes	39	3.36	1.135
I believe admin supports CTE[1]	No	12	2.75	1.215
with staff	Yes	39	2.90	1.188
CTE[1] age	No	12	3.83	2.125
	Yes	39	3.90	1.889
CTE[1] director full-time position	No	12	1.33	.492
	Yes	39	1.74	.442
CTE[1] number of full-time staff	No	12	1.08	1.676
	Yes	39	3.13	3.205
CTE[1] number of part-time staff	No	12	1.33	1.155
	Yes	39	1.31	1.625
CTE[1] currency with technology	No	12	2.67	1.231
use	Yes	39	4.00	.795
CTE[1] currency with technology	No	12	2.25	1.055
for UDL[2] training	Yes	39	3.21	.978
CTE[1] hardware/software training	No	12	1.17	.389
	Yes	39	1.79	.409
Director time in role	No	12	2.67	1.371
	Yes	39	2.92	1.528
Director time in faculty	No	12	3.67	1.371
development	Yes	39	4.08	1.345
Director education level	No	12	2.92	.289
	Yes	39	2.64	.537
Director knowledge of UDL[2]	No	12	3.17	1.030
	Yes	39	3.72	.724
Importance of faculty use of	No	12	3.92	1.084

UDL[2] in courses	Yes	38	4.47	.797
CTE[1] knowledge of UDL[2]	No	12	2.92	.996
	Yes	39	3.67	.869
Faculty requests for UDL[2] help	No	10	.70	1.059
	Yes	38	1.45	1.350
Faculty requests for help with students disabilities	No	10	1.60	1.578
	Yes	38	2.26	1.427

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 21

Independent Samples t-tests for CTE[1] Ongoing UDL[2] Course Support

	df	t	p
Public or private	49	.315	.754
For-profit or non-profit	49	-.978	.345
Current all student enrollment	49	-1.023	.311
Current students with disabilities enrollment	47	.601	.551
Number of full-time faculty	48	1.391	.171
Number of adjunct faculty	48	-2.270	**.028**
I believe admin supports CTE[1] with funding	49	-.699	.488
I believe admin supports CTE[1] with staff	49	-.374	.710
CTE[1] age	49	-.100	.921
CTE[1] director full-time position	49	-2.737	**.009**
CTE[1] number of full-time staff	49	-2.899	**.006**
CTE[1] number of part-time staff	49	.051	.960
CTE[1] currency with technology use	49	-3.533	**.003**
CTE[1] currency with technology for UDL[2] training	49	-2.905	**.005**
CTE[1] hardware/software training	49	-4.702	**.000**
Director time in role	49	-.520	.606
Director time in faculty development	49	-.911	.375
Director education level	49	2.301	**.027**
Director knowledge of UDL[2]	49	-2.081	**.043**
Importance of faculty use of UDL in courses	48	-1.932	.059
CTE[1] knowledge of UDL[2]	49	-2.528	**.015**
Faculty requests for UDL[2] help	46	-1.620	.112
Faculty requests for help with students disabilities	46	-1.280	.207

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

Hypothesis 3: The level of use of technology by university Centers for Teaching Excellence impacts the degree of support of Universal Design for Learning by Centers for Teaching Excellence.

Universal Design for Learning was precipitated by application of advances in technology for academic course content, delivery, and assessment. Advances in technology have made UDL possible. There are now a great many technologies that address the needs of students with various disabilities. Students with disabilities may have sensory disabilities, e.g., blindness, low vision, hearing impairment, speech impairment, and/or cognitive disabilities, e.g., dyslexia, attention deficit disorder. Therefore, the level of use of technology employed by CTEs is a relevant and important characteristic to evaluate.

A series of t-tests to determine if the use of technology by university CTEs impacts the degree of support of UDL by CTEs was conducted. The grouping variable in the t-test was the CTE's ongoing support for UDL determined by the survey question, 'Does your faculty development unit offer ongoing support to faculty while they are in the process of integrating UDL principles into new or existing course designs?', with 'yes' or 'no' as possible answer choices. Table 22 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 23) were statistically significant: 'CTE number of asynchronous training sessions' (0.20), 'CTE currency with technology use' (.003), 'CTE currency with technology for UDL training' (.005) and 'CTE hardware/software training' (.000). The analysis revealed that a CTE's use and understanding of technology were important factors in determining if

UDL is supported by the CTE unit. All of the variables used in the analysis are listed in Table 23.

Table 22

Means and Standard Deviations for CTE[1] Ongoing UDL[2] Course Support

Group Statistics				
	CTE[1] ongoing UDL[2] course support	N	Mean	Std. Deviation
CTE[1] number of synchronous training sessions	No	12	3.17	1.992
	Yes	39	4.33	2.228
CTE[1] number of asynchronous training sessions	No	12	1.50	1.168
	Yes	39	2.72	2.305
CTE[1] currency with technology use	No	12	2.67	1.231
	Yes	39	4.00	.795
CTE[1] currency with technology for UDL[2] training	No	12	2.25	1.055
	Yes	39	3.21	.978
CTE[1] hardware/software training	No	12	1.17	.389
	Yes	39	1.79	.409

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 23

Independent Samples t-tests for CTE[1] Ongoing UDL[2] Course Support

	df	t	p
CTE[1] number of synchronous training sessions	49	-1.623	.111
CTE[1] number of asynchronous training sessions	49	-2.437	**.020**
CTE[1] currency with technology use	49	-3.533	**.003**
CTE[1] currency with technology for UDL[2] training	49	-2.905	**.005**
CTE[1] hardware/software training	49	-4.702	**.000**

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A second t-test to determine if the use of technology by university CTEs impacts the degree of support of UDL by CTEs was conducted. The grouping variable in the t-test was 'CTE faculty UDL consultation' determined by the survey question, 'Do you provide individual consultation with instructors for implementing UDL in their courses?', with 'yes' or 'no' as possible answer choices. Table 24 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 25) were statistically significant: 'CTE number of asynchronous training sessions' (.010), 'CTE currency with technology use' (.000), 'CTE currency with technology for UDL training' (.002) and 'CTE hardware/software training' (.003). The analysis revealed that CTEs currency with technologies, general and for UDL, their asynchronous training and training in hardware and software were important factors in determining if UDL is

supported by their CTE units. All of the variables used in the analysis are listed in Table 25.

Table 24

Means and Standard Deviations for CTE[1] Faculty UDL[2] Consultation

Group Statistics				
	CTE[1] faculty UDL[2] consultation	N	Mean	Std. Deviation
CTE[1] number of synchronous training sessions	No	9	3.56	1.944
	Yes	42	4.17	2.273
CTE[1] number of asynchronous training sessions	No	9	1.33	1.000
	Yes	42	2.67	2.260
CTE[1] currency with technology use	No	9	2.56	1.014
	Yes	42	3.93	.921
CTE[1] currency with technology for UDL[2] training	No	9	2.00	1.000
	Yes	42	3.19	.969
CTE[1] hardware/software training	No	9	1.22	.441
	Yes	42	1.74	.445

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 25

Independent Samples t-tests for CTE[1] Faculty UDL[2] Consultation

	df	t	p
CTE[1] number of synchronous training sessions	49	-.749	.458
CTE[1] number of asynchronous training sessions	49	-2.764	**.010**
CTE[1] currency with technology use	49	-3.990	**.000**
CTE[1] currency with technology for UDL[2] training	49	-3.328	**.002**
CTE[1] hardware/software training	49	-3.161	**.003**

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A third series of t-tests to determine if the use of technology by university CTEs impacts the degree of support of UDL by CTEs was conducted. The grouping variable in the t-test was 'Faculty orientation UDL info'. The underlying logic of using the presence or absence of UDL information in faculty orientation materials is the postulation that CTE units that do provide such technical information are CTE units that use and disseminate technology information effectively. This grouping variable was determined by the survey question, 'Does your faculty development unit include information on UDL in new faculty orientation?', with 'yes' or 'no' as possible answer choices. Table 26 lists the number of responses for each answer, the mean, and the standard deviation. The following variable (see Table 27) was statistically significant: 'CTE currency with technology use' (.035). The analysis reveals that a CTE's use technology, as determined by the inclusion of UDL information in faculty orientation information was an important

factor in determining if UDL is supported by their CTE units. Therefore the hypothesis was accepted. All of the variables used in the analysis are listed in Table 27.

Table 26

Means and Standard Deviations for Faculty Orientation UDL[1] Information

Group Statistics				
	Faculty orientation UDL[1] info	N	Mean	Std. Deviation
CTE[2] number of synchronous training sessions	No	27	3.63	2.115
	Yes	23	4.43	2.253
CTE[2] number of asynchronous training sessions	No	27	2.00	1.819
	Yes	23	2.96	2.458
CTE[2] currency with technology use	No	27	3.37	1.079
	Yes	23	4.00	.953
CTE[2] currency with technology for UDL[1] training	No	27	2.70	1.068
	Yes	23	3.22	.951
CTE[2] hardware/software training	No	27	1.59	.501
	Yes	23	1.70	.470

Note 1. UDL = Universal Design for Learning

Note 2. CTE = Center for Teaching Excellence

Table 27

Independent Samples t-tests for Faculty Orientation UDL[1] Information

	df	t	p
CTE[2] number of synchronous training sessions	48	-1.302	.199
CTE[2] number of asynchronous training sessions	48	-1.578	.121
CTE[2] currency with technology use	48	-2.168	**.035**
CTE[2] currency with technology for UDL training	48	-1.782	.081
CTE[2] hardware/software training	48	-.746	.460

Note 1. UDL = Universal Design for Learning

Note 2. CTE = Center for Teaching Excellence

Note 3. All statically significant values are in bold

Hypothesis 4: The level of education of directors of Centers for Teaching Excellence influences the level of support for Universal Design for Learning provided by the Center for Teaching Excellence.

Centers for Teaching Excellence are often exiguous except in very large universities. The staff may be limited to a director, an assistant, and perhaps one or two other employees. The CTE director plays a critical role in determining the training and support provided by the CTE unit. The director's knowledge is an important factor that impacts the content focus of the CTE. The acquisition of this knowledge, particularly recondite subjects such as UDL, is conventionally achieved through formal education. Determining if directors' education, particularly courses taken in undergraduate, graduate, and doctoral degree programs, impacts the CTE's level of support for UDL is the focus of hypothesis 4.

A series of t-tests to determine if the level of education of directors of CTEs influences the level of support for UDL by CTEs was conducted. The grouping variable in the t-test was the CTE's ongoing support for UDL determined by the survey question, 'Does your faculty development unit offer ongoing support to faculty while they are in the process of integrating UDL principles into new or existing course designs?', with 'yes' or 'no' as possible answer choices. Table 28 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 29) were statistically significant: 'Director education level' (.027), 'Bachelors number of UDL courses' (.018), 'Masters number of UDL courses' (.013), and 'Director knowledge of UDL' (.043). The analysis reveals that a director's education was an important factor in determining if UDL is supported by the CTE unit. All of the variables used in the analysis are listed in Table 29.

Table 28

Means and Standard Deviations for CTE[1] Ongoing UDL[2] Course Support

Group Statistics				
	CTE[1] ongoing UDL[2] course support	N	Mean	Std. Deviation
Director time in role	No	12	2.67	1.371
	Yes	39	2.92	1.528
Director time in faculty development	No	12	3.67	1.371
	Yes	39	4.08	1.345
Director education level	No	12	2.92	.289
	Yes	39	2.64	.537
Bachelors number of special ed courses	No	12	.50	1.168
	Yes	38	.53	.762

Bachelors number of UDL[2] courses	No	11	.00	.000
	Yes	36	.25	.604
Masters number of special ed courses	No	12	.42	1.165
	Yes	37	.43	.765
Masters number of UDL[2] courses	No	12	.08	.289
	Yes	37	.43	.647
Doctors number of special ed courses	No	11	.45	1.214
	Yes	25	.48	.872
Doctors number of UDL[2] courses	No	11	.45	.688
	Yes	25	.64	.952
Director knowledge of UDL[2]	No	12	3.17	1.030
	Yes	39	3.72	.724
Director UDL[2] recent training	No	12	2.58	.996
	Yes	39	3.03	1.063

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 29

Independent Samples t-tests for CTE[1] Ongoing UDL[2] Course Support

	df	t	p
Director time in role	49	-.520	.606
Director time in faculty development	49	-.920	.362
Director education level	49	2.301	**.027**
Bachelors number of special ed courses	48	-.091	.928
Bachelors number of UDL[2] courses	45	-2.485	**.018**
Masters number of special ed courses	47	-.054	.957
Masters number of UDL[2] courses	47	-2.583	**.013**
Doctors number of special ed courses	34	-.071	.943
Doctors number of UDL[2] courses	34	-.581	.565
Director knowledge of UDL[2]	49	-2.081	**.043**
Director UDL[2] recent training	49	-1.278	.207

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A second t-test to determine if the level of education of directors of CTEs influences the level of support for UDL by CTEs was conducted. The grouping variable in the t-test was the 'CTE faculty UDL consultation' determined by the survey question, 'Do you provide individual consultation with instructors for implementing UDL in their courses?', with 'yes' or 'no' as possible answer choices. Table 30 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 31) were statistically significant: 'Director's education level' (.000),

‘Bachelors number of UDL courses’ (.018) and ‘Director knowledge of UDL’ (.017). The analysis reveals that a director’s education was an important factor in determining if UDL is supported by the CTE unit. All of the variables used in the analysis are listed in Table 31.

Table 30

Means and Standard Deviations for CTE[1] Faculty UDL[2] Consultation

Group Statistics				
	CTE[1] faculty UDL[2] consultation	N	Mean	Std. Deviation
Director time in role	No	9	2.44	1.590
	Yes	42	2.95	1.464
Director time in faculty development	No	9	3.22	1.716
	Yes	42	4.14	1.221
Director education level	No	9	3.00	.000
	Yes	42	2.64	.533
Bachelors number of special ed courses	No	8	.75	1.389
	Yes	42	.48	.740
Bachelors number of UDL[2] courses	No	7	.00	.000
	Yes	40	.23	.577
Masters number of special ed courses	No	8	.63	1.408
	Yes	41	.39	.737
Masters number of UDL[2] courses	No	8	.13	.354
	Yes	41	.39	.628
Doctors number of special ed courses	No	8	.63	1.408
	Yes	28	.43	.836
Doctors number of UDL[2] courses	No	8	.38	.744
	Yes	28	.64	.911
Director knowledge of UDL[2]	No	9	3.00	1.118
	Yes	42	3.71	.708
Director UDL[2] recent training	No	9	2.33	1.000
	Yes	42	3.05	1.035

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Table 31

Independent Samples t-tests for CTE[1] Faculty UDL[2] Consultation

	df	t	p
Director time in role	49	-.931	.356
Director time in faculty development	49	-1.906	.062
Director education level	49	4.343	**.000**
Bachelors number of special ed courses	48	.820	.416
Bachelors number of UDL[2] courses	45	-2.467	**.018**
Masters number of special ed courses	47	.698	.489
Masters number of UDL[2] courses	47	-1.670	.113
Doctors number of special ed courses	34	.499	.621
Doctors number of UDL[2] courses	34	-.760	.453
Director knowledge of UDL[2]	49	-2.462	**.017**
Director UDL[2] recent training	49	-1.889	.065

Note 1. CTE = Center for Teaching Excellence

Note 2. UDL = Universal Design for Learning

Note 3. All statically significant values are in bold

A third t-test to determine if the level of education of directors of CTEs influences the level of support for UDL by CTEs was conducted. The grouping variable in the t-test was the Faculty Orientation UDL Information determined by the survey question, 'Does your faculty development unit include information on UDL in new faculty orientation?', with 'yes' or 'no' as possible answer choices. Table 32 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 33) were statistically significant: 'Director education level' (.006), 'Bachelors number of

special ed courses' (.033), 'Director knowledge of UDL' (.009), and 'Director UDL recent training' (.007). The analysis reveals that a CTE's use of technology, as determined by the inclusion of UDL information in faculty orientation materials was an important factor in determining if UDL is supported by their CTE units. Therefore the hypothesis was accepted. All of the variables used in the analysis are listed in Table 33.

Table 32

Means and Standard Deviations for Faculty Orientation UDL[1] Information

	Group Statistics			
	Faculty orientation UDL[1] info	N	Mean	Std. Deviation
Director time in role	No	27	2.78	1.601
	Yes	23	2.96	1.397
Director time in faculty development	No	27	3.78	1.423
	Yes	23	4.22	1.278
Director education level	No	27	2.89	.320
	Yes	23	2.48	.593
Bachelors number of special ed courses	No	26	.27	.452
	Yes	23	.83	1.114
Bachelors number of UDL[1] courses	No	24	.08	.282
	Yes	22	.32	.716
Masters number of special ed courses	No	26	.23	.430
	Yes	22	.68	1.171
Masters number of UDL[1] courses	No	26	.23	.514
	Yes	22	.50	.673
Doctors number of special ed courses	No	23	.26	.449
	Yes	12	.92	1.505
Doctors number of UDL[1] courses	No	23	.52	.730
	Yes	12	.75	1.138
Director knowledge of UDL[1]	No	27	3.30	.912
	Yes	23	3.87	.548
Director UDL[1] recent training	No	27	2.56	.974
	Yes	23	3.35	1.027

Note 1. UDL = Universal Design for Learning

Table 33

Independent Samples t-tests for Faculty Orientation UDL[1] Information

	df	t	p
Director time in role	48	-.417	.679
Director time in faculty development	48	-1.140	.260
Director education level	48	2.972	**.006**
Bachelors number of special ed courses	47	-2.239	**.033**
Bachelors number of UDL[1] courses	44	-1.439	.162
Masters number of special ed courses	46	-1.712	.099
Masters number of UDL[1] courses	46	-1.536	.133
Doctors number of special ed courses	33	-1.476	.166
Doctors number of UDL[1] courses	33	-.722	.475
Director knowledge of UDL[1]	48	-2.737	**.009**
Director UDL[1] recent training	48	-2.795	**.007**

Note 1. UDL = Universal Design for Learning

Note 2. All statically significant values are in bold

Hypothesis 5: Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities.

Determining an objective method of evaluating the mission statements and codifying them as 'yes', i.e., espouse support for people with disabilities, or 'no', i.e., does not espouse support for people with disabilities, was a necessary first step to prepare data for statistical analysis. A statement from the National Disabilities Rights Network

was used as a reference for the evaluation. The statement reads, "Education leaders to lead with equity, while also sharing a message of hope and ability to provide services to students with disabilities in new ways" (National Disabilities Rights Network, 2020, p. 1). This statement served as a general guiding principle by capturing the spirit of espousing support for people with disabilities. In addition to this guiding principle, the researcher reviewed all of the mission statements in the sample in an attempt to identify an additional, more tangible, method of evaluation. An additional evaluation method surfaced. This additional evaluation approach involved carefully reading each mission statement to determine if two key words, or equivalent synonyms where present. The two key words were: 'inclusive' and 'accessibility'. These two key words directly relate to the hypothesis and are ingrained in the lexicon of literature about person with disabilities. Using this methodology each mission statement was codified accordingly.

A t-test to determine if schools' with mission statements that espouse support for people with disabilities CTE units provide greater support for UDL than schools' with mission statements that do not make such assertions was conducted. The grouping variable in the t-test was mission statements. Table 34 lists the number of responses for each answer, the mean, and the standard deviation. The following variables (see Table 35) were statistically significant: 'CTE ongoing UDL course support' (.000) and 'CTE faculty UDL consultation' (.002). Therefore the hypothesis was accepted. All of the variables used in the analysis are listed in Table 35.

Table 34

Means and Standard Deviations for Mission Statements of Postsecondary Institutions in the Commonwealth of Pennsylvania

Group Statistics				
	Mission Statement	N	Mean	Std. Deviation
Importance of faculty use of UDL[1] in courses	No	45	4.38	.860
	Yes	5	4.00	1.225
CTE[2] recent training mention UDL[1]	No	45	2.27	1.286
	Yes	6	1.67	.816
CTE[2] recent training in UDL[1]	No	45	1.13	1.079
	Yes	6	.67	.516
CTE[2] future training mention UDL[1]	No	44	1.45	1.170
	Yes	5	1.20	.837
CTE[2] ongoing UDL[1] course support	No	45	1.73	.447
	Yes	6	2.00	.000
CTE[2] faculty UDL[1] consultation	No	45	1.80	.405
	Yes	6	2.00	.000
Faculty orientation UDL[1] info	No	44	1.45	.504
	Yes	6	1.50	.548
Faculty orientation UDL[1] legal info	No	44	1.30	.462
	Yes	6	1.17	.408
CTE[2] knowledge of UDL[1]	No	45	3.53	.968
	Yes	6	3.17	.753
CTE[2] UDL[1] training provided	No	45	3.11	1.112
	Yes	5	2.80	.837
All faculty have knowledge of UDL[1]	No	45	2.40	.963
	Yes	6	2.50	.837
All faculty trained in providing	No	44	2.86	1.025

f2f accommodations	Yes	5	3.00	.707
All faculty trained in providing online accommodations	No	44	2.66	1.238
	Yes	6	3.17	.753
Faculty requests for UDL[1] help	No	42	1.38	1.361
	Yes	6	.67	.816
Faculty requests for help with students disabilities	No	42	2.10	1.511
	Yes	6	2.33	1.211

Note 1. UDL = Universal Design for Learning

Note 2. CTE = Center for Teaching Excellence

Table 35

Independent Samples t-tests for Mission Statements of Postsecondary Institutions in the Commonwealth of Pennsylvania

	df	t	p
Importance of faculty use of UDL[1] in courses	48	.894	.376
CTE[2] recent training mention UDL[1]	49	1.108	.273
CTE[2] recent training in UDL[1]	49	1.037	.305
CTE[2] future training mention UDL[1]	47	.471	.640
CTE[2] ongoing UDL[1] course support	49	-4.000	**.000**
CTE[2] faculty UDL[1] consultation	49	-3.317	**.002**
Faculty orientation UDL[1] info	48	-.205	.838
Faculty orientation UDL[1] legal info	48	.649	.520
CTE[2] knowledge of UDL[1]	49	.890	.378
CTE[2] UDL[1] training provided	48	.604	.548
All faculty have knowledge of UDL[1]	49	-.242	.810
All faculty trained in providing f2f accommodations	47	-.288	.774
All faculty trained in providing online accommodations	48	-1.412	.191
Faculty requests for UDL[1] help	46	1.247	.219
Faculty requests for help with students disabilities	46	-.368	.714

Note 1. UDL = Universal Design for Learning

Note 2. CTE = Center for Teaching Excellence

Note 3. All statically significant values are in bold

Summary

Descriptive analyses were conducted and presented which provided insights into the characteristics of the participating postsecondary institutions in the Commonwealth of Pennsylvania. Analyses were conducted to specific to each of the five hypotheses. Each

hypothesis was accepted to be true, due to statistically significant variables yielded in the statistical output. Centers for Teaching Excellence that are well supported by university administration, CTE characteristics and staff composition, the level of use of technology by CTEs, the level of education of CTE directors, and the university's mission statements were all meaningful contributors to a CTE's level of support for Universal Design for Learning.

Chapter V: Discussion and Implications

Introduction

This research focused on the issues that may impact postsecondary institutions' Centers for Teaching Excellence (CTE) faculty training and support for Universal Design for Learning (UDL). Universal Design for Learning is a pedagogical framework used to proactively design curriculum to reduce access barriers to course content and activities, thereby increasing opportunities for positive learning outcomes (Orr et al., 2009). Evmenova's (2018) research reveals that faculty value Universal Design for Learning training with some professors ranking UDL training as a top priority. Burgstahler et al. (2000) note that faculty desire pedagogical training for disability instruction. Further, Izzo et al. (2008) found that faculty have a particular interest in understanding how to meet the needs of students that choose to not disclose their learning disability, e.g., cognitive learning disabilities.

Centers for Teaching Excellence serve a crucial role in providing postsecondary faculty with training and support to enhance their teaching practice (Haras et al., (2017). CTEs are the principle means of providing the training that faculty desire and need. Given the importance of CTEs in helping postsecondary faculty develop knowledge and competencies to improve their teaching practice, it was prudent to analyze CTE characteristics. Understanding how the level of administrative support for CTEs, CTE directors' educational backgrounds, and CTE staff compositions, impacts a CTE's support for UDL will yield insights and enable administrators to make informed decisions. These insights and decisions could positively influence an institution's support for UDL, and consequently benefit students' learning outcomes. The research findings

can be used to influence decision-makers to more fully integrate UDL principles into their faculty training and support programs and in so doing support a broader range of diverse learners.

Discussion of Findings

This section interprets the analysis results for each of the five hypotheses and relates the findings to the theoretical background and relevant literature of previous studies pertinent to this research domain. The section is divided into two categories. Descriptive statistics are presented first and provide background information about the sample to provide context. The second section presents the results, findings, and relevant literature specific to each of the hypotheses.

Descriptive Statistics

Postsecondary Institution Demographics

The sample was primarily comprised of large postsecondary institutions, which was expected considering the existence of a Center for Teaching Excellence unit was a criterion for participation in the research, i.e., typically only large universities have a CTE unit. Examining the postsecondary institutions in the Commonwealth of Pennsylvania that participated in the research study, it was revealed that, as the size of the university increased, the level of administrative support increased, in both general support, as defined by the evaluation of the CTE directors, and in funding for the CTEs. This is encouraging because the larger the university, the larger the volume of impacted

students. The greater the level of general and financial support, the greater the opportunities for the CTEs to effectively train and support faculty, in the application of UDL as well as other subject areas that may benefit student academic achievement. This same relationship existed for support for students with disabilities, i.e., the larger the school, the greater the importance university administrations placed on attending to the special needs of students with disabilities. Again, this is encouraging because more students across the Commonwealth will benefit from this administrative support. With regards to the level of importance that university administrations placed on integration of UDL principles into course curriculum, the same phenomenon existed, i.e., the larger the institution the greater the importance placed on UDL course integration. That said, and not unexpectedly, overall there was less administration emphasis on UDL specifically, than on support for students with disabilities generally.

The CTE directors of both public and private schools believed that they were generally supported by administration. However the CTE directors of private schools did not feel that they were adequately funded, whereas the CTE directors of public schools believed that they were adequately funded. These findings indicate that public schools are doing a better job at supporting their CTEs than private schools, which is unfortunate because there are many private schools in the Commonwealth of Pennsylvania. CTEs of private schools may benefit from an increase in financial support that may translate into improved faculty training and support, and consequently, improved pedagogy and access to courses for all students, particularly students with disabilities. And, of course, this improved pedagogy and quality of learning experience can only help to enhance private

schools' enrollment numbers and corresponding revenues – something that is of increasing concern for private schools across the country.

The most profound difference in the demographics of the participating institutions was between non-profit and for-profit institutions. The CTE directors of non-profit schools believed that they were generally well supported and funded by administration, but the CTE directors of for-profit schools were mixed in their opinion, some felt moderately supported and funded while others did not feel well supported by administration or well-funded. The profound distinction is in the administrations' support for students with disabilities and UDL, as assessed by the CTE directors. The administrations of non-profit schools placed a very high importance on supporting the needs of students with disabilities, whereas the for-profit schools did so to a lesser degree. These same findings held true with the support for UDL, i.e., non-profit schools provide greater support than for-profit schools. It is clear that there is an opportunity to more effectively meet the needs of students with disabilities across the Commonwealth if for-profit institutions were to place greater importance on providing the resources to their CTEs and increasing their emphasis on supporting students with disabilities. It is also evident that all schools, regardless of their demographics, can help students by placing greater importance on the application of UDL as a framework to improve course access.

Centers for Teaching Excellence Demographics

Examining the postsecondary institutions' Centers for Teaching Excellence in the research study, it is not surprising that the larger schools, defined by student enrolment, in general have more CTE staff than the smaller schools. However, distinctions exist.

For example, the larger public schools have more full-time staff than the larger private schools, which tend to have less full-time staff, but more part-time staff. Further, there is a relationship between school size and CTE staff size in public schools, but this relationship does not exist in the private school sector. These discrepancies may exist because public schools, which also tend to have CTEs that have been in existence longer, place more emphasis on faculty training and support and therefore invest more money in full-time staff for their CTEs than private schools. Supporting this interpretation of the data is the fact that private schools tend to have more part-time staff in their CTEs, which may well translate into inferior faculty training and support. Considering UDL is a framework that requires support by persons, with not only a firm understanding of UDL itself, but also considerable knowledge, experience, and proficiency with a diverse range of technologies, it is likely that private institutions are less prepared to provide UDL training to the faculty at their respective schools. This is unfortunate because roughly two-thirds of the schools in the research were private institutions. This full-time vs. part-time phenomenon does not necessarily hold true for the CTE director position. Approximately two-thirds of both public and private schools have full-time CTE directors, though here again, the public schools have a slightly higher ratio of full-time CTE directors than part-time CTE directors. In both public and private schools the likelihood of a CTE having a full-time director increases in accordance with a school's size. On the whole, public institutions appear to place greater emphasis on faculty development by virtue of greater full-time staffing of CTEs, which typically translates into improved instruction and student academic achievement.

Though it appears that public institutions place greater importance on faculty development than private institutions, as a whole, postsecondary institutions CTEs in the Commonwealth of Pennsylvania are staffed by only one or two full-time employees, which reduces the chance that UDL support will be adequately addressed. For UDL to be well supported, all schools across the Commonwealth should increase the staff size of their CTEs.

Directors of Center for Teaching Excellence Demographics

The majority of CTE directors, 68.6%, reported high levels of faculty development experience, i.e., six or more years of experience in faculty development. Yet just over half of the directors, 52.9%, had three or less years in the role of a CTE director. A rational interpretation of this data is that CTE directors are typically hired into this position after they have gained experience performing faculty development responsibilities in some other capacity. As noted in the Center for Teaching Excellence Demographics section, over half of CTEs have been in existence for ten years or less, which may also contribute to reduced years of experience in role for CTE directors due to the fact that most CTEs have not been around long enough to have employees with long incumbencies.

Examining directors' education, it is evident that the majority of the directors had limited exposure to courses that had either special education or UDL content in any of their degree programs, i.e., bachelor's, master's, doctorate. Further, about a third of the directors reported having UDL training of any type either rarely or not at all, and another third reported having UDL training 'sometimes' in the past three years. Overall, the

directors do not have a great deal of formal or informal training in UDL, yet the majority of directors, (62.7%,) assess their knowledge of UDL as either 'good' or 'excellent'. Two possible interpretations of this incongruent reporting of self-assessed UDL knowledge against a backdrop of scant UDL training is that directors either have a false, elevated sense of their UDL knowledge or that they inflated their self-assessment of UDL knowledge when answering the survey question because they believed UDL was important and that they should have, by virtue of their position, understood UDL well. Directors that lack UDL knowledge will be less effective in providing training and support for faculty implementation of UDL in their courses, which results in students with disabilities having suboptimal access to course content and activities, translating into reduced opportunities for academic success.

Further evidence of this problem is revealed in the CTE directors' rating of the importance for faculty to include UDL in their courses. The vast majority of directors, 86.2%, rated the importance for faculty to include UDL in their courses as either 'important' or 'very important'. It is apparent that CTE directors believe in the value of UDL, or at least profess to, yet they may not taking the necessary measures to acquire the requisite UDL knowledge to be effective in their role of supporting faculty. This finding is disappointing because students, particularly those with disabilities, will be less likely to reap the benefits of UDL infused courses due to the likelihood that faculty's opportunities to be trained and supported in UDL are diminished due to their institution's CTE lack of knowledge in UDL. This deficiency may be overcome by university administrators emphasizing the importance of UDL and providing the motivation and means for

directors to acquire UDL knowledge and subsequently integrate UDL into their CTE faculty training and support repertoire.

Hypotheses Results and Findings Summary

Five hypotheses were formulated at the onset of this research. All reasonable and relevant permutations of variables were explored to evaluate each hypothesis. Results of the data analyses substantiated each hypothesis to be true. Each hypothesis' analyses and findings are presented in this section.

Hypothesis 1 Results and Findings

Hypothesis 1: Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration.

Data from this research demonstrates that administrative support of CTEs does impact CTEs' level of support for UDL. Therefore the hypothesis is accepted as true. General administrative support, measured as CTE directors' belief in such support, and administrations' encouragement for faculty to participate in CTE training were statistically significant factors that contributed to the validation of this hypothesis. It can reasonably be concluded that administrations that encourage faculty to participate in CTE training recognize the value of continual faculty professional development and the importance of the role that CTEs play in helping faculty improve pedagogical acumen and their teaching practice.

Administrative support for a CTE in the form of staffing, particularly whether the CTE director position was full-time or part-time, as well as the number of full-time CTE staff positions were also important statistically significant factors. CTEs directors that are full-time are better able to fulfill their CTE responsibilities. Firstly, and simply, more man-hours equate to increased capacity to: support more CTE initiatives, design and provide more training, develop additional learning resources for faculty use, consult directly with individual professors to aid them in improving their courses, and have more time for their own professional development as well as the professional development of their CTE staff. CTEs that do not have full-time directors or staff are more likely to only have sufficient capacity to cover elementary faculty support, e.g., basic course design, composing syllabi, converting face-to-face courses to hybrid or online courses. Having increased man-hours, by virtue of having full-time directors and staff, facilitates developing faculty training and support beyond the basics. The increased time allows CTEs to develop faculty training for more advanced subjects such as Universal Design for Learning. Further, because UDL is abstruse, taking time and effort to understand fully, the increased time permits CTE staff to develop internal competencies in UDL and the various technologies that allow for course content and activities to be presented, as per UDL principles, in diverse formats, e.g., video, audio, text transcriptions, and the like. Naturally CTEs that have larger staffs are better equipped to offer more training, provide more consultation, and develop and deliver a greater volume of training programs. This has the potential and likelihood to translate into greater faculty support in both the number of faculty served and number and diversity of training programs offered.

In addition to the benefits of increased capacity for CTE projects, CTE directors that are full-time are less likely to have other competing non-CTE priorities. Part-time CTE directors will naturally have other responsibilities outside of their CTE responsibilities. These other responsibilities may have deadlines that distract directors from their CTE work, thereby limiting and/or delaying CTE projects. Directors that are able to focus all of their time and energies on CTE initiatives are better positioned to provide a wider range of faculty training, such as UDL, that they and their centers offer.

The analysis of this research indicates that CTE directors believed that they were supported by administration. By providing administrative support, CTEs are more able to provide training and support for faculty with UDL implementation in new and existing courses. This in turn helps students because the amount of resources for UDL available to faculty significantly impacts faculty's provisioning of accommodations for students (Bourke et al., 2000). Izzo et al. (2008) have also concluded that faculty need institutional support and training that is specific to meeting the learning needs of students with disabilities so that they can effectively implement these strategies in their classrooms and distance learning environments. Administrative support for CTEs, particularly with regards to staffing, has a positive impact on that CTE's support for UDL.

Hypothesis 2 Results and Findings

Hypothesis 2: University Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence.

Examining CTEs' characteristics and staff compositions revealed, not unexpectedly, that larger schools were more likely to have a full-time director and full-time staff than smaller schools, and conversely, smaller schools were more likely to have part-time directors and staff that was typically limited to one person or none at all. A similar relationship with regards to part-time staff does not exist, with the exception of the aforementioned director position, i.e., there is great diversity in the amount of part-time staff in the CTE units with no relationship between a school's size and its part-time staff levels. This diversity and lack of relationship was also found to be true for the distinction between for-profit and non-profit schools, i.e., no relationship exists with regards to a school's profit characteristic and the school's CTE part- or full-time staff levels. This was an unexpected finding. That said, the overall findings bode well for UDL in general in that the research definition of what constitutes a school's size was based on student enrollment. Therefore, the larger schools are able to positively affect more students due to the increased CTE staff sizes and consequent greater support for faculty training and consultation, particularly training and support for UDL.

The data reveals an opportunity for CTEs to increase their capacity by increasing the volume of part-time staff. As stated in hypothesis 1, increased man-hours can equate to an increased ability to produce more training, and importantly, training beyond elementary support. Further, having increased part-time staff will allow directors to delegate the routine tasks of maintaining a CTE unit. Extricating directors from day-to-day operations would allow them to apply themselves to more esoteric endeavors, such as developing competencies and training in UDL.

This research revealed that CTE staff composition does play a role in a CTE's support for UDL. Haras et al. (2017) research indicates that the evolution of CTEs has raised their importance in providing faculty with the training and support that they need to advance institutional goals resulting in improved student learning. As noted in hypothesis 1, a CTE's staff composition is an important factor in their support for UDL.

As positive as these findings are for larger institutions, it does expose the fact that smaller schools do not have CTEs that are staffed beyond a director, often a part-time position, and have perhaps one or likely no other CTE staff employees. This leaves the smaller schools in disadvantaged positions to adequately support faculty in UDL, or any other faculty professional development initiatives. Compounding this negative situation is the fact that there are a great many small postsecondary institutions in the Commonwealth of Pennsylvania, most of which do not have dedicated, stand-alone CTE units. Faculty development is typically the domain of faculty committees headed by professors that are appointed temporarily or an individual, often in the Provost office, that serves in the faculty development role part-time, i.e., this responsibility is one of many other responsibilities associated with the position. All of this leads to an underserved student population with regards to UDL implementation. Heightening the awareness of the benefits of UDL in an attempt to garner increased integration into faculty development programs would be very beneficial for all students, particularly students with disabilities.

Hypothesis 3 Results and Findings

Hypothesis 3: The level of use of technology by university Centers for Teaching Excellence impacts the degree of support of Universal Design for Learning by Centers for Teaching Excellence.

Examining the CTEs' understanding and use of technology provided perhaps the most heartening findings in the research with regards to support for UDL and students with disabilities. The analysis revealed that CTEs have kept current with advances in technology, which translated to support for UDL, and proved hypothesis 3 to be true. This is important because Universal Design for Learning became feasible due to advances in, and application of, technologies that facilitate faculty to present curriculum and learning materials that are flexible and accessible (McGuire et al., 2006). CTE's that understand and effectively use technology are better positioned to support UDL through faculty training and assistance. Advances in technology are ongoing, with new technology possibilities emerging frequently. Considering the fact that CTEs are one of the primary resources for faculty to acquire understanding and training in technology, it is critical that CTE staff maintain their currency with new technologies. Further, CTEs must understand how to best leverage these emerging technologies in course activities and content to optimize student access and the overall student experience. One somewhat disappointing finding was that the number of CTE synchronous training sessions offered was not statistically significant in the analysis. Synchronous training, e.g., videoconferencing, desktop sharing, and text chat, can be an effective delivery approach that enables faculty to more fully engage, e.g., ask questions, with CTE training staff. It can also be an effective method, e.g., increased access from remote locations and greater

flexibility (Zydney, McKimmy, Lindberg & Schmidt, 2019), for faculty to deliver their own course content to their students. It is recommended that CTE staff consider increasing the number of synchronous training sessions that they offer to faculty.

The research further uncovered additional positive findings. Not only were the CTEs keeping abreast of current technologies in general, they were also retaining currency with UDL technologies in particular. Naturally having CTE staff that are already knowledgeable in UDL technologies will reduce the learning curve barriers in developing UDL training for faculty. Technology savvy CTE staff members are also more effective in supporting faculty in designing new courses with UDL and retrofitting existing courses infused with UDL. Further, CTE staffs that understand the fundamentals of UDL are already aware of the value and benefits that the framework provides. This leads to a CTE staff predisposed to providing UDL training and support for faculty. Faculty professional development experiences, in this instance from CTEs, positively impacts their willingness to provide accommodations for students (Bigaj et al., 1999; Lombardi et al., 2015). Positive experiences with CTEs resulting in faculty embracing UDL translates into broader support for students with disabilities.

Additionally, the research revealed that CTEs were effectively using technology to not only aid faculty with UDL implementation initiatives, but also to effectively deliver the training sessions to faculty. By modeling the hoped-for behavior in faculty, CTEs can set a good example for faculty and indoctrinate them in the application of technology in a pedagogical setting. Such an approach allows faculty to experience the effective use of technology from a 'student's' perspective. This 'teaching the teacher' technique may lower anxiety levels to new technology proficiency acquisition, which can

often be daunting and complicated. It is recommended that CTE staff, or any party charged with the responsibility to provide faculty training, be vigilant in pursuing their personal professional development in technology competencies.

Hypothesis 4 Results and Findings

Hypothesis 4: The level of education of directors of Centers for Teaching Excellence influences the level of support for Universal Design for Learning provided by the Center for Teaching Excellence.

Examining CTE directors' level of education, this research revealed important findings about the type of education and training that impacted the directors' CTE units' support for UDL. Directors' highest degree level, i.e., bachelor's, master's, doctorate was a significant factor. About two thirds of the directors obtained doctoral degrees, with the balance having obtained master's degrees with one director obtaining a bachelor's degree. The finding that more advanced degrees equated to more UDL support in the centers that these directors manage is an encouraging finding because the majority of directors in the research do have doctoral degrees. That said, the remaining one third of directors with the highest academic achievement level of master's degree does constitute a meaningful volume of CTE directors in the Commonwealth. These findings suggest that university administrators wanting to more fully support UDL in their institutions may consider making achievement of a doctoral degree a requisite criterion for hiring CTE directors in their institutions. Alternatively, providing the means and encouragement for existing CTE directors, i.e., those that have already been hired into their position, to pursue doctoral degrees may be another solution.

As noted in the Directors of Centers for Teaching Excellence Demographics section, the CTE directors had limited exposure to courses that included content in either special education or UDL in any of their degree programs, i.e., bachelor's, master's, doctorate. Therefore, the research examined additional characteristics of CTE directors' education beyond formal degree programs. Two additional factors that positively impacted a CTE's support for UDL, with regards to the directors' education, were the directors' recent, i.e., within the past three years, training in UDL and the directors' self-assessment of their UDL knowledge. This is a particularly compelling finding because it revealed that support for UDL in a CTE, and subsequently in a university, can be positively influenced by a director's professional development. University administrators that have CTE directors in place and hope to increase their institution's support for UDL can achieve their goal by providing the time and opportunities for directors to engage in professional development endeavors to increase their understanding of UDL. These professional development opportunities may take the form of: conferences, seminars, courses, subscriptions to UDL-related organizations and information repositories, and the like. The finding that the majority of directors, 62.7%, assessed their knowledge of UDL as either 'good' or 'excellent' supports the assertion that these directors are obtaining UDL knowledge from sources other than from their formal, postsecondary education.

In addition to improving the knowledge of UDL for existing CTE directors after they have completed their postsecondary degrees, universities can improve the programs that their institutions, e.g., university schools of education, offer to their bachelor's, master's, and doctoral students. Schools can infuse the courses that they offer with more content on special education and UDL and offer more courses that focus on these issues

specifically. By doing this, students that graduate from their programs, who may become professors or CTE directors, will have a greater understanding of the benefits and implementation practices of UDL.

Lieberman (2018) noted that the director of Boston's Center for Teaching Excellence, John Rakestraw, asserted that helping faculty improve pedagogy is central to his institution's commitment to faculty. Centers for Teaching Excellence are instrumental in training and supporting university faculty in the use of UDL. CTE directors' education, be it from formal degree programs or professional training, can have a positive impact on the support provided by the CTE units under their charge. Considering all of this information, hypothesis 4 is found to be true.

Hypothesis 5 Results and Findings

Hypothesis 5: Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities.

Examining the mission statements of the participating universities revealed that there was a statically significant relationship between a schools' espoused support for students with disabilities in their mission statements and schools' actual support for students with disabilities as measured by the CTEs' faculty consultation and support of UDL. This analysis substantiates hypothesis 5 as true. This finding was encouraging but not surprising. What was surprising and discouraging was only six of the schools in the sample stated support for students with disabilities in their mission statements. All six of

these schools were public institutions. As noted previously, CTEs in public schools are generally better funded and have more staff than CTEs in private schools, according to CTE directors. The opportunity exists for private schools to better position their institutions from a public perception perspective to integrate language about support for students with disabilities into their mission statements. Naturally it is hoped that the public schools will also follow through with these stated sentiments by actually encouraging faculty to design courses with support and access for students with disabilities.

Considering the number of students in the United States with disabilities in postsecondary schools is increasing (Newman, 2005) one would hope that university administrations would understand this trend and reference it in their public-facing statements and marketing materials. Underpinning the importance of publicly recognizing support for the growth of students with disabilities in postsecondary education is the fact that fastest growing and largest sub-population of students with disabilities are students with undisclosed disabilities, typically cognitive and learning disabilities, that comprise 60% of the total college student population (Wagner et al., 2005). All students, including students with undisclosed disabilities, would also benefit from UDL implementation (Orr et al., 2009). Universities can also heighten faculty awareness and understanding of the needs for students with disabilities through internal documentation and literature, e.g., new faculty orientation information and faculty handbooks. In so doing, a positive cycle of change may occur, i.e., faculty more fully understand needs of students with disabilities, faculty become more aware of the resources available to them to address the need, (i.e., CTE units' UDL training and

materials), requests for CTE UDL training and support increase, CTE UDL competencies and training increase, a greater volume of students have greater access to course content and activities, resulting in enhanced opportunities for student academic success.

It would be beneficial, and is recommended, for institutions to publically state their support for students with disabilities to affirm to this population that their needs will be considered and addressed. In so doing, these students will feel recognized and welcomed in an academic environment that is accessible and accommodating for the broadest student population possible.

Implications for Future Research

Implications for future research include quantitative and qualitative research to further investigate administrative support for UDL, Centers for Teaching Excellence directors' knowledge acquisition of Universal Design for Learning, and postsecondary institutions' stated support for persons with disabilities. Future studies may expand the collection of data on administrative support to include university administrators. Studies to quantify the volume of UDL and special education content covered in baccalaureate, graduate, and doctoral courses taken by CTE directors, as well as to identify other means of UDL knowledge acquisition may be accomplished through more open-ended questioning and/or qualitative research. Future studies may include the expansion of mission statement evaluation to also include the vision statements of universities. In conclusion, future research is needed to discover the means by which CTE directors obtain knowledge on Universal Design for Learning.

Summary and Conclusions

It is evident, based on the numerous past research studies presented in this paper, that application of UDL as a pedagogical framework increases access to curriculum for all students, particularly students with disabilities. It has also been established that Centers for Teaching Excellence can play a critical role in improving postsecondary faculty teaching practices, including the understanding and application of UDL. For these reasons, this research focused on the issues that influence a CTE's support for UDL.

The number of students in the United States with disabilities in postsecondary schools is increasing (Rao et al., 2015). Providing greater access to curriculum via application of UDL principles significantly increases the likelihood of academic success for students with disabilities (Skinner, 2007), yet there was a need for more research, particularly in postsecondary education (Rose et al., 2006). Roberts et al. (2011) noted that discussion of UDL application in higher education courses is rare, and Moore et al. (2018) have stated that there is limited research in the utilization of UDL in higher education. This research provides insights into the characteristics of Centers for Teaching Excellence and the directors that manage these units to enable administrators to more effectively evaluate their centers, particularly with regards to support for Universal Design for Learning, and make improvements which in turn enhances opportunities for student academic success.

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Appendix A

IRB Protocol Summary Form

Duquesne University Institutional Review Board
Protocol Summary Form

An Investigation of Postsecondary Centers for Teaching Excellence Support for Universal Design for Learning.

Joseph C. Kush, Advisor

ABSTRACT

1. Statement of the research question

This study is designed to examine the relationship between school characteristics and demographics of the directors of Centers for Teaching Excellence in postsecondary educational institutions with the level of support and training provided to faculty for Universal Design for Learning (UDL).

Question 1: Do Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration?

Question 1 Hypothesis: Centers for Teaching Excellence that are well supported by university administration provide greater support for Universal Design for Learning than Centers for Teaching Excellence that are not well supported by university administration.

Question 2: Do university Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence?

Question 2 Hypothesis: University Centers for Teaching Excellence characteristics and staff composition influence the level of support for Universal Design for Learning by Centers for Teaching Excellence.

Question 3: Does the level of use of technology by university Centers for Teaching Excellence impact the degree of support of Universal Design for Learning by Centers for Teaching Excellence?

Question 3 Hypothesis: The level of use of technology by university Centers for Teaching Excellence impacts the degree of support of Universal Design for Learning by Centers for Teaching Excellence.

Question 4: Does the level of education of directors of Centers for Teaching Excellence influence the level of support for Universal Design for Learning provided by the Center for Teaching Excellence?

Question 4 Hypothesis: The level of education of directors of Centers for Teaching Excellence influences the level of support for Universal Design for Learning provided by the Center for Teaching Excellence.

Question 5: Do Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities?

Question 5 Hypothesis: Centers for Teaching Excellence at universities with mission statements that espouse support for people with disabilities provide greater support for Universal Design for Learning than universities that have mission statements that do not espouse support for people with disabilities.

2. Purpose and significance of the study

This study is intended to reveal the level of integration of Universal Design for Learning in postsecondary education institutes Centers for Teaching Excellence or equivalents in the Commonwealth of Pennsylvania. Universal Design for Learning applied to pedagogy is a framework that anticipates, proactively plans for, and addresses the needs of a broad range of diverse learners (McGuire, Scott & Shaw 2006) by presenting curriculum and materials that are flexible and accessible. UDL increases access to learning materials and activities and improves learning for all students, but students with disabilities in particular (Orr & Hammig, 2009). This is an important consideration because the number of students in the United States with disabilities in postsecondary schools is increasing, comprising nearly 11% of the overall student population (Rao, Edelen-Smith & Wailehua, 2015).

The results of the study will provide program directors, deans, and administrators with valuable information that can be used for self-evaluation of the faculty preparation training and support programs under their direct control and for comparison of other faculty preparation, development and support programs with the objective of influencing decision-makers to more fully integrate UDL principles into their training programs.

3. Research design and procedures

This proposed exploratory study will utilize a quantitative research method to gather data. Internet searches on postsecondary educational institutions' Centers for Teaching Excellence staff in the Commonwealth of Pennsylvania will be conducted to identify center directors and their contact information, e.g., email addresses. Participants will be informed of the survey and research project via an individual email sent to their work email address. Additional, reminder, emails will be sent to the participants encouraging them to complete the survey if they have not done so after a previous request(s). After the survey is closed, the survey data will be downloaded from the Qualtrics website for analysis. IBM SPSS (Statistical Package for the Social Sciences) will be used to analyze the data.

4. Instruments

An electronic online survey will be deployed using Duquesne's Qualtrics platform. The survey will be divided into the following sections: About the Institution,

Administrative Institutional Support for Faculty Development Unit, Faculty Development Unit Characteristics, Faculty Development Unit Use of Technology, Background of Faculty Development Unit Director (or Equivalent), Faculty Development Unit Support for Universal Design for Learning (UDL), and Faculty Interest in UDL (Appendix A). The survey will have fifty-four questions. The computer-based online survey will contain questions with answer option form fields consisting of radio buttons, single-select form fields, multi-select check-box form elements, and various five-point Likert scales with selection options, "Strongly Agree," "Agree," "Neutral," "Disagree," and "Strongly Disagree", or "Unimportant," "Slightly Important," "Moderately Important," "Important," and "Very Important", or "Very Poor," "Poor," "Fair," "Good," and "Excellent", or "Never," "Rarely," "Sometimes," "Often," and "Very Often". The consent to participate form will be presented first with an option to accept consent or not.

5. Sample selection and size

Participants will be approximately one hundred individuals that are directors, or other responsible persons, of Centers for Teaching Excellence in colleges and universities in the Commonwealth of Pennsylvania. The participants will be requested to provide information about: their institution, their institution's faculty support, and their current role, education, and background. The participants must be eighteen years of age or older. The sample is not a protected population.

6. Recruitment of subjects

Participants will be contacted and invited to participate in the study by an introduction email sent to each participant individually by the researcher. A second survey information email will contain a hyperlink to the online survey and provide details relating to informed consent. Participants will be informed that their decision to participate, or not, is completely at their discretion. An electronic consent form will be part of the online survey and precede the survey questions. The consent form will indicate their willingness to complete the online survey and that all data collected will maintain confidentiality and anonymity. The consent form will also indicate that participants must be 18 years of age or older to participate. Participants will be asked to give informed consent (Appendix B). Participants should be able to complete the online survey in approximately twelve minutes. Participants will be instructed that their participation is voluntary and that they may withdraw at any time.

Participants will be provided an option to engage in an incentive program. The incentive program will consist of a lottery for four $50 Amazon gift cards. The purpose of the incentive program is to encourage participation in the research study. Participants are under no obligation to engage in the incentive program. The researcher will assign and provide a random number to each participant via email. Only the researcher will have access to the codes that connect individual participant emails to each unique code number. Participants that elect to engage in the incentive program will input their code number into a text box form field on the survey.

An introduction to the study email will be sent to participants informing them of the research. A few days later a survey information email will be sent that will provide a hyperlink to the survey. One week after the survey information email, a reminder to complete the survey email will be sent. After an additional week, another reminder to

participate email will be sent. The purpose of the additional reminder to participate emails is to increase participation in the research.

7. Informed consent procedures

Opportunity to consent will be provided at the point of participation. Once the participant accesses the hyperlink, provided via the survey information email, they will be asked to provide informed consent before continuing to the data collection online survey. The informed consent information will be presented on the initial screen seen by the participant with the statement, 'By completing and submitting the survey you are voluntarily consenting to participate in this project'. A radio button labeled, 'I Agree' will follow this statement for the user to click on to provide consent. The participant must click the 'I Agree' radio button to gain access to the online survey, i.e., the survey questions for data collection. The informed consent form communicates that participation is voluntary and participants may withdrawal at any time and there will be no compensation nor penalty for participation or withdrawal. The consent form also provides the researcher's and Chair of the Duquesne University Institutional Review Board's contact information should the participant have any questions.

8. Collection of data and method of data analysis

The data collection will be explained to participants in the introduction email(s) and at the beginning of the online survey form. All information obtained from this research will be kept confidential. Data and analysis results will not be shared or made public in a way that indicates the identity of the participants; only aggregated data will be reported. The researcher will remove any information that may be used to identify individuals in the study final report. Statistical analyses may include descriptive statistics, e.g. mean, mode, range, standard deviation, correlational analyses, Cronbach alpha coefficient, and inferential statistics.

9. Emphasize issues relating to interactions with subjects and subjects' rights

Participants will be informed that they can choose to not participate, or can request to withdrawal from the study at any time. Contact information to do so will be provided. Participants can also simply ignore the requests and not participate. Participants can take the survey at any time while it is open.

Survey data will be collected and temporarily stored on the Qualtrics servers until the survey open period is complete. Qualtrics uses Transport Layer Security (TLS) encryption (also known as HTTPS) for all transmitted data. The survey will be protected via URL obscurity via complexity, i.e., URL will consist of complex string of alphanumeric characters. Qualtrics services are hosted by trusted data centers that are independently audited using the industry standard SSAE-16 method. Three-hundred controls based on the highly-regarded NIST 800-53 receive constant monitoring and periodic independent assessments. Qualtrics meets the general requirements set forth by many U.S. Federal requirements, including the FISMA Act of 2002 and meet or exceed the minimum requirements as outlined in FIPS Publication 200.

Once the open survey period is complete, the data will be downloaded from the Qualtrics server to the researcher's computer. The researcher's computer is located in an environment that is locked and secure, both physically and with software, e.g., firewall

and local logon user name and password protection. All data will be destroyed twenty-four months after the final statistical analyses are completed.

Appendix B

Informed Consent Form

DUQUESNE UNIVERSITY
600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

Duquesne University
Institutional Review Board
Protocol #2020/02/2
Initial Approval: 02/25/2020
Expires: 02/21/2023

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE: AN INVESTIGATION OF POSTSECONDARY CENTERS FOR TEACHING EXCELLENCE SUPPORT FOR UNIVERSAL DESIGN FOR LEARNING

INVESTIGATOR: David Adam McGeehan, Doctoral Candidate, School of Education, Duquesne University

ADVISOR: (if applicable) Joseph Kush, PhD. Professor, School of Education, Duquesne University

SOURCE OF SUPPORT: This study is being performed as partial fulfillment of the requirements for the doctoral degree in Instructional Technology at Duquesne University.

PURPOSE: You are being asked to participate in a research project that seeks to investigate the level of support for Universal Design for Learning in postsecondary educational institutions in the Commonwealth of Pennsylvania.

In order to qualify for participation, you must be:

- 18 years of age or older
- Responsible for faculty development at the institution where you are employed

PARTICIPANT PROCEDURES: To participate in this study, you will be asked to respond to questions about your background and your involvement in faculty development at your institution. You will also be asked about the level of support for Universal Design for Learning available to faculty at your institution. The process will take about 12 minutes.

These are the only requests that will be made of you.

RISKS AND BENEFITS: There are no risks greater than everyday life. While there may be no direct benefits to you, your association with this project will help myself and other researchers to better understand how to improve instruction.

COMPENSATION: There will be no compensation for participation in this study. Participants will be provided an option to engage in an incentive program. The incentive program will consist of a lottery for four $50 Amazon gift cards. The purpose of the incentive program is to encourage participation in the research study. Participants are under no obligation to engage in the incentive program.

Participation in the project will require no monetary cost to you.

CONFIDENTIALITY: Your participation in this study and any personal information that you provide will be kept confidential at all times and to every extent possible.

Your name will never appear on any survey or research instrument. All electronic forms will be kept secure. Your responses will only appear in statistical data summaries. The online survey data will be submitted to a secure server maintained by Qualtrics. Once the survey is closed, the data will be downloaded from the Qualtrics server to a secure computer for statistical analysis. One year after the research is complete, all data will be destroyed. At no time will tracking software be used or IP addresses obtained.

RIGHT TO WITHDRAW: You are under no obligation to participate in this study. You are free to withdraw your consent to participate at any time by clicking the “exit” button or closing this window.

SUMMARY OF RESULTS: A summary of the results of this research will be supplied to you, at no cost, upon request.

VOLUNTARY CONSENT:

I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have questions about my participation in this study, I may call David McGeehan. Should I have questions regarding protection of human subject issues, I may call Dr. David Delmonico, Chair of the Duquesne University Institutional Review Board, at 412.396.4032.

Appendix C

Online Survey Content

Explanatory copy in italics will not be present on the final survey.

Survey Content

(Introduction statement copy)
Welcome to the faculty development unit support of Universal Design for Learning (UDL) survey. The purpose of this study is to identify factors impacting institutional support for UDL. All information collected is anonymous and confidential.
The survey will take about twelve minutes to complete.

By completing and submitting the survey you are voluntarily consenting to participate in this project.

Radio button selection option:
I Agree

View Informed Consent information. *('Informed Consent' text is a hyperlink to a PDF document of the Consent to Participate Information)*

If you would like to be eligible to win one of the four $50 gift cards, insert your numeric code (provided in your invitation to participate email).
(Open text input box)

(Statement copy)
Universal Design for Learning (UDL) Definition
UDL is the design of instructional materials and activities that meets the needs of a diverse learner population with differing abilities, particularly students with disabilities. UDL is achieved by developing inclusive teaching practices in instructional design with flexible curricular materials and activities to reduce barriers and improve access to curriculum.

About Your Institution
(Section introduction statement copy)
This section collects information about the institution/university where you currently work.

Is your institution public or private?

Radio button selection options:
Public
Private

Is your institution for-profit or non-profit?

Radio button selection options:
For-profit

Non-profit

What is your institution's current student enrollment, i.e., all students, undergraduate and graduate?

Dropdown menu selection options:

Less than 1,000
1,000 to 1,999
2,000 to 2,999
3,000 to 3,999
4,000 to 4,999
5,000 to 5,999
6,000 to 6,999
7,000 to 7,999
8,000 to 8,999
9,000 to 9,999
10,000 or more

What percentage of your institution's students, would you estimate, are students with disabilities?

Dropdown menu selection options:

Less than 1%
1% to 5%
6% to 10%
11% to 15%
16% to 20%
21% to 25%
26% or more

How many **full-time faculty**, not including adjuncts, would you estimate, are at your institution?

Dropdown menu selection options:

Less than 50
50 to 99
100 to 149
150 to 199
200 or more

How many **adjunct faculty**, would you estimate, are at your institution?

Dropdown menu selection options:

Less than 20
20 to 39
40 to 59
60 to 79
80 to 99
100 or more

Administrative Institutional Support for Faculty Development Unit
(Section introduction statement copy)
This section collects information about the administrative support provided to your faculty development unit or equivalent. Your institution's faculty development unit may have a different name, e.g., Center for Teaching Excellence, Faculty Center for Teaching and Learning, Center for Faculty Professional Development, or individuals or units within the provost office responsible for faculty profession development.

In Qualtrics, at the beginning of the page put, Rate your level of agreement with the following statement,

'I believe that my institution's faculty development unit is **generally well supported by the university administration**.'

Likert scale selection options:
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'I believe that my institution's faculty development unit is **adequately funded**.'

Likert scale selection options:
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'I believe that my institution's faculty development unit is **adequately staffed**.'

Likert scale selection options:
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

In Qualtrics, at the beginning of the page put, Rate your level of agreement with the following statement,
'I believe that my university's administration encourages faculty to **participate in faculty development unit training in general.**'

Likert scale selection options:
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

‘I believe that my university’s administration encourages faculty to **participate in faculty development unit in UDL training.**’

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

‘I believe that my university’s administration encourages faculty to **incorporate UDL into their courses**.’

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

‘I believe that my university’s administration **understands the legal considerations** to provide access to curricula for students with disabilities.’

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

How would you rate the level of importance that you feel the university administration places upon,

- Faculty development training in general

  Likert scale selection options:

  Unimportant
  Slightly Important
  Moderately Important
  Important
  Very Important

- Support of students with disabilities

  Likert scale selection options:

  Unimportant
  Slightly Important
  Moderately Important
  Important
  Very Important

- Integration of UDL principles in course curricula
    Likert scale selection options:
        Unimportant
        Slightly Important
        Moderately Important
        Important
        Very Important

Faculty Development Unit Characteristics
(Section introduction statement copy)
This section collects information about your faculty development unit (or equivalent). Your institution's faculty development unit may have a different name, e.g., Center for Teaching Excellence, Faculty Center for Teaching and Learning, Center for Faculty Professional Development, or individuals or units within the provost office responsible for faculty profession development.

What type of faculty development support structure does your institution presently have in place?
    Dropdown menu selection options:
        Stand-alone unit/department
        Faculty committee
        Housed in administrative office, e.g., provost
        Other

How long has your faculty development unit been in existence?
    Dropdown menu selection options:
        Less than 1 year
        1 to 5 years
        6 to 10 years
        11 to 15 years
        16 to 20 years
        21 to 25 years
        26 to 30 years
        31 years or more

Is the faculty development unit director (or equivalent) role a full-time position?
    Radio button selection options:
        Yes
        No

How many **full-time persons** work in your faculty development unit?
    Dropdown menu selection options:
        0
        1
        2
        3

4
5
6
7
8
9
10 or more

How many **part-time persons** work in your faculty development unit?

Dropdown menu selection options:

0
1
2
3
4
5
6
7
8
9
10 or more

What are the primary training responsibilities of your faculty development unit (check all that apply)?

Multi-select check boxes selection options:

Face-to-face courses
Online/hybrid courses
Instructional design
Assessment strategy and design
Syllabus design
Technology skills
Library/research skills
Accommodation for students with disabilities
Institutional administration systems
Faculty peer review
Faculty tenure pursuit

On average, how many **synchronous, i.e.,** occurring at same time, live, (face-to-face and/or via computer, e.g., webinar, Zoom) training sessions does your faculty development unit offer per year?

Dropdown menu selection options:

0 to 5
6 to 10
11 to 15
16 to 20
21 to 25

26 to 30
31 or more

On average, how many **asynchronous, i.e.,** not occurring at same time, training sessions does your faculty development unit offer per year?

Dropdown menu selection options:

0 to 5
6 to 10
11 to 15
16 to 20
21 to 25
26 to 30
31 or more

Faculty Development Unit Use of Technology

(Section introduction statement copy)

Your institution's faculty development unit may have a different name, e.g., Center for Teaching Excellence, Faculty Center for Teaching and Learning, Center for Faculty Professional Development, or individuals or units within the provost office responsible for faculty profession development.

Check all technologies that your faculty development unit staff use in developing and delivering the **training sessions** that you provide to the university.

Multi-select check boxes selection options

PowerPoint
Prezi
Haiku Deck
Powtoon
Animoto
Google Slides
Keynote
Online training participant feedback
Online signup calendar
Video
Multimedia
Online/mobile polling, e.g., Nearpod

Check all technologies that your faculty development unit staff use in developing and delivering the **training materials** that you provide.

Multi-select check boxes selection options

Word documents
PDF documents
Podcasts
Vodcasts (videos)
Online self-paced modules
Gamified learning

Simulations
Virtual learning environments
Twitter
Facebook
Instagram
Online chat
Online discussion forums
Embedded formative assessment, e.g., Quizlets
Electronic flashcards

In Qualtrics, at the beginning of the page put, Rate your level of agreement with the following statement,

'My faculty development unit leverages current technologies to effectively present training sessions **in general**.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'My faculty development unit leverages current technologies to effectively present training sessions **for UDL training in particular**.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

Does your faculty development unit provide technical training in the use of software and/or hardware?

Radio button selection options:

Yes
No

Background of Faculty Development Unit Director (or Equivalent)

(Section introduction statement copy)

This section collects information about your background. For purposes of this study, the term Director will be defined as, an individual with the title of director or equivalent for the university's Center for Teaching Excellence or similar department responsible for faculty professional development.

How long have you been serving **in your current faculty development role**?

Dropdown menu selection options:

1 year or less
2 to 3 years
4 to 5 years
6 to 10 years
11 to 20 years
21 years or more

How long have you been in a role responsible for faculty development **throughout your career?**

Dropdown menu selection options:

1 year or less
2 to 3 years
4 to 5 years
6 to 10 years
11 to 20 years
21 years or more

What is your highest level of education? *(depending on how this question is answered, the appropriate below next six questions will be hidden or revealed)*

Dropdown menu selection options:

Bachelor's degree
Master's degree
Doctoral degree

In your **bachelor's degree**, how many courses included information on **special education?**

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

In your **bachelor's degree**, how many courses included information **on UDL**?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

In your **master's degree**, how many courses included information on **special education**?

Dropdown menu selection options:

0
1 to 2
3 to 4

5 to 6
7 or more

In your **master's degree**, how many courses included information **on UDL**?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

In your **doctoral degree**, how many courses included information on **special education**?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

In your **doctoral degree**, how many courses included information **on UDL**?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

How would you rate your knowledge of UDL?

Likert scale selection options:

Very Poor
Poor
Fair
Good
Excellent

In the past three years, how often have you received UDL training, e.g., webinars, conferences, research?

Likert scale selection options:

Never
Rarely
Sometimes
Often
Very Often

How important do you feel it is for faculty to integrate UDL principles into their courses?

Likert scale selection options:

Unimportant
Slightly Important
Moderately Important
Important
Very Important

Faculty Development Unit Support for Universal Design for Learning (UDL)
(Section introduction statement copy)
This section collects information about your faculty development unit's involvement with Universal Design for Learning. Your institution's faculty development unit may have a different name, e.g., Center for Teaching Excellence, Faculty Center for Teaching and Learning, Center for Faculty Professional Development, or individuals or units within the provost office responsible for faculty profession development.

How many training programs that **include mention of UDL** has your institution's faculty development unit presented in the past three years?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

How many training programs that **focus exclusively on UDL** has your institution's faculty development unit presented in the past three years?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

How many training programs that **include mention of UDL do you have planned for the upcoming year**?

Dropdown menu selection options:

0
1 to 2
3 to 4
5 to 6
7 or more

Does your faculty development unit offer ongoing support to faculty while they are in the process of integrating UDL principles into new or existing course designs?

Radio button selection options:

Yes
No

Do you provide individual consultation with instructors for implementing UDL in their courses?

Radio button selection options:

Yes
No

Does your faculty development unit include information on UDL in new faculty orientation?

Radio button selection options:

Yes
No

Does your faculty development unit include information on UDL-related legislation in new faculty orientation?

Radio button selection options:

Yes
No

In Qualtrics, at the beginning of the page copy, Rate your agreement with the following statement,
'My institution's faculty development unit staff has sufficient understanding of UDL principles to effectively support faculty.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'My institution's faculty development unit provides sufficient training sessions and materials available for faculty on the subject of UDL.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'The faculty across my institution's campus are adequately knowledgeable in UDL.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

Faculty Interest in Universal Design for Learning (UDL)
(Introduction statement copy is not needed for this section)

In Qualtrics, at the beginning of the page copy, Rate your agreement with the following statement,
'The faculty at my institution are adequately trained in providing access to curricula for students with disabilities in face-to-face courses.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

'The faculty at my institution are adequately trained in providing access to curricula for students with disabilities in online and hybrid courses.'

Likert scale selection options:

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

How many times have faculty requested help with UDL from your institution's faculty development unit in the past three years?

Dropdown menu selection options:

0
1 to 3
4 to 6
7 to 9
10 or more

How many times have faculty requested help with accommodations for students with disabilities from your institution's faculty development unit in the past three years?

Dropdown menu selection options:

0
1 to 3
4 to 6
7 to 9
10 or more

End of Survey Statement
(Conclusion statement copy that appears after the submit button is clicked)
Thank You!
You have successfully completed the survey.

Appendix D

Recruitment Emails

Explanatory copy in italics will not be present on the final emails sent to participants.

Introduction Email
Email Subject Line: Doctoral Candidate Research - Effectively Support Faculty in the Use of Universal Design for Learning

Dear IndividualRecipientNameHere, *(This copy placeholder will be replaced with each individual's name).*

I am a doctoral candidate at Duquesne University. I am conducting research on the use of Universal Design for Learning (UDL) in postsecondary education.

Your unique expertise would be of tremendous value to my research.

The purpose of the study is to identify factors that impact university faculty development center's and director's efforts to help teachers apply Universal Design for Learning (UDL) to courses. UDL is an instructional design framework that optimizes curriculum access for all students, particularly those with disabilities.

By participating in the study and completing the brief survey, you will be contributing valuable information to the body of knowledge on UDL, which will ultimately help all students.

You will also have an opportunity to possibly receive one of four $50 Amazon gift cards.

Soon, you will receive an email with a link to the survey.

Your participation is greatly appreciated!

Sincerely,
David McGeehan
Doctoral Candidate, Duquesne University
mcgeehand1@duq.edu

Survey Information Email
Email Subject Line: Doctoral Candidate Research - Effectively Support Faculty in the Use of Universal Design for Learning – The Survey Is Here!

Dear IndividualRecipientNameHere, *(This copy placeholder will be replaced with each individual's name).*

A few days ago you received an email announcing an important research study about Universal Design for Learning.

I am a doctoral candidate at Duquesne University. I am conducting research on the use of Universal Design for Learning (UDL) in postsecondary education.

Your unique expertise would be of tremendous value to my research.

The purpose of the study is to identify factors that impact university faculty development center's and director's efforts to help teachers apply Universal Design for Learning (UDL) to courses. UDL is an instructional design framework that optimizes curriculum access for all students, particularly those with disabilities.

By participating in the study and completing the brief survey, you will be contributing valuable information to the body of knowledge on UDL, which will ultimately help all students.

Take the survey now. *(This copy, or a button, will be a link to the survey).*
The informed consent information is available on the survey.

You will also have an opportunity to possibly receive one of four $50 Amazon gift cards using this numeric code, IndividualNumericCodeHere *(This copy placeholder will be replaced with each individual's unique numeric code. The unique code is for voluntary entry into lottery to possibly win one of the gift cards).*

Your participation is greatly appreciated!

Sincerely,
David McGeehan
Doctoral Candidate, Duquesne University
mcgeehand1@duq.edu

To opt-out of the study, reply to this email with intent to do so.

1st Email Reminder Request to Complete Survey
Email Subject Line: Doctoral Candidate Research - Effectively Support Faculty in the Use of Universal Design for Learning – The Survey Is Ready for You

Dear IndividualRecipientNameHere, *(This copy placeholder will be replaced with each individual's name).*

A week ago you received an email inviting you to participate in an important research study about Universal Design for Learning. If you have already taken the survey, thank you, and please disregard this email.

I am a doctoral candidate at Duquesne University. I am conducting research on the use of Universal Design for Learning (UDL) in postsecondary education.

Your unique expertise would be of tremendous value to my research.

The purpose of the study is to identify factors that impact university faculty development center's and director's efforts to help teachers apply Universal Design for Learning (UDL) to courses. UDL is an instructional design framework that optimizes curriculum access for all students, particularly those with disabilities.

By participating in the study and completing the brief survey, you will be contributing valuable information to the body of knowledge on UDL, which will ultimately help all students.

Take the survey now. *(This copy, or a button, will be a link to the survey).*

You will also have an opportunity to possibly receive one of four $50 Amazon gift cards using this numeric code, IndividualNumericCodeHere *(This copy placeholder will be replaced with each individual's unique numeric code. The unique code is for voluntary entry into lottery to possibly win one of the gift cards).*

Your participation is greatly appreciated!

Sincerely,
David McGeehan
Doctoral Candidate, Duquesne University
mcgeehand1@duq.edu

To opt-out of the study, reply to this email with intent to do so.

2nd Email Reminder Request to Complete Survey
Email Subject Line: Doctoral Candidate Research - Effectively Support Faculty in the Use of Universal Design for Learning – Final Chance to Participate

Dear IndividualRecipientNameHere, *(This copy placeholder will be replaced with each individual's name).*

A week ago you received an email inviting you to participate in an important research study about Universal Design for Learning. If you have already taken the survey, thank you, and please disregard this email.

I am a doctoral candidate at Duquesne University. I am conducting research on the use of Universal Design for Learning (UDL) in postsecondary education.

Your unique expertise would be of tremendous value to my research.

The purpose of the study is to identify factors that impact university faculty development center's and director's efforts to help teachers apply Universal Design for Learning (UDL) to courses. UDL is an instructional design framework that optimizes curriculum access for all students, particularly those with disabilities.

By participating in the study and completing the brief survey, you will be contributing valuable information to the body of knowledge on UDL, which will ultimately help all students.

Take the survey now. *(This copy, or a button, will be a link to the survey).*

You will also have an opportunity to possibly receive one of four $50 Amazon gift cards using this numeric code, IndividualNumericCodeHere *(This copy placeholder will be replaced with each individual's unique numeric code. The unique code is for voluntary entry into lottery to possibly win one of the gift cards).*

Your participation is greatly appreciated!

Sincerely,
David McGeehan
Doctoral Candidate, Duquesne University
mcgeehand1@duq.edu

To opt-out of the study, reply to this email with intent to do so.

Appendix E

Relevant Organizations

Association on Higher Education and Disability (AHEAD)

8015 West Kenton Circle, Suite 230

Huntersville, NC 28078

(704) 947-7779

https://www.ahead.org

Center for Applied Special Technology (CAST)

200 Harvard Mill Square, Suite 210

Wakefield, MA 01880

(781) 245-2212

cast@cast.org

http://www.cast.org

The Center for Universal Design in Education

DO-IT

Sheryl Burgstahler, Ph.D., Director

University of Washington, Box 354842

Seattle, WA 98195-4842

(206) 685-3648

doit@uw.edu

http://www.washington.edu/doit/

National Center for Accessible Media (NCAM)

WGBH Educational Foundation

1 Guest Street Boston, MA 02135

(617) 300-3300

http://main.wgbh.org/wgbh/pages/ncam/

The National Center for Educational Outcomes

At University of Minnesota

Sheryl Lazarus, Ph.D., Director

207 Pattee Hall, 150 Pillsbury Drive SE

Minneapolis, MN 55455

(612) 626-1530

nceo@umn.edu

https://nceo.info/about

Trace Research and Development Center

College of Information Studies, University of Maryland

Room 2117 Hornbake Building, South Wing

4130 Campus Drive

College Park, MD 20742

(301) 405-2043

trace-info@umd.edu

http://trace.umd.edu

Open Learning and Educational Support

University of Guelph

Johnston Hall, Room 160

Guelph, ON N1G 2W1

Canada

(519) 767-5000

https://opened.uoguelph.ca/student-resources/universal-instructional-design

Appendix F

Principles of Universal Design

Principle One: Equitable Use: The design is useful and marketable to people with diverse abilities.

1 a. Provide the same means of use for all users: identical whenever possible; equivalent when not.

1 b. Mold segregating or stigmatizing any users.

1c. Provisions for privacy, security, and safety should be equally available to all users.

ld. Make the design appealing to all users.

Principle Two: Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

2a. Provide choice in methods of use.

2b. Accommodate right- or left-handed access and use.

2c. Facilitate the user's accuracy and precision.

2d. Provide adaptability to the user's pace.

Principle Three: Simple and Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

3a. Eliminate unnecessary complexity.

3b. Be consistent with user expectations and intuition.

3c. Accommodate a wide range of literacy and language skills.

3d. Arrange information consistent with its importance.

3e. Provide effective prompting and feedback during and after task completion.

Principle Four: Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.

4b. Provide adequate contrast between essential information and its surroundings.

4c. Maximize "legibility" of essential information.

4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).

4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Principle Five: Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.

5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.

5b. Provide warnings of hazards and errors.

5c. Provide fail safe features.5d. Discourage unconscious action in tasks that require vigilance.

Principle Six: Low Physical Effort: The design can be used efficiently and comfortably and with a minimum of fatigue.

6a. Allow user to maintain a neutral body position.

6b. Use reasonable operating forces.6c. Minimize repetitive actions.

6d. Minimize sustained physical effort.

Principle Seven: Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

7a. Provide a clear line of sight to important elements for any seated or standing user.

7b. Make reach to all components comfortable for any seated or standing user.

7c. Accommodate variations in hand and grip size.

7d. Provide adequate space for the use of assistive devices or personal assistance.

Source: The Center for Universal Design, North Carolina State University (1997). (Thompson, Johnstone & Thurlow, 2002).

Appendix G

Designing Material to Be Accessible to Braille Text Converters

Braille as an accommodation will be facilitated if the following features are avoided in the design of the test:

- Use of construct irrelevant graphs or pictures
- Use of vertical or diagonal text
- Keys and legends located to the left or bottom of the item, where they are more difficult to locate in Braille formats
- Items that depend on reading of graphic representations (such as blueprints, furniture in a room) that do not also have verbal/textual descriptions that can be translated into Braille
- Items that include distracting or purely decorative pictures, which draw attention away from the item content

These features are also relevant for students with visual disabilities who do not use Braille, and possibly also for many students for whom visual features may create distractions (Thompson, Johnstone & Thurlow, 2002).

Appendix H

Recommended Readability Guidelines

- Use simple, clear, commonly used words, eliminating any unnecessary words. When technical terms must be used, they should be clearly defined. Compound complex sentences should be broken down into several short sentences, stating the most important ideas first.
- Introduce one idea, fact, or process at a time; then develop the ideas logically. All noun-pronoun relationships should be made clear. When time and setting are important to the sentence, place them at the beginning of the sentence.
- When presenting instructions, sequence steps in the exact order of occurrence.
- If processes are being described, they should be simply illustrated, labeled, and placed close to the text they support.

(Thompson, Johnstone & Thurlow, 2002)