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Supporting Students with Disabilities Entering the Science, Technology, Engineering, and Mathematics Field Disciplines

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ABSTRACT

Extensive research exists on female, African American, and Hispanic students pursuing Science, Technology, Engineering and Mathematics (STEM) field disciplines. However, little research evaluates students with disabilities and career decision-making relating to STEM field disciplines. This study explored the career decision-making experiences and self-efficacy for students with disabilities.

The purpose of this research study was to document experiences and perceptions of students with disabilities who pursue, and may consider pursuing, careers in the STEM field disciplines by exploring the career decision-making self-efficacy of students with disabilities. This study documented the level of influence that the students with disabilities had or may not have had encountered from parents, friends, advisors, counselors, and instructors as they managed their decision-making choice relating to their academic major/career in the STEM or non-STEM field disciplines.

A total of 85 respondents of approximately 340 students with disabilities at one Midwestern public university completed a quantitatively designed survey instrument. The Career Decision-Making Self-Efficacy Scale-Short Form by Betz and Hackett was the instrument used, and additional questions were included in the survey. Data analysis included descriptive statistics and analysis of variance.

Based upon the results, college students with disabilities are not currently being influenced by individuals and groups of individuals to pursue the STEM field disciplines. This is a cohort of individuals who can be marketed to increase enrollment in STEM programs at academic institutions.

This research further found that gender differences at the institution under study did not affect the career decision-making self-efficacy scores. The men did not score any higher in confidence in career decision-making than the women.

Disability type did not significantly affect the relationship between the Career Decision-Making Self-Efficacy Total Scores or college major choice. Of the three disability types represented more frequently, the Mental Health disability was found to be a growing disability at the institution under study.

This research was found to be beneficial in the documentation of specific levels of influence perceived by students with disabilities from parents, friends, advisors, counselors, and instructors that related to their career decision-making and academic major choices.

Key words: students with disabilities, self-efficacy, career decision-making self-efficacy, STEM.

DEDICATION

I am lovingly dedicating this dissertation to my parents Rose Marie and John Dishauzi. They have been instrumental in the success in my life. I am blessed to have parents that know the value of an education.

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When it came time to develop a dissertation research project, I was instructed to choose an area that I would be passionate about due to the time and commitment that the project would take to complete. I presented to my advisor and committee chairperson, Dr. Shawn Woodhouse, a very challenging project that others felt could not be accomplished. Through her wisdom, she knew that there was a way to design the research project to be able to attain approval and eventually completion of the project. I would like to express my gratitude to Dr. Shawn Woodhouse in being a tremendous mentor. With the exposure to her knowledge and expertise, I catch myself pausing, hearing her perspective and advice as part of my everyday internal dialogue. Her guidance has impacted my growth as a person and my professional development, which has benefited my colleagues, students and my involvement with professional organizations in and outside of the field of Education. With her support and encouragement, I have gained an enormous amount of confidence to take on any challenge that may come to me in the Education field and in any other future endeavor in my life.

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CHAPTER ONE

INTRODUCTION

Careers in the fields of Science, Technology, Engineering, and Mathematics (STEM) are vital for individuals to explore in this 21st century. Why is a Science, Technology, Engineering or Mathematics discipline important in today's world? One major reason provided by the U.S. Department of Labor indicates that "[w]orkforce projections for 2014… show that 15 of the 20 fastest growing occupations require significant science or mathematics training to successfully compete for a job" (Jones, 2008, p.2). The U.S. Bureau of Labor Statistics has revealed that even though there are occupations that require a significant base of knowledge in the STEM fields fewer students are majoring in those fields (Jones, 2008). According to Kuenzi (2008), "…the overall proportion of STEM degrees awarded in the United States has historically remained at about 17 percent of all postsecondary degrees awarded" (p. 1).

When students enroll to attain a degree in postsecondary education, they will have been exposed to one or all of these fields depending on their career interests. As college students progress through the institution's required curriculum of their major education plan, they will have to take a course or two that would be considered to be part of a STEM discipline. Therefore, by the time all students graduate from postsecondary education, they will be exposed to some form of the STEM disciplines. As an example, a new college graduate will depend on the knowledge and understanding of some form of basic math and technological sciences.

A common thread that has been revealed and focused on in the literature involves an increased need for promotion and encouragement of students at colleges and

universities to choose STEM fields of study. When students initially enroll in a college or university, they declare a major. If the first or second major that they select is going to be within one of the disciplines of Science, Technology, Engineering, or Mathematics, their major would be classified a STEM field (Chen & Weko, 2009).

According to the National Science Board (2010), "Currently, far too many of America's best and brightest young men and women go unrecognized and underdeveloped, and thus, fail to reach their full potential" (p. 1). Specifically, students with disabilities represent an unrecognized group of men and women and the research has revealed a significant lack of information regarding the representation of these students into the Science, Technology, Engineering, or Mathematics fields.

Background of the Study

Many studies document a lack of minorities, such as African Americans, Hispanics, and women in the STEM field disciplines. The documents produced by the National Science Foundation indicate that the majority of students who have chosen a career path in the Science or Engineering fields have been male (Perna et al., 2009). During the years 1995 through 2007, the National Science Board revealed an increase in bachelor's degrees for the following groups: "Asians/Pacific Islanders from 8 to 9 percent, black students from 7 to 8 percent, Hispanic students from 6 to 8 percent and American Indian/Alaska Natives from 0.5 to 0.7 percent" (2010, p. 2-4). Even though there has been a small increase in each of these race/ethnicity groups, there still appears a need for more of these minority individuals to attain degrees in STEM fields. Chen and Weko (2009) noted that students enrolled within the technology component of the STEM

fields were older in age, came from "low-income families and were found to be less academically prepared" (p.18).

In the Fall of 2009, President Barack Obama declared a set of initiatives to increase enrollment of individuals in the STEM fields. The campaign is called "Educate to Innovate." In a White House press release (2009), the following three areas of significance were highlighted in this campaign:

> …increasing STEM literacy so all students can think critically in science, math, engineering and technology; improving the quality of math and science teaching so American students are no longer outperformed by those in other nations; and expanding STEM education and career opportunities for underrepresented groups, including women and minorities. (para.7)

President Obama has put emphasis on the outcome of this campaign to assist the United States of America in sustaining its role as a major leader in the world by increasing the number of employed individuals in STEM careers.

The researcher's objective in this study is to focus on a scarcely studied, unrepresented group of students with disabilities who can contribute as future innovators in STEM disciplines. According to Getzel (2008), postsecondary education is primarily the place for "career-related experiences creat[ing] an important link for students with disabilities to apply the knowledge and skills they acquire in college to a work environment" with the need of access to hands-on, experiential learning (p.212). The Bayer Corporation (2010) has cited that "more than 77 percent of women and unrepresented minorities are missing from the U.S. STEM workforce… and were not identified or encouraged or nurtured to pursue STEM studies…" (p. 13).

The following parent, teacher, and community comments directed towards prospective STEM major students reveal the negative support that they encountered when considering the pursuit of a STEM pathway: “I’m not good at science,” “I don’t have the engineering gene,” “I’m doing fine without mathematics skills,” and “I didn’t need the Internet when I was in school” (Jones, 2008, p. 9). These statements may impede the progress of students with or without disabilities to choose STEM field careers. According to Hill, Corbett and St. Rose (2010), when the female gender believe that they have only a certain allotment of intelligence, they fall into agreeing with the inclination that men are stronger in math and science courses; this attitude limits their decision to select a career in Science, Technology, Engineering, or Mathematics fields. It has been documented, according to Hill et al. (2010), that those individuals with careers as scientists and engineers do not necessarily have the highest grades in math and science:

> Less than 1/3 of college educated white men in engineering, math, computer science, and physical science workforce scored higher than 650 on the SAT math exam. More than 1/3 had SAT math scores below 550 (math score of the average humanities major). Even though a correlation exists between high school math test scores and later entry into STEM education and careers, very high math scores are not necessarily a prerequisite for success in STEM fields. (p. 21)

Stern and Woods (2001) conducted a study supported by the National Science Foundation that involved interviewing 34 students with disabilities from their childhood experiences to higher education and pre-career counseling in science, engineering and mathematics. The interviews consisted of highlighting the use of assistive technology, how to persist and overcome roadblocks to success, continuing to think beyond low

expectations placed upon them by medical, educational, and employment establishments, when they attained or were diagnosed with the disability, the awareness of the disability laws, participating in activities outside of school, experiences of what influenced their choice in a STEM field, and how family was involved in their journey. The purpose of documenting the case studies was to increase the representation of students with disabilities in science, mathematics and engineering and demonstrate how these students succeeded in accomplishing their goals where as others may have failed. The study was successful in that all of the interviewees were awarded degrees and are working in STEM fields today.

In the transition into postsecondary education for students with disabilities, it is important to note the Civil Rights mandates that created services for these students. They are the Vocational Rehabilitation Act of 1973 that includes Sections 504 and 508, and the American with Disabilities Act of 1990. “Both statutes prohibit discrimination on the basis of disability and require that postsecondary institutions ensure equal access for otherwise qualified students with disabilities,” where, equal access is defined as “providing students with reasonable academic adjustments (also called accommodations) and auxiliary aids” (Madaus, 2005, p. 32).

Students with disabilities may have been passive and may not have participated in their educational plans if they were diagnosed in elementary or secondary school. Students with disabilities may have been diagnosed with a disability after enrolling in a postsecondary institution. Therefore, according to Smith, English and Vasek (2002), there is a need for communication with the students with disabilities and the assurance that

they are able to comprehend the word “transition” when in the college setting and choosing their major.

Problem Statement

There is a scarcity of literature on the promotion, support, and encouragement of students with disabilities and their involvement in the Science, Technology, Engineering, or Mathematics disciplines. Many studies have considered women and other minorities. Aptitudes, perceived limitations for success, negative support by the community, and test scores of students with disabilities all suggest that there will be limited success in STEM majors and careers.

Wagner, Newman, Cameto, Garza, and Levine (2005) reported from a U.S. Department of Education Study “…parents of 61% of youth with disabilities had some expectation that [the] youth [with disabilities] would continue on to postsecondary education, almost 92% of their peers in the general population were expected to continue education after high school” (p. 4-3). This is a 31% difference in support for such an achievement. Luzzo, Hitchings, Retish and Shoemaker (1999) studied 121 students in which 75 students had a diagnosed disability. They determined by using the Career Decision-Making Self-Efficacy Scale-Short Form that students with disabilities had a lower level of confidence in making career decisions. They concluded these low confidence levels may have been determined by the attitudes of teachers’ and parents’ about the past failures of these students in the educational system and the teachers and parents resolve in order to protect these students from future feelings of failure in postsecondary education.

With specific intervention and support, these populations can be successful as suggested by Luzzo et al. (1999) who state "that career counselors who work with students with disabilities may want to develop CDMSE-enhancing strategies" to understand what qualities these students possess in order that they feel confident about making career decisions (p. 151). They also suggest that because of a "pessimistic attributional style for career decision-making and lower levels of CDMSE" that "future research addressing the career decision-making needs of college students with disabilities should increase our understanding of the factors that distinguish career decision-making deficits of students with different types of disabilities" (Luzzo et al., 1999, p. 153).

There is to date, limited analysis of the impact of promotion and intervention of students with disabilities as they consider postsecondary majors and future career orientations. This absence of data leaves a void in the body of evidence that can guide policy at higher education institutions. There is also a void in determining the distribution of resources to support these students' degree compliance, persistence, and academic and professional success.

Purpose of the Study

The focus of this study is on college students with disabilities as an unrepresented minority group in the Science, Technology, Engineering, or Mathematics fields. Painter and Bates (2012) have explored the influences of persistence in higher education and have reported "... being a part of an underrepresented group has a negative effect on completing a degree in the STEM fields" (p. 3). There is a demand for an increase of college students to choose careers in STEM. With the continued increase in diversity of

the United States population, attention can be given to college students with disabilities to help increase enrollment of college students in the STEM field disciplines.

Factors have been found that encourage college students' persistence in STEM fields which include self-confidence, the amount of attained academic coursework, personal interests, and the ability to identify with college personnel in the field chosen (Painter & Bates, 2012). According to Stage and Milne (1996), the educational goal choice of a student with a disability is thwarted by "attitudinal barriers and organizational structures within universities" (p. 429). Students with disabilities may feel that their career choices are predetermined by their disability and therefore have a predisposition not to choose STEM field majors.

The purpose of this study is to document experiences and perceptions of college students with disabilities who pursue, and may consider pursuing, careers in the STEM field disciplines by exploring the career decision-making self-efficacy of students with disabilities. This study will document the level of influence that the students with disabilities had or may not have had encountered from parents, friends, advisors, counselors, and instructors as they managed their decision-making choice relating to their academic major/career in the STEM or non-STEM field disciplines.

Significance of the Study

There is a need for higher education institutions to understand the experiences of students with disabilities with regard to making decisions about their college major and transition into higher education. The career choice options for a student with disabilities should not be initially dismissed because of their disability until accommodations and their self-efficacy are explored.

This study is important for the development of the institution's strategic plan relating to the Student Services department. The information that is gained by this department can be used for the implementation or development of programs to assist the students with disabilities. The programs can focus on their career choices and persistence in the STEM field majors.

The data gained from this study can also be evaluated by the enrollment services department of higher education institutions to increase the diversity at the institution by the enrollment of students with disabilities. The recruitment process can be analyzed to determine how to increase the enrollment of students with disabilities at the institution and how to increase these students' interest in STEM academic majors. The increase in enrollment of this underrepresented minority group can increase revenue in federal financial aid allocated to higher education institutions.

This study is also significant because the results will place students with disabilities in a more advantageous position in their career decision-making process. When the students answer the surveys of the study, some weaknesses in the students' transition process to the university from outside experiences and experiences within the university may be revealed. If those weaknesses become clear, they could be corrected to provide a wider range of options available in academic majors, such as those in STEM, to the students with disabilities.

With the need of an increase of students in STEM academic majors, the timeliness of this study could also bring awareness to the academic arena that students with disabilities need to be more integrated into STEM courses prior to postsecondary education. With positive mentoring through the students' various phases of education,

students with disabilities may gain a new perspective on choice and take more of an interest in seeking their academic majors and career choices.

Research Questions

The experiences of students with disabilities in their cultural circle shape their career decision-making (Bandura, 1997; Hacket & Betz, 1981). The following research questions will guide this study:

Research Question One: Do students with diagnosed disabilities receive academic and/or personal support when selecting Science, Technology, Engineering, or Mathematics academic majors?

Research Question Two: Do male college students with diagnosed disabilities in STEM and non-STEM majors have a different perception of their career decision self-efficacy than female students with diagnosed disabilities in STEM and non-STEM majors?

Research Question Three: Does the students' disability type influence his or her confidence level results as it pertains to career decision self-efficacy scores?

Research Question Four: Do students with diagnosed disabilities differ in career decision self-efficacy by college major choice and type of disability?

Hypotheses

Hypotheses were developed from the research questions and are as follows:

Hypothesis 1: Students with disabilities will perceive a higher frequency of academic and/or personal support when considering enrollment in Science, Technology, Engineering, or Mathematics as academic majors.

Null hypothesis 1: Students with disabilities will not perceive a higher frequency of academic and/or personal support when considering enrollment in Science, Technology, Engineering, or Mathematics as academic majors.

Hypothesis 2: Male students with disabilities in STEM or non-STEM majors will score higher in confidence than female students with disabilities in STEM or non-STEM majors in career decision self-efficacy.

Null Hypothesis 2: Male students with disabilities in STEM or non-STEM majors will not score higher in confidence than female students with disabilities in STEM or non-STEM majors in career decision self-efficacy.

Hypothesis 3: There is a relationship between the student's type of disability and career decision self-efficacy scores.

Null Hypothesis 3: There is no relationship between a student's type of disability and career decision self-efficacy scores.

Hypothesis 4: There is a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores.

Null Hypothesis 4: There is not a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores.

Delimitations and Limitations

The delimitations of this study would be the consideration of only one public, urban Midwest university and the use of the students with disabilities identified by the Disability Access Services Office at the institution. The use of one institution may

minimize the generalizability of the results of this study to the population of students with disabilities.

The study is limited to the number of students who have documented disabilities and who identify themselves with the Disability Access Services Office. The dependence on a large sample size could be jeopardized if the students do not use the services from that department. Another limitation to the study could be the willingness and honesty of the participants to answer the online survey instruments.

Assumptions

Assumptions were made in that the research subjects will have access to the online surveys as university students. Furthermore, there is the assumption that the information obtained from this study will create and/or enhance programs for students with special needs through Student Services and will be used by the Admissions department for recruitment of students into the Science, Technology, Engineering, or Mathematics academic majors. Another assumption is that the information gained from this study will change or create new institutional policy to assist students with special academic needs.

Finally, it is assumed that the students with disabilities enrolled at the institution in the future will have access to the research results. This access of information will provide an increase in the students with disabilities awareness of career opportunities in STEM and the opportunity to enroll in those degree programs.

Definitions of Terms

This section of Chapter One includes terms that have been defined to clarify their use in this study.

Barrier: prevention or discouragement of the student to enter or think of entering a particular major at college.

Career Decision-Making Self-Efficacy (CDMSE): the understanding within an individual that one has the ability to complete the appropriate processes or tasks with the intended result being a career decision (Plake & Impara, 2001).

Disability: "a physical or mental condition that causes functional limitations that substantially limit one or more major life activities, including mobility, communication (seeing, hearing, speaking), and learning" (Raue & Lewis, 2011, p. 1).

Influence: to encourage, persuade, or guide a student toward considering a particular major at college.

Minority: "a racial, religious, political, national, or other group thought to be different from the larger group of which it is part" or "a group having little power or representation relative to other groups within a society" (Minority, 2011, para. 2).

Self Determination Skills: "personal or interpersonal skills that include the acceptance of a disability and how it affects learning; understanding what services are needed; knowing how to describe one's disability; and the need for certain supports to service providers; and overcoming obstacles that may be presented" (Getzel, 2008, p. 210).

Self-Efficacy: "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 71).

STEM: Science, Technology, Engineering or Mathematics.

STEM major: the first or second major selected by a college/university student within one of the Science, Technology, Engineering and Mathematics disciplines.

Underrepresented: "present in inadequate numbers or amounts; insufficiently represented" (Underrepresented, 2011, para. 1).

Organization of the Study

This research study will contain five chapters. Chapter One of the study contains the background, problem and purpose of the study, research questions and hypotheses, significance of the study, delimitations and limitations of the study, and definitions of terms. Chapter Two is the review of the literature relating to students with disabilities, self-efficacy, Science, Technology, Engineering and Mathematics trends and career choice. Chapter Three will outline the research methodology of the study including the population and sample, instrumentation, data collection, data analysis, and limitations of the study. Chapter Four contains a discussion of the results of the study. Chapter Five will provide the conclusion and a section for future research recommendations.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The Congressional Research Service reported that the United States ranked 20th in the world among 24 year olds that received degrees in engineering or the natural sciences, such as biology, chemistry, and physics (Kuenzi, 2008). In the review of the literature, there has been an emphasis placed on the need to increase student enrollment and diversity in higher education institutions within the Science, Technology, Engineering, or Mathematics (STEM) field disciplines. President Barack Obama announced a new program in the Fall of 2009 called "Educate to Innovate." He expressed, "Success on these fronts will require improving STEM literacy for all students; expanding the pipeline for a strong and innovative STEM workforce; and greater focus on opportunities and access for groups such as women and underrepresented minorities" (The White House, para. 2). According to Glynn, Brinkman, Armstrong, and Taasoobshirazi (2011), "to address the critical need for scientific literacy, the American Association of Colleges and Universities has adopted a goal to build and sustain strong undergraduate education in science" (p. 1159). There is hope that eventually each graduate professionally develops more in the sciences and therefore contributes that knowledge as a working member of the community.

There is a scarcity of literature regarding the promotion, support, and encouragement of students with disabilities and their involvement in STEM disciplines. The purpose of this research study was to document experiences and perceptions of students with disabilities who pursue, and may consider pursuing, careers in the STEM

field disciplines by exploring the career decision-making self-efficacy of students with disabilities. This study documented the level of influence that the students with disabilities had or may not have had encountered from parents, friends, advisors, counselors, and instructors as they managed their decision-making choice relating to their academic major/career in the STEM or non-STEM field disciplines.

This chapter will detail research on college students with disabilities, an underrepresented minority, and decision-making process that they employ to select a specialization in STEM or non-STEM fields. Topics that will be explored include the federal laws relating to students with disabilities in postsecondary education, the disability types, the trends of individuals who choose STEM majors, the career decision-making process employed by students with and without disabilities, and the barriers or influences that impact students with disabilities entering the STEM field disciplines. Albert Bandura's theory of self-efficacy will serve as the conceptual framework used to explore the career decision-making process that students with disabilities employ when selecting a specialization in the STEM or non-STEM disciplines.

Federal Laws and Students with Disabilities

This section details the requirements under federal law for students who are identified as having a disability. The legal responsibilities for the postsecondary institutions in servicing students with disabilities are different as compared to a student in secondary educational institutions. The proper documentation during the transition process into postsecondary education as clarified by the Individuals with Disabilities Education Act of 2004 will ensure the institutions help students with disabilities successfully reach their educational goals.

The Vocational Rehabilitation Act of 1973, Section 504 and the Americans with Disabilities Act of 1990 are two civil rights mandates which relate to postsecondary education when creating services for students who have disabilities. (Boyer-Stephens et al., 2010; Brinckerhoff, Shaw, & McGuire, 1992; Burgstahler, 2003; Madaus, 2005; Roberts, Hye, Brown, & Cook, 2011). "Both statutes prohibit discrimination on the basis of disability and require that postsecondary institutions ensure equal access for otherwise qualified students with disabilities," where, equal access is defined as "providing students with reasonable academic adjustments (also called accommodations) and auxiliary aids" (Madaus, 2005, p. 32).

IDEA of 2004

The Individuals with Disabilities Education Act (IDEA) of 2004, Public Law 105-17, is the federal law that applies to all public schools and applies specifically to secondary education and the educational preparation of students with disabilities before they transition into postsecondary education. The thirteen disability types that are defined under this law are autism, deaf-blindness, deafness, emotional disturbance, deaf and hearing impairment, mental retardation, multiple disabilities, orthopedic impairment, other health impairment, specific learning disability, speech or language impairment, traumatic brain injury, and visual impairment (Child, para. 1; Kauffman & Hallahan, 2011).

The services that are provided under IDEA are paid for by the educational system and there is no financial cost to the student (Cawthon & Cole, 2010). An authorized school official drafts an individualized education plan to which the parents must also agree, and is reviewed with the parents and monitored by the authorized school official. It

applies to and covers students from pre-kindergarten to the 12th grade or to the age of 21 years old provided they are still pursuing a secondary education. Progress toward completion of their education plan must be demonstrated when it is reviewed at the end of the school year. At no later than the age of 16, the transition process begins for the student regarding this plan whether they decide to pursue a postsecondary degree or seek employment, and this plan can help clarify each agency's responsibility during that process. When the student reaches the age of 18, the parental rights are transferred to the student (Boyer-Stephens et al., 2010; Kaplin & Lee, 2007; Madaus, 2005; Madaus & Shaw, 2006; Trainor, 2008).

Rehabilitation Act of 1973

The 93rd United States Congress passed the Rehabilitation Act of 1973 which replaced the Vocational Rehabilitation Act. The Rehabilitation Act of 1973 defines "handicapped individual" as "any individual who has a physical or mental disability which for such individual constitutes or results in a substantial handicap to employment and can reasonably be expected to benefit in terms of employability from vocational rehabilitation services" (Section 7, no. 6).

Section 504. Section 504 of the Rehabilitation Act of 1973, Title V, of Public Law 93-112 states in detail:

> No otherwise qualified handicapped individual in the United States, as defined in section 7(6), shall, solely by reason of 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. (para. 22)

This law applies to all public and private institutions that receive federal financial aid (Cawthon & Cole, 2010). If a student has been identified with a disability while enrolled in a secondary education institution, a 504 plan will replace the individualized education plan at the college level which will list the accommodations that will be provided at the institution for the student. However, the college student has to self-identify to the institution to receive services and provide the documentation necessary for his or her specific disability. If the student is not identified with a disability until enrollment in a higher education institution, success is the responsibility of the student because the student must make the institution aware of the need for special accommodations. The postsecondary institution is not required to pay for the diagnostic evaluation of the student's disability and it is the responsibility of the student to pay for these evaluations (Boyer-Stephens et al., 2010; Brinckerhoff et al., 1992; Kaplan & Lee, 2007; Madaus, 2005; Madaus & Shaw, 2006).

Section 508. Section 508 of the Rehabilitation Act provide the standards relating to access to technology for persons with disabilities that are employed at federal agencies and for members of the public that need to access any kind of services from Federal agencies (Section 508, n.d.). The Electronic and Information Technology Accessibility Standards state from the Office of the Federal Register (2000):

> Section 508 requires that when Federal agencies develop, procure, maintain, or use electronic and information technology, they shall ensure that the electronic and information technology allows Federal employees with disabilities to have access to and use of information and data that is comparable to the access to and use of information and data by Federal employees who are not individuals with

> disabilities…also requires individuals with disabilities who are members of the public seeking information or services from a Federal agency to have access. (p. 80500)

The Sections of the law include the following standards: 1) the software and operating systems should be easy to navigate by the person with disabilities, including various ways to use a keyboard with adjustable contrast for easy visualization of the screen for those who cannot manage bright screens, 2) web pages that have voice response systems, video, and multimedia for those individuals that use Braille, and 3) accessible computer hardware, whether it be desktop or portable with the ability to use facsimile and scan (Burgstahler, 2003; Office of Federal Register, 2000).

American with Disabilities Act of 1990

The American with Disabilities Act (ADA) of 1990 applies to both public and private educational institutions and defines a disability as "a physical or mental impairment that substantially limits one or more of the major life activities of such individual; a record of such an impairment; or being regarded as having such an impairment" (Wilhelm, 2003, p. 221). When students are identified with a disability under the ADA, they must contact the institution and inform the appropriate campus office of the documented disability in order to receive their accommodations. The accommodations provided by this act are not just educational (Cawthon & Cole, 2010).

The ADA was amended in 2008 by a change in structure of the document, and it became effective in January of 2009. The subchapters are now arranged to be applicable to employment, public services, public accommodations and services operated by private entities and telegraphs, telephones and radiotelegraphs, including wire and radio

communication. The subsections are detailed relating to non-discrimination of employment, transportation, telecommunications, and technological access (American, 2008). Kaplin and Lee (2007) identify the following areas that relate to higher education institutions and non-discrimination in the ADA: "1) eligibility criteria; 2) modifications of policies, practices, and procedures; 3) auxiliary aids and services; 4) examinations and courses; 5) removal of barriers in existing facilities; 6) alternatives to barriers in existing facilities; 7) personal devices and services; 8) assistive technology; 9) seating in assembly areas; and 10) transportation services" (p. 333).

Disability Types

The Individuals with Disabilities Education Act defines thirteen different types of disabilities in the Regulations: Part 300/A/section 300.8 (Child, n.d., para. 1, Kauffman & Hallahan, 2011, p. 66). The Disability Access Services (DAS) Office of the university under study has students with disabilities that self-identify to the office with documentation relating themselves to those thirteen disability types. The students with the following disability types are provided services at the university's DAS Office: Deaf/Hard of Hearing, General/Medical, Mental Health, Orthopedic, Mobility/Wheelchair, Blind/Low Vision, Specific Learning Disorder (LD), Attention Deficit Hyperactivity Disorder (ADHD), and LD/ADD (Attention Deficit Disorder) (L. Williams, personal communication, August 18, 2011; L. Williams, personal communication, July19, 2013).

The "Diagnostic and Statistical Manual for Mental Disorders*"* is used to diagnose disability types. It has undergone a major review with changes in its recently published fifth edition. These changes encompass the diagnostic criteria, labeling of the disability

types and reorganizing of the disability types (American Psychiatric Association, 2000, 2013). The following section will describe each of the disability types of the students that have self-identified to the Disability Access Services Office in relation to the current federal law and the current diagnostic manual. Those disability types will include Attention-Deficit/Hyperactivity Disorder, Autism Spectrum Disorder, Deaf and Hearing Impairment, Emotional Disturbance/Mental Health, Motor Disorders, Orthopedic Impairment, Other Health Impairment, Specific Learning Disorder, and Visual Impairment.

Attention-Deficit/Hyperactivity Disorder

This diagnostic category has evolved through various editions of the "Diagnostic and Statistical Manual for Mental Disorders" (DSM). In the DSM-III, this disorder was known as Attention-Deficit Disorder (ADD) with or without hyperactivity, and then in the DSM-III-Revised edition, it was changed to Attention-Deficit/Hyperactivity Disorder (ADHD) (Lahey & Carlson, 2001; Kaufmann & Hallahan 2011; American Psychological Association, 2013).

Attention-Deficit/Hyperactivity Disorder is identified by "a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development" (American Psychiatric Association, 2013, pp. 59-60). It is characterized by a group of inattention criteria and a group of hyperactivity and impulsivity criteria (American Psychiatric Association, 2013). In the DSM-5, Attention-Deficit/Hyperactivity Disorder is listed in the Neurodevelopmental Disorders section of conditions where it emphasizes in this edition that this disorder can continue through adulthood for those that have been identified (American Psychiatric Association, 2013).

Autism Spectrum Disorder

In the fifth edition of the "Diagnostic and Statistical Manual of Mental Disorders (DSM-5)", Autism Spectrum Disorder is listed in the Neurodevelopmental Disorders section (2013). Autism Spectrum Disorder is distinguished by "persistent deficits in social communication and social interaction across multiple contexts, including deficits in social reciprocity, nonverbal communicative behaviors used for social interaction, and skills in developing, maintaining, and understanding relationships" (American Psychological Association, 2013, p. 31). Additionally, the diagnostic criteria emphasizes that there must be a presence of "restrictive, repetitive patterns of behavior, interests, or activities" (American Psychological Association, 2013, p. 50). Symptoms will fall on a range with this disorder and may be identified in a person's early development, however the "symptoms will cause clinically significant impairment in social, occupational, or other important areas of current functioning" (American Psychological Association, 2013, p. 50).

Asperger's Disorder, Autistic Disorder, and Pervasive Developmental Disorder are disability types that the Disability Access Services Office has only recorded since Fall semester 2012 in their Received Services report (L. Williams, personal communication, July19, 2013). These three disorders are included in the DSM-5 disability type of Autism Spectrum Disorder. The DSM-5 (2013) has indicated that "individuals with a well-established DSM-IV diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified should be given the diagnosis of autism spectrum disorder" (American Psychiatric Association, p. 51).

Deaf and Hearing Impairment

The IDEA definition for Deaf and Hearing Impairment is "a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification that adversely affects a child's educational performance" (Child, n.d. para. 5). Hearing impairment is defined by the severity of the loss whether one or both ears are involved in the impairment. In order to be proactive in diagnosing children early in the identification of a hearing impairment, there are 40 states that have implemented laws in which newborns must receive evaluations of their hearing (Kauffman & Hallahan, 2011).

Emotional and Behavioral Disorders/Mental Health

According to the IDEA, the disability requirement for a child to be considered having what is labeled as Emotional Disturbance is:

> An inability to learn that cannot be explained by intellectual, sensory, or health factors; an inability to build or maintain satisfactory interpersonal relations with peers and teachers; inappropriate types of behavior or feelings under normal circumstances; a general pervasive mood of unhappiness or depression; a tendency to develop physical symptoms or fears associated with personal or school problems. Emotional Disturbance does include schizophrenia.
>
> (Child, n.d., para. 6)

Kauffman & Hallahan (2011) include Anxiety Disorders and Depression within the section identified as Emotional and Behavioral Disorders.

In the DSM-5 (2013), Depressive Disorders, Bipolar Disorders, and Anxiety Disorders are listed in independent sections. Anxiety Disorders "…share features of

excessive fear and anxiety and related behavioral disturbances [with a prominence of panic attacks]" (American Psychiatric Association, 2013, p. 189). Depressive disorders have "…the common features of sad, empty, or irritable mood, accompanied by somatic and cognitive changes that significantly affect the individual's capacity to function" (American Psychiatric Association, 2013, p. 155). Bipolar disorders are separated into Bipolar I Disorder and Bipolar II Disorder according to the DSM-5. In "Bipolar I Disorder, it is necessary to meet the criteria for a manic episode that may have been preceded or followed by a hypomanic or major depressive episode" (American Psychiatric Association, 2013, p. 123). In Bipolar II Disorder, the individual is required to have "…at least one [extended] episode of major depression [of 4 weeks in length] and at least one hypomanic episode… [that lasts at least 4 days with noticeable changes in social function that can also interfere with work] (American Psychiatric Association, 2013, p. 123).

In communication with L. Williams (July 19, 2013), it has been recorded since Fall semester of 2007 that the students have self-identified to the Disability Access Services Office at the university under study with Anxiety Disorder, Depressive Disorder, and Bipolar Disorder disability types. The Disability Access Services Office lists all three disorders under the disability type heading of Mental Health on their Received Services report.

Motor Disorders

The Motor Disorders include developmental coordination disorders, stereotypic movement disorder and tic disorders as listed in the DSM-5 under the Neurodevelopmental Disorders section (American Psychological Association, 2013).

The American Psychological Association (2013) defines the three types of Motor Disorders as:

> Developmental coordination disorder is characterized by deficits in the acquisition and execution of coordinated motor skills and I manifested by clumsiness and slowness or inaccuracy of performance of motor skills that cause interference with activities of daily living. Stereotypic movement disorder is diagnosed when an individual has repetitive, seemingly driven, and apparently purposeless motor behaviors, such as hand flapping, body rocking, head banging, self-biting, or hitting. Tic disorders are characterized by the presence of motor or vocal tics, which are sudden, rapid, recurrent, non-rhythmic, stereotyped motor movements or vocalizations. (p. 32)

The students that have self-identified at the Disability Access Services Office with mobility problems may have to use wheelchairs or other orthopedic appliances to proceed with their activities of daily living on campus. These students with disabilities that have been documented as having a Motor Disorder are listed under the disability type of Mobility/Wheelchair in the Disability Access Services Office Received Services report (L. Williams, personal communication, August 18, 2011; L. Williams, personal communication, July19, 2013).

Orthopedic Impairment

Orthopedic impairment is a disability type within the Individuals with Disabilities Education Act. It is defined as “a severe orthopedic impairment that adversely affects a child’s educational performance [which] includes impairments caused by a congenital anomaly, impairments caused by disease (e.g., poliomyelitis, bone tuberculosis), and

impairments from other causes (e.g., cerebral palsy, amputations, and fractures or burns that cause contractures" (Child, n.d., para. 10).

The students with disabilities that self-identified to the Disability Access Service Office have orthopedic impairments that have adversely affected the student's educational environment. The orthopedic impairments have included back, neck, leg, and nerve problems. (L. Williams, personal communication, August 18, 2011; L. Williams, personal communication, July19, 2013).

Other Health Impairment

Other Health Impairment is defined as "having limited strength, vitality, or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment that adversely affects a child's educational performance" (Child, n.d., para. 11). The conditions are "due to chronic or acute health problems such as asthma, attention deficit disorder or attention deficit hyperactivity disorder, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, sickle cell anemia, and Tourette syndrome" (Child, n.d., para. 11).

These students with disabilities have been categorized under the disability type heading of General/Medical in the Disability Access Services Office Received Services report (L. Williams, personal communication, August 18, 2011; L. Williams, personal communication, July19, 2013). It was reported to this researcher that the common health conditions that students have self-identified with at the university under study have been Diabetes, Multiple Sclerosis, and Crohn's Disease (L. Williams, personal communication, July 19, 2013).

Specific Learning Disorder (LD)

In the DSM-IV-TR (2000), Learning Disorders was a disorder listed under the section named Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence. In the DSM-5 (2013), the Learning Disorders disability type has been changed to Specific Learning Disorder and is listed under the section called Neurodevelopment Disorders. Specific Learning Disorder has the following diagnostic criteria in the DSM-5 (2013): "difficulties learning and using academic skills, as indicated by the presence of at least one of the following symptoms that have persisted for at least 6 months, despite the provision of interventions that target those difficulties [including the stipulation that the students must have very low academic testing scores in comparison to their chronological age group" (p. 66). The recognizable symptoms that may present for a student with this disorder include difficulties in mathematical computation, mathematical comprehension, reading, reading comprehension, spelling, and writing (American Psychiatric Association, 2013). When students are diagnosed with a specific learning disorder, the severity (mild, moderate, severe), academic domain (reading, written, mathematics), and sub-skill (math reasoning, math calculation, reading fluency, reading comprehension) must be documented because of the coding requirements of the International Classification of Diseases Manual (American Psychiatric Association, 2013).

Visual Impairment

Visual impairment includes blindness and low vision types of disabilities. Visual impairment is defined as "blindness mean[ing] an impairment in vision that, even with correction, adversely affects a child's educational performance" (Child, n.d., para. 15).

These students may have some difficulty in their social interaction skills due to this disability.

Trends in STEM

The evaluation of the trends of the individuals who choose a STEM discipline assists in establishing the foundation of how students with disabilities are viewed in the literature. It is important to understand the groups that have been researched in the past as it relates to pursuit of a degree in a STEM discipline. Underrepresented groups that have been the focus of research relating to the STEM disciplines include the minority groups of women, African Americans, Native Americans, and Hispanics. Students with disabilities are also an underrepresented group that have been included within those minority groups, however there is a lack of studies that emphasize the students with disabilities trending within STEM careers.

The profile of students enrolled in STEM programs

Chen and Weko (2009) identified which individuals chose STEM fields by using data from the 2003-2004 National Postsecondary Student Aid Study, the Educational Longitudinal Study of 2002-2006, and the 1995-1996, 1998 and 2001 Beginning Postsecondary Students Longitudinal Study. The data was collected and evaluated using descriptive statistics and *t* tests. In 2003-2004, it was determined that "14 % of all undergraduate students in postsecondary education were enrolled in a STEM field" (Chen & Weko, 2009, p. 3). They were characterized as being male, younger and dependent, Asian/Pacific Islander, foreign students in which English was not their primary language, students who had more support and financial benefits from their families when choosing a college education, and students who came from a strong background in college

preparation (Chen & Weko, 2009; Tyson, Lee, Borman, & Hanson, 2007; Wolanin & Steele, 2004).

May and Chubin (2003) supported this research from data obtained from the United States Census Bureau in relationship to underrepresented minority students stating that "STEM workers remain overwhelmingly white, male" and that "talented women, minorities, and persons with disabilities" were at a decrease (p. 27). Their data collection also included United States government reports documented after 1980, internet websites, and peer-reviewed articles. During their search, a significant longitudinal study was conducted from 1994 to 1998 indicating that two percent of the characters within television programs were represented as scientists and "75 percent of those scientists [characterized were represented as] white males" (May & Chubin, 2003, p.32). They concluded that the minority students could not identify themselves with having a career as a scientist or an engineer because they could not link an association of themselves to the white male characters who represented those careers on the primetime television shows.

In data collected from the National Science Foundation's Division of Science Resources Statistics, Hill, Corbett, and St. Rose (2010) also concluded that "in the mid-eighties women earned slightly more than… 36 % of the bachelor's degrees in computer science [as compared to males and] by 2006 that number had dropped [of bachelor's degrees] to 20% [for females] (p. 11). They also observed this trend for females continuing at the graduate level and in the workplace. Bayer Corporation (2010) supports this information and produced a research survey of a 1,226 sample size that yielded a significant finding at a 95 % confidence level regarding why such underrepresentation

existed among Asian, African-American, Hispanic and American Indian female chemists and chemical engineers and African-American, Hispanic and American Indian male chemists and chemical engineers. It was determined that "more than 77% … of women and unrepresented minorities are missing from the U.S. STEM workforce …were not identified or encouraged or nurtured to pursue STEM studies…" (Bayer Corporation, 2010, p. 13).

Tyson, Lee, Borman, and Hanson (2007) found from a research sample size of 91,148 students, obtained from 350 Florida public schools and 30 community colleges, a reduced amount of 11th and 12th grade high school Hispanic and African American students who were both male and female in science and mathematics advanced coursework. Descriptive statistics and logistic regression revealed that both genders of students would start college at a disadvantage to begin a major in a STEM field because of the lack of preparation in their education or inability to have the prerequisites to enter those particular programs (Hill, Corbett, & St. Rose, 2010; Stern & Woods, 2001).

Students with Disabilities and STEM

The research has shown that there is an increase in the number of students with disabilities who are identified and serviced in United States educational systems, but there is a lack of studies that emphasize students with disabilities and their participation in STEM. The National Science Foundation (2011) reported that "12 % of the U.S. population has some [type of] disability" (p. 2). A study by Raue and Lewis (2011) specifically defined, "a disability…as a physical or mental condition that causes functional limitations that substantially limit one or more major life activities, including mobility, communication (seeing, hearing, speaking), and learning" (p. 1). *The Condition*

of Education 2011 report that was created from National Center for Education Statistics data documented that "children and youth ages 3-21 receiving special education services was 6.5 million in 2008-09 corresponding to about 13 percent of all public school enrollment" (And et al., 2011, p. 32). Orr and Hammig (2009) reported from survey data taken from the National Center for Education Statistics in 1999-2000 that "9% of U.S. undergraduate students [who enrolled in community college programs had] a disability" (p.181).

Data was collected on students with disabilities by the National Center for Educational Statistics and reported to the U.S. Department of Education from a voluntary survey in questionnaire form sent to 1600 degree-granting postsecondary institutions. The survey was mailed in the 2009-2010 academic year to obtain data using the Postsecondary Education Quick Information System for the 2008-2009 academic year. The methodologies of sampling error, non-sampling error and t-test calculations were used to analyze the survey. The results identified that 88 percent of the institutions enrolled students with disabilities, and the categories included in the study were as follows: specific learning disabilities at 31%, ADD/ADHD at 18%, mental illness/psychological/psychiatric at 15%, and health impairment/condition at 11% (Raue & Lewis, 2011). The requirements that verified if the students had a disability included the acceptance of an Individualized Education Program, documentation of a secondary school 504 plan of the Rehabilitation Act of 1973, and an evaluation from vocational rehabilitation.

Surveys conducted in 2008 by the Division of Science Resources Statistics of the National Science Foundation, the National Center for Educational Statistics, and the

Bureau of Labor Statistics of the U.S. Department of Labor indicated that students with disabilities were enrolled in undergraduate programs in all fields at 10.5 % as compared to students with disabilities in graduate programs in all fields at 7.5 %. The undeclared major was the largest choice of major at 11% for undergraduate students with disabilities. The largest numbers of graduate students with disabilities were enrolled in social/behavioral sciences fields at a rate of 8.5 %. Undergraduate students with disabilities selected life/physical/mathematical science majors at a rate of 9.5 % as compared to the same graduate majors (6.5%). The lowest number of graduate students with disabilities enrolled in a STEM field was engineering/computer science (5.5%), and including undergraduate students with disabilities who selected the same majors (10.5%) (National Science Foundation, 2011).

Alston and Hampton (2000) reported that "there is a scarcity of literature on the matriculation of persons with disabilities in science and engineering" (p. 159). Wolanin and Steele (2004) indicated in a higher education report that "those in public four-year institutions with disabilities [54 percent] were less likely to achieve a bachelor's degree than those without disabilities [28% percent]" (p. 17). The students with disabilities would usually attain a certificate or license instead of a four year degree due to their education being focused more towards vocational educational training and 2 year degree institutions. Orr and Hammig (2009) concurred with the findings for data collected from the National Longitudinal Transition Study-2, as they conducted a study using a sample size of 2,049 students with disabilities which indicated that the students attended more two year institutions than four year institutions. In this sample size, only twenty-five

percent of the students expressed that they would even graduate from their 4 year degree program.

Conversely, the University of Nebraska-Omaha, a four-year university, and Metropolitan Community College completed a 5-year project supported by a National Science Foundation grant which emphasized a collaborative effort to increase the enrollment and graduation of students in the STEM majors that are born and raised in the United States (Heidel et al., 2011). Emphasis was placed on encouraging students that had difficulties in freshman and sophomore courses in mathematics and sciences to be part of Facilitated Study Groups. Open communication with both institutions created a bridge towards success with their programs. As part of the data collection process, the students were encouraged to contribute their opinions about the program. By having this open communication, female and ethnic minorities expressed a feeling of marginalization as compared to white male STEM students, therefore, the researchers had adapted the tutoring program to minimize those experiences in hoping that change would assist the students in their progress towards graduation. The creation of pre-STEM majors, early undergraduate research, and attention to the diversity of the student participants helped influence the increase of students enrolled in the program and a 38% increase in STEM graduates (Heidel et al., 2011).

Theoretical Framework

The theoretical framework of this study is influenced by Albert Bandura's work with the theory of self-efficacy. "Life in the societies of today is undergoing accelerated social and technological change as well as growing global interdependence," and this change engenders "…challenging new realities plac[ing] heavy pressure on people's

capabilities to exercise some control over the course their lives take" (Bandura, 1995, p. ix). On a day-to-day basis as individuals such as students with disabilities grow, their beliefs play an important role in managing their lives and subsequently their eventual decision of choosing a career.

Self-Efficacy

Albert Bandura (1977) defines "efficacy expectation [as] the conviction that… [a person] can successfully execute the behavior required to produce the outcomes" (p. 193). The level of confidence of an individual's capability to perform certain tasks will determine how well he will be able to adapt to a given situation. Bandura (1977) states, "Efficacy expectations are a major determinant of people's choice of activities, how much effort they will expend, and how long they will sustain effort in dealing with stressful situations" (p. 194).

Mastery, generality, and strength are three dimensions to which Bandura (1977, 1997) ascribed with regard to how a person performs due to their level of self-efficacy exhibited. Mastery, also known as Level, relates to the amount of difficulty of a task or situation such as performing addition mathematical problems with increased difficulty (Zimmerman, 2000). Generality relates to individuals "judg[ing] themselves efficacious across a wide range of activities or only in certain domains of functioning" (Bandura, 1997, p. 43). It would be similar to having an anatomy course and being able to use that material and transfer it in understanding how to diagnose clinical cases (Zimmerman, 2000). Strength can be described as individuals perceiving a situation to be a positive or more durable situation which will lead them to a higher self-efficacy, but if the appearance is less durable, negative or weak, the individual may have lower self-efficacy

because they feel they have failed (Bandura, 1997; Hackett & Betz, 1981). Bandura (1997) suggests that when using self-efficacy scales, information should be "supplemented with interviews, open-ended surveys, and structured questionnaires to identify the levels of challenge and impediment to successful performance of the required activities" (p. 43).

Based upon sources of self-efficacy from the three dimensions described above, Bandura (1995, 1977, 1997) has described four different ways an individual's perceived self-efficacy is influenced and developed. They are called performance accomplishments, vicarious expectations, verbal persuasion and physiological states, also known as emotional arousal (Bandura, 1977; Pajares, 1997). These different sources are ways that an individual can increase the level of self-efficacy they exhibit.

Performance accomplishment, also referred to as mastery experience is an individual's capability of performance based on past experiences. The more individuals have successful experiences, it builds self-efficacy. Self-efficacy decreases when a person fails at a task. Bandura (1977, 1995, 1997) emphasizes that the more success that is achieved in a given situation, an individual can overcome obstacles with which they are presented. Ajzen and Fishbein further explain, "people who believe that they have the skills and other resources needed to perform the behavior or overcome barriers are likely to develop a strong sense of self-efficacy" (2005, p. 193).

The second way an individual can build self-efficacy is by vicarious experiences, and they are based on live modeling or symbolic modeling (Bandura, 1977, 1995). When individuals observe others like themselves who experience positive outcomes, they will perceive it is possible for them to have similar outcomes that are positive to increase their

self-efficacy. Based upon this theory, people will seek out individuals to whom they aspire to become. However, the vicarious experiences in a peer model not only can produce positive outcomes, but peer models can also show that experiences can bring negative outcomes (Schunk, 1987).

The third influential source of self-efficacy is verbal persuasive or social persuasion (Bandura, 1994, 1995). When individuals are surrounded by people who will persuade them into thinking that they can succeed to the point of mastery, they are more than likely going to continue to have the strength to accomplish the particular task at hand. However, Bandura (1995) adds that individuals who are "persuaded that they lack capabilities tend to avoid challenging activities that can cultivate their potentialities, and they give up quickly in the face of difficulties" (p. 4). Social persuasion can be related to people being in a task driven situation in their environment where they could face encouragement or discouragement by the individuals around them. When instructors in college are preparing their syllabi to include social interaction type of skills, "the social learning theory of Bandura [and self-efficacy can play a role in] creating social support opportunities for learning for students with visual impairment" (Kauffman & Hallahan, 2011, p. 253).

The fourth source of self-efficacy is emotional arousal or psychological states (Bandura, 1995, 1997). A person who responds positively or negatively to a situation will depend on their emotional state at the time. Bandura (1997) finds that individuals who can help reduce their stress and anxiety to situations and feel "… less vulnerable…" can weaken their fears which "… may reduce their self-doubts and debilitating self-arousal… [in order that they can place themselves in rewarding settings]" (p. 200). The feeling of

effectively coping with situations will keep the individual involved and more attached to the situation when there is less stress. When individuals are placed in a positive environment this would result in a state of increased self-efficacy, and if individuals were in a state of anxiety that would result in a reduction of self-efficacy. Lent, Brown, and Larkin (1984) reported the data from a study they conducted which included 28 male and 14 female undergraduate students enrolled in a career planning course for students that were thinking of enrolling in the majors of science and engineering. The results showed that enrollment in a career planning course increased their self-efficacy, which influenced student persistence in their chosen STEM majors.

According to Getzel (2008), "students with disabilities need self-determination skills to successfully transition to, adjust to, and remain in college" (p. 210). Students with disabilities may have been placed in a position that limits their choices when it comes to an education in postsecondary education. Therefore, according to Bandura (1977), "given appropriate skills and adequate incentives, efficacy expectations are a major determinant of people's choice of activities, how much effort they will expand, and how long they will sustain effort in dealing with stressful situations" (p. 194). Individuals that have a decreased self-efficacy can "create internal obstacles that block opportunities for new rewarding experiences [of any new challenge]" (Madaus et al., 2003, p. 160).

Research in self-efficacy has been expansive. It has been shown to intertwine with all aspects of an individuals' environment, goals, and well-being. Since Bandura's development of the concept of self-efficacy, researchers have applied it to women career development (Hackett & Betz, 1981), academic achievement and persistence (Lent, Brow, & Larkin, 1984), teaching (Woolfolk & Hoy, 1990), mathematics career choice

and performance (Hackett, 1985; Lent, Lopez, & Bieschke,1991,1993; Pajares & Miller, 1994,1995), unemployment (Eden & Aviram, 1993; Sterrett, 1998), smoking cessation (Dijkstra & De Vries, 2000), first year college performance (Chemers, Hu, & Garcia, 2001), motivation to learn (Bong, 2001; Schunk, 1990; Zimmerman, 2000), gender or race/ethnicity and science, (Britner & Pajares, 2001), prediction of college outcomes (Gore, 2006), stress and academic success (Hackett, Betz, Casas, & Rocha-Singh, 1992; Zajacova, Lynch, & Espenshade, 2005), science achievement (Britner & Pajares, 2006), computer and internet learning environments (Decker, 1998; Hodges & Murphy, 2009), career decision-making (Betz & Hackett, 1981, 1986; Betz, Klein, & Taylor, 1996), goal orientation (Hsich, Sullivan, & Guerra, 2007), first generation college students (Vuong, Brown-Welty, & Tracz, 2010), promotion of physical activity (Luszcynska, Schwarzer, Lippke, & Mazurkiewicz, 2011) and statistical models in STEM students (Painter & Bates, (2012).

From the research started by Bandura (1995, 1997) on the concept of self-efficacy, the importance of understanding career choice emerged. Career choice has been cited about the concept of self-efficacy and STEM fields relating to various minority groups, such as African Americans, Hispanics and women. Stress and academic success have played a role in career choice which relates well to the fourth source of self-efficacy developed by Bandura called psychological states (Bandura, 1995, 1997; Zajacova, Lynch, & Espenshade, 2005). If a career decision poses to individuals as a challenge, and the individuals have a sense of high self-efficacy, they are more than likely able to cope with their decision-making and achieve their final goal. Hackett, Betz, Casas, and Rocha-Singh (1992) also found that when a students' self-efficacy is decreased by stress, it can

also decrease their ability to be confident in making decisions "… and might be a source of lowered academic and career self-efficacy" (p. 529).

The emphasis of this research study will be exploring career decision-making and the STEM fields in relationship to an invisible group of minority individuals known as students with disabilities. Fouad and Byers-Winston (2005) asserted that there are differences in perception of what kind of opportunities there are in career choice among those individuals considered being from a minority group. The following section of this chapter expands upon the research in career decision-making self-efficacy.

Career decision-making self-efficacy

Research has confirmed that a person's self-efficacy will influence the decision-making process and therefore determine the specific data that is collected in order to make the decision regarding career choice. The greater the self-efficacy that an individual possesses, the greater the determination the individual has to complete their academic requirements. While completing requirements or even pre-requisites, those individuals will have a wider range of career choices for specific majors and can successfully progress toward their educational plan to attain them (Bandura, 1994, 1995; Lent, Brown, & Larkin, 1984). Ajzen and Fishbein (2005) recognize that if a behavior such as making a decision on a career is thought to produce a positive outcome, individuals will have a greater self-efficacy in making that decision, and in comparison, self-efficacy is diminished when there is an expectation of a negative outcome.

Betz and Hackett (1981) are the leading researchers who have expanded the self-efficacy work of Bandura by applying that theory to career development and career-decision-making. Betz and Hackett (1981) researched the career development of women

and their underrepresentation in STEM field disciplines and managerial occupations. They applied Bandura's self-efficacy theory to attempt to understand if women had low self-efficacy and elected to pursue alternate professions because of their expectation that those fields were dominated by males. A questionnaire was distributed to 134 females and 101 males to elicit demographic data, self-efficacy and confidence ratings regarding education, training requirements, job duties, the measure of interests, and consideration of each of the 20 selected occupations. Sixty-two percent of the sample provided American College Test scores for the subtests of English and mathematics. The results revealed that males had higher self-efficacy in the nontraditional careers such as accounting, drafting, engineering, criminal justice and mathematics. The male participant's lowest self-efficacy rating pertained to completing coursework for the career of physician; whereas the female participant's lowest rating pertained to completing coursework in the field of engineering. Females had higher self-efficacy scores in traditionally female occupations such as dental hygienist, elementary teacher, home economist, physical therapist, and secretary. The results of the research reported that a person's self-efficacy was related to career choice.

Betz and Hackett (1983) expanded their prior research (Betz and Hackett, 1981) into a two phase research study, the first which contained a sample size of 50 males and 64 females. A pilot study of the testing instrument was used. The second sample size consisted of 153 females and 109 males, and the purpose was to reveal the relationship of mathematics self-efficacy to gender, career choice, and college course choices in the mathematics and science components of STEM. They concluded that males had higher mathematics self-efficacy as compared to females, which was lower. Males also

exhibited higher self-efficacy with regard to the choice of mathematics as a major or any science field that had a component of math. The males also had a lower level of stress when enrolling in courses in mathematics and/or science. On the contrary, Lent, Larkin, and Brown (1989) noted when they researched 17 females and 53 males relating to self-efficacy in mathematics and science interests, gender differences in self-efficacy did not exist. They attributed the result to obtaining the sample size from an undergraduate career course that emphasized science and engineering careers, as the groups of individuals as a whole were interested in those careers that were more balanced. However, they did note another difference in Betz and Hackett's (1983) research relating to stress, no matter the career choices that were available to students, women acclimated to the college environment at higher rates than men.

Lent, Lopez, and Bieschke (1993) conducted a similar study relating self-efficacy to career decision-making as did Betz and Hackett (1981). The study in 1993 replicates a study they conducted in 1991 which emphasized the relationship of mathematics self-efficacy to the student's decisions-making process of enrolling into mathematics courses. Second, they examined achievement, self-efficacy and the participant's career interest. Finally, they wanted to see the relationship among self-efficacy, enrollment, and academic performance. In their research, they agreed with Betz and Hackett (1981) that "… mathematics skills are a prerequisite to participation in a wide variety of career fields… [therefore, enrollment in mathematics courses becomes essential to success in pursuing a certain range of careers]" (Lent, Lopez, & Bieschke, 1991, p. 425). The sample size for this study consisted of 166 students divided into 59 males and 107 females. The results revealed that self-efficacy in mathematics correlates with choosing

majors in science and mathematics, and men had higher self-efficacy than women (Betz & Hackett, 1981, 1983; Lent et al., 1991, 1993; Glynn et al., 2011).

Career Decision-Making for Students with Disabilities

Career decision-making by students with disabilities can be shaped through the influence of others and the student's personal life experiences as they grow into adulthood (Bandura 1994; Glynn et al., 2011). These influences could enhance the development of the student or impede their growth and decision-making abilities as it relates to career choice. This section will detail the literature on barriers (discouragement) and influences (encouragement) that may impact students with disabilities and the career decision-making path that they select regarding a career in a STEM field.

Barriers or discouragement to Students with Disabilities

There are various barriers that discourage students with disabilities regarding their choice of career and these barriers can cause eventual interference with their academic success in higher education. There are individuals who surround students with disabilities and believe that the math and science fields are only suited for a particular population of individuals. This section will detail the literature that relates to the perception of the type of barriers that students with disabilities encounter when selecting STEM field majors at postsecondary institutions because of their relationships with advisors, counselors, parents, high school teachers and college instructors.

Advisors and counselors. Advisors and counselors can be involved in the academic and career decisions of the students with disabilities at any phase of their educational process. Conyer's (2002) research drew attention to the "disability culture" that is defined as a group of students that are "largely unrecognized" by counselors in

comparison to other multicultural groups in the diverse population of students at educational institutions (p. 173).

Hitchings et al. (2001) studied 97 students with learning disabilities from three postsecondary institutions consisting of 54 females and 43 males in a qualitative study consisting of semi-structured interviews. The results revealed that, "a high school counselor told a college senior who had been accepted into a graduate social work program to become a cosmetologist instead because she wasn't "smart enough to go to college" (Hitchings et al. 2001, p. 11). Another student in his first year of college recalled going to his college counselor and asking about suggestions on career materials for his major in graphic arts, and the counselor then stated that "wasn't exciting stuff" (Hitchings et al., 2001, p. 12). Additionally, four students were told that they needed to go to vocational school because they were not college material because of their grades. Hitchings et al. (2001) added secondary education as a variable in the study, and only eight percent of the students met with the counselors in the years prior to attending college with "only six out of 44 students with disabilities reported being "actively" involved in their transition plans during high school (p. 13).

Parents. There was research reported by Jones (2008) that included the following statements made by parents to their children who were prospective STEM students: "I'm not good in science," "I don't have the engineering gene," "I'm doing fine without mathematics skills," and "I didn't need the Internet when I was in school" (p. 9). In research conducted by the Bayer Corporation (2010), a mid-career Asian female chemist stated, "I was the first in my family to go to college. There was just a complete lack of understanding. They were a very traditional family in their views that boys do

everything" (p. 15). In that Bayer Corporation (2010) research of 1,226 women and underrepresented minority chemists and chemical engineers, 26 percent of the participants reported that a parent or a family member discouraged their pursuit of a STEM career. When asked in general if anyone "had ever been discouraged…during the course of their successful pursuit of a STEM career,..40 percent [said that] they were discouraged" (Bayer Corporation, 2010, p. 21).

Smith, English and Vasek (2002) evaluated in their research the parents' involvement in the transition process of college freshmen with learning disabilities in a quantitative survey given to 60 students who were provided services at the Baylor University disability support services office. They found that parents were not savvy about the support services or even where they were located on the campus that their child was attending. They concluded that the parent unknowingly contributed to the student's lack of ability to become more independent. The students had been more passive regarding their educational plans in secondary school and needed to become a self-advocate during their freshman year on campus even though they had an Individualized Transition Plan when entering college.

High school teachers and college instructors. A barrier that is important to note is the bias of being a certain gender or having a certain level of intelligence to be a prospective student who would enter a STEM career. These stereotypes have been documented in the research that reveal there are certain perceptions of what types of courses and college majors men and women should consider that would influence which career they may choose (Bayer Corporation, 2010). It has been stated that men are stronger in math and science courses than women (Bayer Corporation, 2010; Hill et al.,

2010). According to Hill et al. (2010), "When girls and women believe they have a fixed amount of intelligence, they are more likely to believe the stereotype, lose confidence, and disengage from STEM as a potential career when they encounter difficulties in their course work" (p. 35). Dweck (2007, 2010) has researched how educators who praise students' intelligence regarding the effort they exert to complete a task will put the student in a particular set of mind called a "fixed mind-set" (p. 34). This would be described as a student just caring about how others will think of them as opposed to is described as a growth mind-set which would be a student emphasizing the process of how he or she learns.

The literature has revealed that the individuals who are scientists and engineers are not necessarily the individuals who earned the highest grades in math and science, therefore according to Hill et al. (2010) in research conducted by Weinberger,

> Less than one-third of college-educated white men in the engineering, math, computer science, and physical science workforce scored higher than 650 on the SAT math exam, and more than one-third had SAT math scores below 550—the math score of the average humanities major. Even though a correlation exists between high school math test scores and later entry into STEM education and careers, very high math scores are not necessarily a prerequisite for success in STEM fields. (p. 21)

According to Hitchings et al. (2001), previous research that they reviewed in the literature regarding factors that impacted high school students and college students with disabilities during career decision-making process yielded that following assumptions

> First, the type and severity of a disability…can reduce exploratory activities of an individual during childhood, adolescence and young adulthood. Second …the high school years may be directed at academic remediation or physical intervention that … [could] be spent in career exploration and preparation activities. Third, many parents are overprotective and attempt to advocate for their sons or daughters, particularly in career development and related areas. Fourth, many individuals with disabilities have attributes that impede the career decision-making process…external locus of control, fear of failure, outer directedness and lack of goal orientation. (p. 8)

Ninety-seven students were given semi-structured interviews based on two components their understanding of career development and their ability to be able to define their disability. When the students were asked about their career goals, "students majoring in education or health-related careers (30%) had more specific goals than students in other majors," and among them "only 4 students (4%) expressed very specific goals" (Hitchings et al. 2001, p. 11).

Influence or Encouragement for Students with Disabilities

Advisors and counselors. Advisors and Counselors are both groups of individuals who have the ability to empower the student in their care at educational institutions. Field, Sarver, and Shaw (2003) identify that "a critical goal for personnel who work in college Offices for Students with Disabilities and other college personnel (e.g., administrators and faculty) are the long-term development of self-determined adults" (p. 343). A review of the literature indicated that the concept of self-determination has been referred to in various articles relating to students with disabilities

and their goal for success in their postsecondary education and future employment. According to Field, Sarver and Shaw (2003),

> Self-determination is a combination of skills, knowledge and beliefs that enable a person to engage in goal-directed, self-regulated, autonomous behavior. An understanding of one's strengths and limitations together with a belief in oneself as capable and effective are essential to self-determination. When acting on the basis of these skills and attitudes, individuals have greater ability to take control of their lives and assume the role of successful adults in our society. (pp. 339-340)

Accommodations and support.

Advisors and counselors can be proactive in identifying to the students and parents the academic differences between secondary and postsecondary education during the transition process. In secondary education, the modification of exams and assignments is directed by the special education teachers and therefore communicated to the regular education teachers regarding the accommodations necessary for each student's needs (Boyer-Stephens et al., 2010). In the postsecondary system, the students must possess the skills of organization, planning and the ability to study independently, as students are responsible for themselves (Smith et al., 2002). Students with disabilities have added stressors of increased workloads, larger classes, and increased social pressures due to the change in the culture when transitioning to the postsecondary system. The students will have to be able to organize their course planner in order to go to classes in multiple buildings (Boyer-Stephens et al., 2010).

Transition into postsecondary education.

Deciding to go to college is a major decision and can be very stressful to those who are not academically prepared. Therefore, in order for these students to have a successful transition, there has to be adequate communication and an understanding of the term "transition" between the secondary and postsecondary schools and the student (Smith et al., 2002). Transition is a multifaceted process that can only be successful if there is a bridge between the secondary and postsecondary educational systems. This increase in communication prior to and during transition can avoid misunderstandings and reduce the stress and misunderstanding about procedures for the parent, student, or provider of services.

In a report from the National Governor's Association (2007), "…nearly three out of 10 first-year college students in the United States are placed immediately into a remedial course" (p. 8). It is because of the decrease in emphasis of taking basic math and science coursework in high school. This can decrease the success rate and student interest in taking and completing coursework in order to obtain a degree in the STEM field disciplines. The National Governor's Association (2007) also adds that "[t]he community college system…spends an estimated $1.4 billion annually on remediation in math for inadequately prepared freshmen" so they can start their program plan at their institution with more confidence (p. 8).

According to Mellard (2005), "the transfer to postsecondary educational settings to the sequential process of a student completing secondary school requirements and planning and participating successfully in further formal educational activities in a degree or certification program" (p. 2) is of great importance. The literature identified problems

with learning disabled students facing transition to postsecondary education that included the lack of a familiar model of services, institutional variations in the type of services that are provided, and the understanding of their legal rights at each level of the process (Trainor, 2008). "Studies of college students with learning disabilities revealed that they had greater difficulty handling academic demands, adjusting to change, dealing with criticism, and adjusting to university life" (Heiman & Precel, 2003, p. 248). This also could be considered an overwhelming time period for their families and the individuals at the institutions who are involved with this transition. There can also be a misperception by the students and their families that the services provided at the secondary level are the same as the services at the postsecondary level.

Smith, English, and Vasek (2002) reported that the high school student needs to be provided with the appropriate skills in order to experience a successful transfer process from secondary education to the postsecondary education environment. This preparation is extremely important for all prospective college freshmen whether or not he or she has a disability. To have a successful transfer, it is imperative to distinguish the issues students with disabilities encounter as they would enter the postsecondary system of education. The issues identified by Smith et al. (2002) are:

> 1) being unprepared for responsibility; 2) managing free time; 3) being overwhelmed by workload; 4) learning time management skills; 5) making new friends; 6) missing academic support of parents; 7) telling others of their disability; 8) failing classes; 9) being distracted and not being able to focus; and 10) being realistic about how the disability affects their goals and ambition. (p. 492)

According to Heiman & Precel (2003), learning disabled students in college have an increased stress level that is caused by the academic load and the time it takes to address their responsibilities and tasks. Services can be provided and accommodations can be made in the educational environment if the institution is aware of the needs of those students. This wide range of support services has been documented by research done by Madaus (2005), and are presented as:

> Decentralized services [which includes a] formal contact person, limited support services, few established policies, [and] students [are] dependent on sympathetic faculty; Loosely coordinated services [which includes a] formal contact person, generic support services and accommodations available, peer tutors available, students referred to other on-campus resources; Centrally coordinated services [which includes a] full-time program coordinator, services housed in disability office, accommodations provided, established policies and procedures, emphasis on student self-advocacy, adaptive technology available, trained disability specialists available, individualized support available, and individualized support plans developed. (p. 34)

The faculty and staff at both the secondary and postsecondary institutions must understand the definition of transition and be able to communicate with each other in assisting the student during that transition. As revealed by Trainor's (2008) research, transition services is defined from The Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 as:

> a coordinated set of activities for a child with a disability that— is designed to be within a results-oriented process, that is focused on improving the academic and

> functional achievement of the child with a disability to facilitate the child's movement from school to post-school activities, including postsecondary education, vocational education, integrated employment (including supported employment), continuing and adult education, adult services, independent living, or community participation. (p. 153)

At the postsecondary level the students are required to fulfill the requirements of each course. The institutions expect a standard of excellence that also requires every student to be treated with the same degree of equality, however that "[e]qual treatment can be a handicap for students with disabilities" with the reason being that "…their disabilities mean that they are not able to work on an equal footing…" with their peers (Mellard, 2005, p. 7). Findings by Madaus, Ruban, Foley and McGuire (2003) emphasized that the better the "postsecondary experience," the more likely a student with a disability will retain a job in the workplace (p. 159). The more the students can feel included, comfortable and part of the institution's system, Smith et al. (2002), agree that the student's self-worth with disabilities is amplified and they feel a greater sense of belonging in the community at large.

The students who have high levels of self-efficacy may be able to transition in a more positive way into the Science, Technology, Engineering, and Mathematics fields. Madaus et al. (2003) states in relation to the learning disabled that, "…challenging and stressful activities require persistent effort, [and] people with higher levels of self-efficacy are more likely to persevere and succeed in the face of challenges" (p. 160).

Parents. Parents who are involved in the education of their children are a positive influence and help build self-efficacy, instill motivation, and challenge students to attain

more education to provide for a future career (Bandura, 1994). Zimmerman, Bandura, and Martinez-Pons (1992) noted in their research that the children set lower goals than the parents. The results revealed children did not meet the high aspirations that the parents set until experiences were created for their children to feel that they could accomplish those goals academically.

Bandura, Barbaranelli, Caprara and Pastorelli (2001) developed a study to identify how children attain their self-efficacy in choosing a specific career and how their decision may affect the plan they pursue in developing their career choice. This research was conducted using 272 children in which 142 were males and 130 were females from two middle schools in a residential area of Rome, Italy, including their teachers and mothers of the children. In the school system when the students complete middle school, they have to choose from a total of 17 educational systems. Perceived self-efficacy was measured before the children ranked 69 career choices. The authors concluded that the children whose parents participated in their educational development created more opportunities for their child and supported them to be able to pursue a postsecondary education. With such support and high aspirations, the children had an increased self-efficacy for those careers in science, education, literary, and medicine (Bandura et al., 2001; Bandura, 1994).

High school teachers and college instructors. Educators spend many hours with the students and can be a major influence in various ways inside and outside of the classroom. Institutions are motivated to increase the diversity of students on their campuses. Roberts, Hye, Brown and Cook (2011) reported an "…increase in higher education diversity includ[ing] 35.35% of students being of minority status; 11.3% of

students reporting a disability;45.3 % of students attending part-time, and 21.5 % of students being ages 25 to 34 with 18.4 % being over age 34" (p. 4). In creating a diverse educational student body, educators need to have insight in regarding the diverse ways that students with disabilities may need to learn in addition to the traditional ways that exists. In increasing diversity in STEM fields, Perna et al. (2009) conducted a qualitative case study analysis at Spellman College that demonstrated how faculty involvement in promotion of peer group relationships, change in curriculum to encourage academic progress, encouraging increasing self esteem, and increasing self confidence in the math and science fields helped with the success of African American women. A student shared her interaction about a faculty member: "[Spellman] professors will spend time with you until you understand. They will sit there and work with you, work with you and work with you" (Perna et al., 2009, p. 14). A math professor shared: "Math is one of those fields that, sometimes, women can be intimidated by and I need to let them know that they can do math. They can do anything they set their minds to" (Perna et al., 2009, p. 13).

Universal Design and awareness of student's learning styles are ways that educators can help influence career decision-making for students with disabilities who pursue STEM field disciplines.

***Universal Design*.**

Orr and Hammig (2009) explored a research based teaching design called Universal Design for Learning developed by the Center for Applied Special Technologies. The goal of Universal Design for Learning is to help instructors in postsecondary education develop their approach to instruction in focusing on students

with disabilities according to their strengths and weaknesses. The students will learn on a continuum that best fits their ability to grow in their learning experiences. As they progress in their growth in subjects such as sciences and math, their confidence increases in choosing a major in one of the STEM field disciplines. An instructor's identification of a student's learning style encourages a design of each lesson considering the student's strengths and can help the student engage in the curriculum in a more meaningful way. One size fits all, or instructing the same way for all individuals, is not the best approach to getting to the learner. There needs to be a balance of approaches to fit the student in the way that it would be the most beneficial to each of them individually. According to Roberts et al., Universal Design was mentioned emphasized eighteen times in the Reauthorization of the Higher Education Opportunity Act of 2008 with one reference being, "… making postsecondary education more accessible to students with disabilities through curriculum development, consistent with the principles of universal design for learning" (2011, p. 6).

Orr and Hammig (2009) researched two groups of randomly selected learning disabled students which were assigned to be instructed in two different ways in relationship to science text comprehension. A traditional group of students was "instructed to read and listen to text passages then answer comprehension questions," and was compared to a "strategy group where students were taught to underline key points, use self-dialogue, and write lists of comparison/contrast details" (Orr & Hammig, 2009, p. 190). In comparing the two groups, the outcome of the study revealed that the strategy group exceeded in comprehension.

Learning styles.

Hargrove, Wheatland, Ding, and Brown (2008) did a study exploring the relationship of learning styles on student's GPA, major, and gender. This particular study was completed in a School of Engineering at Morgan State University. Four types of learning styles that were reviewed were Accommodator, Converger, Diverger, and Assimilator. The Accommodator is a person that is hands-on and relies on others for information. The Converger is the type of person that likes to use his or her practical side and prefers to work alone on tasks. The Diverger will take an idea, reflect on it and think of all the things that can be done with that specific concept in mind. The Assimilator is a person who is "less interested in people and use of theories [and it is] more important that theory be logically sound and precise." (Hargrove et al., 2008, p. 38).

The three STEM majors that were examined were Civil, Electrical and Industrial Engineering. The results of the study revealed that the Assimilator learning style was highly reflective of the three engineering majors; the GPA was at the highest average with the Convergers and at the lowest GPA for the Divergers (Hargrove, Wheatland, Ding, & Brown, 2008, p. 44). If institutions could find ways to provide professional development training for faculty members to identify and understand the learning styles of the students in their charge, it could be "[a] major step towards increasing a student's learning power and learning experiences…" (Hargrove et al., 2008, p. 38).

Conclusion

This literature review has explored the groups of individuals who may choose to select as an academic major the disciplines of Science, Technology, Engineering or Mathematics. The United States Executive Office and government understands that these

fields are lacking in growth, which in turn can affect future innovations in the United States of America and could also interfere with its leadership role in the world (National Academy of Sciences, 2007; National Governors Association, 2007; The White House, 2009; National Science Foundation, 2010).

Barriers exist to impede the growth of individuals in the S.T.E.M. fields, especially relating to minorities and students with special needs, including stereotypes about gender to the amount of intelligence an individual should have to be in a S.T.E.M. field career (Heiman & Precel, 2003; National Governors Association, 2007; Hargrove et al., 2008; Jones, 2008; Kuenzi, 2008; Chen & Weko, 2009; Perna et al., 2009; Bayer Corporation, 2010; Hill et al., 2010; National Science Board, 2010). Furthermore, the type of learning style that a student adopts to understand concepts could deter him or her from entering a science field if the teacher or instructor at the institution feels inadequate to be able to teach the student according to his or her choice of learning style (Hargrove et al., 2008; Orr & Hammig, 2009). Students with disabilities need to have the ability to explore all types of educational opportunities without barriers or undue influence from others.

Valuable information was gained in exploring the components of the transition process of students with special needs into the postsecondary system of education. These results have revealed that to be successful within the transition process there must be transition planning coupled with communication by the advisors and counselors to bridge the gap between the secondary school and the postsecondary institution (Madaus, 2005; Mellard, 2005; Madaus & Shaw, 2007; Smith et al., 2002).

To be successful in any career that they choose, students with disabilities potential to achieve a high self-efficacy should be nurtured. The more challenging the educational experience is in attaining a career, such as in the Science, Technology, Engineering and Mathematics fields, the more the institutions needs to be aware of in order to provide in services to create the best possible learning environment for the student (Madaus et al., 2003).

CHAPTER THREE

METHODOLOGY

Introduction

President Barack Obama started an initiative called “Educate to Innovate” to increase the workforce in the Science, Technology, Engineering, and Mathematics (STEM) fields in order to keep the United States of America globally competitive. The growth in the workforce is due in part to the employment of college students. In order to increase the presence of STEM majors in the workforce higher education institutions need to increase student enrollment into the STEM majors. One component of the president’s initiative is the need to increase the underrepresented minority groups in STEM fields. This study focused on college students with disabilities who did and did not have an interest in STEM disciplines. There is a scarcity of literature regarding the promotion, support, and encouragement of this group of individuals and their involvement in STEM disciplines. The purpose of this research study was to document experiences and perceptions of students with disabilities who pursue, and may consider pursuing, careers in the STEM field disciplines by exploring the career decision-making self-efficacy of students with disabilities. This study documented the level of influence that the students with disabilities had or may not have had encountered from parents, friends, advisors, counselors, and instructors as they managed their decision-making choice relating to their academic major/career in the STEM or non-STEM field disciplines.

This chapter will explain the research study design and specify the research questions, hypotheses, sample setting, sample participants, sampling procedures, instrumentation, and data analysis.

Research Design

This study was a quantitative research design model (Creswell, 2008). This design choice aided in the safeguarding of the identities and anonymity of the population of participants involved in this study. The quantitative study included surveys and questionnaires that were first distributed online. A protocol modification was approved to eventually include a paper version. The participants were contacted by email by an authorized person from the institution's Disability Access Services Office. In the survey and questionnaire, the researcher explained in writing to the participants that care would be taken to ensure that their survey responses were anonymous (Alreck & Settle, 2004; Dillman, Smyth, & Christian, 2009; Granello & Wheaton, 2004). The online surveys were voluntary by the participants. Implicit consent was used since completing the survey was voluntary. The use of online surveys helped decrease human interaction which can helped reduce bias that may have been imposed into research if a survey was completed by interviewing the participants in person (Alreck & Settle, 2004). The data collected was analyzed using descriptive statistics and Analysis of Variance data analysis procedures.

Research Questions

The following research questions were developed to address the limitation of literature regarding students with disabilities, to career decision-making and the STEM field disciplines.

Research Question One: Do students with diagnosed disabilities receive academic and/or personal support when selecting Science, Technology, Engineering, or Mathematics majors?

Research Question Two: Do male college students with diagnosed disabilities in STEM and non-STEM majors have a different perception of their career decision self-efficacy than female students with diagnosed disabilities in STEM and non-STEM majors?

Research Question Three: Does the students' disability type influence his or her confidence level results as it pertains to the career decision self-efficacy scores?

Research Question Four: Do students with diagnosed disabilities differ in career decision self-efficacy by college major choice and type of disability?

Hypotheses

The following hypotheses were used to assist in answering the research questions in this study.

Hypothesis One: Students with disabilities will perceive a higher frequency of academic and /or personal support when considering enrollment in Science, Technology, Engineering, or Mathematics as academic majors.

Null Hypothesis One: Students with disabilities will not perceive a higher frequency of academic and/or personal support when considering enrollment in Science, Technology, Engineering, or Mathematics as academic majors.

Hypothesis Two: Male students with disabilities in STEM or non-STEM majors will score higher in confidence than female students with disabilities in STEM or non- STEM majors with regard to career decision self-efficacy.

Null Hypothesis Two: Male students with disabilities in STEM or non-STEM majors will not score higher in confidence than female students with disabilities in STEM or non-STEM majors with regard to career decision self-efficacy.

Hypothesis Three: There is a relationship between the student's type of disability and career decision self-efficacy scores.

Null Hypothesis Three: There is no relationship between a student's type of disability and career decision self-efficacy scores.

Hypothesis Four: There is a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores.

Null Hypothesis Four: There is not a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores.

Sample Setting

The sample setting was one public, urban Midwestern university that is part of a four campus university system. In February, 2013, the official institutional campus enrollment total was 13,909 students (Silman, 2013). This total reflects both full time and part time undergraduate, graduate and professional student categories.

Sample Population and Sample Selection

Convenience sampling was used to select participants for this study because they were accessible to an authorized person at the institution and the data compiled from the survey was provided by that authorized person (Creswell, 2008). The sample size as of the Winter 2013 Semester included 340 college students with disabilities who were undergraduate, graduate or professional students that received services at the institution's Disability Access Services Office (L. Williams, personal communication, July 19, 2013). The institution identified several categories of disability types as: Deaf/Hard of Hearing, General/Medical, Mental Health, Orthopedic, Mobility/Wheelchair, Blind/Low Vision, Specific Learning Disorder (LD), Attention Deficit Disorder (ADHD), and LD/ADD (Attention Deficit Disorder) (L. Williams, personal communication, August 18, 2011, L. Williams, personal communication, July 19, 2013). All of the disability type categories of participants identified by the institution were considered in order to increase the response rate during the data collection process. The identity of each participant remained anonymous at all times during the course of this study.

Sampling Procedures

Participant Selection

The selection of the participants was conducted by an authorized person in the Disability Access Services Office of the university under study. The individual had a list of email addresses of all the students who received accommodations from that department at the university. The authorized person contacted by email each student who had been identified as having a disability to invite them to participate in the survey. Their participation was anonymous and voluntary.

Survey Software

The survey software that was used is SurveyMonkey. It has an integration component that is compatible with the IBM Statistical Package for Social Sciences Integration (SPSS). This software has enhanced SSL security, which is sensitive data protection, and is Section 508 compliant (SurveyMonkey.com). Section 508 is part of the Rehabilitation Act, which includes technology access for individuals with disabilities who work for any federal agency (section508.gov). In compliance with Section 508, SurveyMonkey has developed keyboard access for the mobility impaired and created color contrast for individuals with low vision. The website is secured with the researcher having the only access by use of a User ID which includes password protection.

A paper version was eventually approved to be used by the respondents as part of the project protocol. This approval process is explained further in this chapter in the Survey Collection Protocol section.

Presentation of the Survey Instrument

The student participants were notified by email and assured that the survey was completely anonymous and their identities would remain unknown to the researcher. There was an informed consent document at the beginning of the survey that reiterated anonymity, including the participant's ability to stop the survey at any time or to leave questions blank. Once the participant had chosen to complete the survey online, he/she was directed in the email statement to a link to SurveyMonkey. The participant who chose to complete the paper version did so at the Disability Access Services testing areas. A time was selected by the authorized person in the Disability Access Services Department when these participants were the most accessible for delivery of the

invitation email in order to increase the response rate. There were scheduled reminders provided during one week, two week, and three weeks intervals. The survey data collection was to end after a one-month time period but was extended (Chapter 3, Table 1) with approval of the Institutional Review Board in order to increase the chances of a high response rate. Incentives initially were not used but a modification to include a gift card incentive was approved due to the low response rate.

Instrumentation

Since the purpose of this research was to document the experiences of students with disabilities in pursuing careers in relationship to their career decision self-efficacy, the Career Decision Self-Efficacy Scale-Short Form was used for this study. In addition, a demographic survey and supplemental questions were included which supported and supplemented the main survey instrument.

Study Measures

Career Decision Self-Efficacy Scale-Short Form. The Career Decision Self-Efficacy Scale was authored by Nancy E. Betz and Karen M. Taylor (1996, 2001) for the use with college students and based on Alfred Bandura's "self-efficacy expectations" concepts and the individual's ability to make career decisions (Plake & Impara, 2001). The short form is composed of 25 questions that use a 5 point Likert scale (See Appendix A). The Likert scale responses range from "No Confidence at all" which is labeled "1" to "Complete Confidence" which is labeled a "5" (Betz, Klein & Taylor, 1996; Banish, 1999; Betz &Taylor, 2001; Plake & Impara, 2001).

A Likert scale is designed for participants to choose a statement that matches a number, usually on a ten-point or a five-point scale. The Likert scale has advantages

regarding its use due to its flexibility, simple format, and ability to provide a summated score (Alreck & Settle, 2004). The 25 item short form was documented with internal consistency reliability with an alpha value of .94 and a test-retest reliability of .83 performed with college students (Betz, Klein, & Taylor, 1996; Betz & Taylor, 2001; Plake & Impara, 2001). Due to the instrument being copyrighted, a survey example is in Appendix A.

On May 9, 2012, this researcher received a copy of the Career Decision Self-efficacy Scale-Short Form survey instrument and a copy of the manual to score the survey instrument from the publisher, Dr. Nancy Betz. She also gave electronic mail permission for use of the survey instrument and the manual documents (See Appendix B). In an update, the survey was sold to Mindgarden; a psychological instrument publishing company after the researcher had already been given permission to use it by the original publisher.

Demographic Survey. The demographic form contained personal demographic information about the participants. Demographic information included variable information such as gender, year in school, marital status, age, ethnicity, transfer student information, academic major, academic college, and disability type. The Demographic survey helped measure "the types of people in the sample" and helped "make comparisons of other results among the demographic groups" (Alreck & Settle, 2004, p. 440). The demographics were placed at the end of the survey. The demographic survey is in Appendix C.

Supplemental Questions. Two supplemental questions were added after the Career Decision Self-efficacy Scale-Short Form. They were on academic major/career

influence and STEM academic major/career influence. These two questions also supported and supplemented the main survey instrument. The questions are located in Appendix D.

Data Analysis

The data is stored and secured in the SurveyMonkey database system, which has the ability to be exported into the SPSS software. The information in the SPSS software system is only accessed by the researcher using a specific password and has only been viewed by the researcher and an advisor. In addition, all data that is digital will be stored on a password-protected computer and in a locked office. All data that is on paper is in a locked file cabinet.

Data analysis included descriptive statistics in order to create frequency distribution tables for means, and create standard deviations for all demographic variables, instruments items, and study variables. The use of descriptive statistics assisted in summarizing, clarifying, and identifying trends in the data. The identification of how the scores are varied and how one score may stand out in comparison to another was useful for answering the research questions.

The dependent variable was the career decision self-efficacy total scores that were calculated from the Career Decision Self-Efficacy Scale-Short Form. The independent variables in the study were gender (male, female), academic major (STEM, non-STEM), and disability type that were measured from the Demographics Survey. The Career Decision Self-Efficacy Scale-Short Form and the Demographics Survey was used to address the Research Questions and Hypotheses of 2, 3, and 4.The Supplemental Questions measured the independent variables of student perceptions of academic and/or

personal influence/support on the dependent variable – frequency of academic and/or personal influence/support (Research Question 1/Hypothesis One).

Following the selection of the Decision-making Tree for Statistical tests to analyze the data by Mertler and Vannatta (2005), Analysis of Variance (ANOVA) methods was chosen. The Decision-Making Tree for Statistical Tests is used to organize the type of research methods that will be based upon the research question and "the number and type of variables" (Mertler & Vannatta, 2005, pp. 19-20). An ANOVA provides information regarding differences among two or more groups and there will be one dependent (quantitative) variable, and one independent (categorical) variable that can have two or more categories which allowed the researcher to determine the significance of mean group differences (Mertler & Vannatta, 2005).

The categorical variables are gender, type of disability, levels of academic and/or personal support (encouragement), and academic major (STEM and Non-STEM). The quantitative variables are the career decision self-efficacy score and the frequency of academic and/or personal support.

An F-ratio is a statistic that is calculated by ANOVA, which reveals the significance of the hypothesis (Alreck & Settle, 2004; Creswell, 2008). Alreck and Settle (2004) state when interpreting ANOVA to start with the computation of "the mean value of the dependent variable for each category of the independent variable and determine if the means for the groups in the analysis are significantly different" (p. 321). Alreck and Settle (2004) state that "if the F-ratio from the ANOVA is larger than the value listed in the table, the differences in means between groups will more likely be statistically significant" (p. 321). A one-way ANOVA analysis will be used to determine the "effect

that one factor (various levels of the independent variable) has on one dependent variable" (Mertler & Vannata, 2005, p. 67). This analysis was used for Hypothesis Two (2X2 one-way ANOVA; STEM/non-STEM major and Male/Female), Hypothesis Three and Hypothesis Four (2X3 one-way ANOVA; STEM/non-STEM major and type of disability).

Survey Collection Protocol and Modifications

The students with disabilities participants from the university under study took a voluntary online survey in which they remained anonymous. To remain anonymous, the DAS Program Coordinator, an authorized person, was the principal investigator's conduit to the students.

The DAS Program Coordinator had the contact list of email addresses of all the registered students who receive accommodations from the DAS Department at the university. This authorized individual sent all of the email invitations with an attached informed consent form to each student who received accommodations through the university's authorized Information Technology Services programmer. The email invitation invited students under study to participate in the voluntary online survey beginning in late November Fall 2013. The students with disabilities participants that were contacted by the email invitation remained anonymous.

The email invitation was designed by the principal investigator and was sent to the DAS Program Coordinator for distribution. The email explained to the participants that their participation would be voluntary and anonymous. The invitation also included the purpose of the research study, the security of the data collection, and an attachment of

the Consent form. Each student participant was able and directed to view and print out, if desired, the Informed Consent form.

Within the email invitation and the consent form was an explanation to each participant of how to provide their consent to participate in the research, how to withdraw by exiting out of the survey, and how to print a copy of the consent form for the participant's records. It was also explained within the consent form that if any questions or concerns would arise regarding the study, the participant could contact the DAS Program Coordinator or research advisor by phone or email. The DAS Program Coordinator was the participant's primary contact to address any of the questions or concerns about the research. If there was a question or concern, the DAS Program Coordinator was informed to withhold the participant's identification from the Principal Investigator and the Faculty Advisor and relay only question and concerns regarding the study, in order that the participant of the research would remain anonymous.

After the participant read the attachment of the Informed Consent form, the student was granted access to a SurveyMonkey survey link that was embedded within the Invitation to Participate email. It was stated within the email invitation and the consent form that when the participant clicked on the SurveyMonkey survey link to take the survey, his/her participation indicated that he/she has read the consent form and has been given the opportunity to ask questions to the DAS Program Coordinator and thereby consented to participate in the research that had been described within the documents.

The survey software used was the Gold professional plan of SurveyMonkey. This software was chosen because it has enhanced SSL security, which is sensitive data protection and is compliant with Section 508 and Section 504 of the Rehabilitation Act of

1973. The Gold professional plan also has integration capability with IBM SPSS Statistical software.

Friendly reminder email messages were sent to the students by the principal investigator by way of the DAS Program Coordinator. When the DAS Program Coordinator sends a mass email message to the students with disabilities, the email messages are transmitted to a dedicated programmer in Information Technology Services. Even though the potential participants knew the email messages were sent by the DAS Coordinator, the response was very low.

Modification One

The first request for a modification to the original proposal was sent to the Institutional Review Board at the beginning of February 2014 because of a low response rate of the population of students under study. With an initial return of only 12 surveys, it would be a challenge to generalize the results.

The request was to include a hard copy of the questionnaire as an alternate method of distribution and response to the online survey. To maintain the anonymity of the student population, the DAS Department continued to be the conduit for the students. The DAS Program Coordinator distributed the survey randomly to the student population under study as they visited the DAS Department. The principal investigator had no contact with the students.

The office did control for those students that had already taken the online survey. The DAS Program Coordinator would ask each student that is randomly approached if he/she had taken the online survey. If the student had taken the online survey, then he/she would not participate in completing the hard copy of the survey. If the student had not

taken the online survey, he/she was given the opportunity to voluntarily complete the hard copy of the survey. This prevented any duplication of a prior participant's response.

The hard copy of the online survey contained an Informed Consent document that was attached. The hard copy of the online survey did not contain identifying information of the participants so that each participant remained anonymous.

All completed survey documents were placed in a folder in a secured area in the DAS Program Coordinator's offices until collected by the principal investigator from the DAS Program Coordinator. Once the surveys were removed from the DAS Department, the principal investigator stored the survey documents in a locked file cabinet in a locked office.

The Institutional Review Board Full Review Committee only meets once a month. This modification request was approved by the Full Committee Review of the Institutional Review Board two weeks after it was submitted.

Modification Two

A second modification request was sent to the Institutional Review Board at the beginning of March 2014 because there were only two additional surveys completed after the last modification. Therefore the total number of participants responding to the survey was 14. In the first part of the second modification request, the principal investigator requested to be present in the controlled environment of the DAS Department to explain the importance of the research study, the purpose of the research study, the voluntary participation, and the details of the Informed Consent to the potential participating students who are provided services at DAS. This was an important part of the request because the response rate continued to be low. The DAS personnel had been very

accommodating in helping with this research study while performing their everyday tasks; however, it did not appear that they had the previously promised time commitment. Anonymity of the population of students under study would continue to be maintained using this controlled environment and would be safeguarded by the following procedure.

After the explanation regarding the research was given by the principal investigator to the DAS students, the principal investigator would leave the student area, DAS Department and building. After the principal investigator left the DAS Department, the DAS proctor distributed the survey to only those students who chose to voluntarily participate in the research survey. The participating students did not provide their names or any other identifying information on the survey instrument. After each participating student completed a survey, the DAS proctor collected the surveys and placed them in a locked secured area within the department. The principal investigator was notified by DAS personnel to return to DAS when another group of students were available to participate. At that time, the procedure that was delineated above started again. When the principal investigator explained the research, the students did not have a copy of the survey instrument. Since the students did not have the survey instrument with them during the explanation of the research, separation of the principal investigator from the survey instrument was maintained.

The completed surveys were collected by the principal investigator in a one to two week interval on a separate date other than the date an explanation was given to a group of students. By returning at a one to two week time period on a day independent of an explanation of the research and leaving the building completely, the researcher was able to maintain the anonymity of those students who had voluntarily participated in the

research study. During that process, the principal investigator had no knowledge of whom had completed a survey and did not have access to any identifying information regarding the student participants.

The principle investigator wanted to increase the response rate. The second part of the second modification request proposed the addition of an incentive for the student population under study who completed a survey, as it would achieve the goal of increasing the response rate. The response rate made it challenging to generalize the results of the study. The incentive details explained to the students the odds of winning. The odds of winning were also included within the Informed Consent form.

The incentive was a weekly drawing for a $10 gift card to the campus bookstore for each DAS student who voluntarily participated in completing a survey online or the hard copy of the survey. The gift cards were provided by the principal investigator to the DAS Department. The DAS personnel managed the incentive drawing and the principal investigator was not present.

The requirements for each student to participate in the drawing included 1) recognition as a DAS student; 2) completion of the survey; and 3) supply of his/her contact information to DAS. DAS personnel collected the contact information as to how each student would like to be notified if he/she won a weekly drawing. DAS personnel selected the winner of the weekly gift card from the collected contact information.

The student was not required to be present to win; therefore DAS personnel contacted and distributed the gift card to each winning student. The contact information of each winning student was removed from the pool of contacts by DAS. The remaining contact information for each participating student remained in the drawing pool so each

participating student would have another weekly chance to win. At the time of second modification request, the odds of winning the drawing was an approximate ratio of 1:340 for registered students from DAS.

As students arrived to the DAS Department to receive services, they were informed by DAS proctors of the new incentive to participate in the survey. In addition, a new Invitation to Participate email message was sent out by the DAS Program Coordinator on behalf of the principal investigator to inform all students under study about the new incentive to participate in the survey.

If the student completed a hard copy of the survey in the DAS Department, he/she could provide his/her preferred contact information when he/she presented to DAS the completed survey instrument. If the student completed the survey online, instructions were provided at the end of the survey regarding the procedure for voluntarily entering the drawing.

The online survey instructions included on the "Thank you for participating" page stated the following:

> Thank you for participating in this survey. By contributing to this research, you have the opportunity to enter a weekly drawing for a $10 gift card to the UMSL bookstore. In order to enter a weekly drawing for a $10 gift card to the UMSL bookstore, please do the following:
>
> 1) Print this page.
>
> 2) Please return this printed page to Linder Williams, Program Coordinator at Disability Access Services at 144 Millennium Student Center.
>
> 3) Provide your preferred contact information on how you would like to be

contacted if you would win the drawing with the print out of this page once you have arrived at Disability Access Services.

4) If you have difficulty or cannot print this page, you can either contact Linder Williams at Disability Access Services at 144 Millennium Student Center or email, linder@umsl.edu and give the code phrase "Spring 2014," instead of the printed page to enter into the drawing.

5) You will be notified from your preferred contact information by Disability Access Services if you have won a drawing. If you did not win, your preferred contact information will remain in the drawing pool so you will have another weekly chance to win. Your odds in winning are 1 in a maximum of 340 participants.

The DAS students who had already completed a survey for this research project prior to this modification request were informed in the Invitation to Participate email message regarding the added incentive. They were directed to contact the DAS Program Coordinator with their preferred contact information so that it would be entered into the drawing pool. Any DAS student that reported to DAS that he/she had already completed a survey for this research project prior to this modification request could have his/her preferred contact information placed into the drawing pool. The principal investigator had no access to the students' identifying information and no knowledge of the winners of the drawings.

This second modification request was returned to the principal investigator by the IRB Full Committee eleven days later for additional modifications. After changes were made to the second modification, the Full Committee Review of the IRB approved the

modification document in April 2014. An updated Invitation to Participate email message and updated Informed Consent form was sent to the DAS Program Coordinator; however there was a delay in sending it to the students with disabilities. The university Information Technology Services programmer that was authorized to assist the DAS Program Coordinator retired and a new programmer was not designated to assist in this project was not assigned. Once the new programmer was assigned, the DAS Program Coordinator went on vacation. These changes delayed the research project one additional semester.

Campus Testing Center

The use of an incentive helped increase the participants' responses to the online survey, however the increase was of short duration. The principal investigator received approval from the IRB Campus Committee to be present in the DAS Department with certain restrictions. The DAS Program Coordinator stated that the students who did arrive at the DAS Department did not come to the department in large groups that would necessitate that the principal investigator should be present.

The principal investigator observed that the accommodation area for test taking was not full with activity with students using the facilities during the Summer 2014 semester that the hard copy surveys were collected. It was stated by the DAS Program Coordinator that the students also choose to take their examinations at the Campus Testing Center (CTC). The principal investigator asked if surveys could be distributed and collected in the Campus Testing Center. The DAS Program Coordinator wanted the principal investigator to wait and see what the response rate results would be of the online survey and of the DAS department hard copy survey from students that arrived at

the DAS department since there was now a gift card drawing incentive open to those students.

This principal investigator waited patiently and subsequently reached out to the Chairperson of the Institutional Review Board upon approval of the research advisor, to see if another modification application must be completed in order to add the CTC as an accommodation site for the distribution of the hard copy of the survey. It was shared with the IRB Chairperson that the dissertation research involved surveying students with disabilities who are registered with the DAS Department. It was also explained that access to these students was provided by the authorized personnel who provide the services to the students, most often when they arrive to take an examination. The current response rate improved from 14 to 51 student responses since the second modification of the protocol included the added incentive; however, it was still going to be difficult to generalize the results to the population under study.

The principal investigator shared with the IRB Chairperson that as an extension of DAS, the students with disabilities have a second location from which to choose when using accommodations to take their examinations. The second location is the CTC. The DAS personnel stated that the students with disabilities were choosing to use the CTC as an extension of DAS Department for their testing accommodations more frequently than using the DAS Department itself. Students were now using the secondary site because CTC is larger in size, its accessibility on campus, accommodations, and the renovations to the DAS Department due to an unforeseen water problem that caused structural damage to the testing accommodation area. The delay in surveying students who use the secondary site directly affected the response rate of this research study.

In order to increase the response rate, the principal investigator could not solely rely upon obtaining access to the students with disabilities within the DAS Department location since the students with disabilities have always had an option to access a second location, the CTC, as an extension of the DAS Department. It was explained to the IRB Chairperson that the procedure and incentive protocol would remain the same. Each student's participation would be voluntary, which included the protection of their anonymity.

The chairperson of the Institutional Review Board concluded that due to the principal investigators description of the situation, there was no need for a modification to add the CTC as a second location because it is always used as an extension of the accommodation services provided by the DAS Department. The principal investigator met with the DAS Program Coordinator to share the Institutional Review Board Chairperson's response. The DAS Program Coordinator immediately contacted the CTC Coordinator. The CTC Coordinator contacted his Dean. The principal investigator received permission to distribute hard copies of the survey at the CTC in September 2014.

Conclusion

This chapter has provided a rationale of the methods that will be utilized in the study. To give the research study strength, a quantitative research design is proposed to gain the best understanding of the data that will be collected from the survey instruments. Anonymity of the population of students with disabilities in the sample will be maintained. The survey instruments will be used upon permission from the respective authors. Reliability and validity of the instruments has been documented.

The results can lead to the discovery of new resources to support these students and open new avenues for understanding the experiences of students with disabilities' journey as they make career decisions that will impact their future. Institutions can explore federal funding sources that may be useful to students with disabilities who are interested in STEM fields. The institution marketing and admissions departments can reevaluate their recruitment protocols for recruitment of students with disabilities which could increase enrollment at the institution. The college advisors and Disability Services Office could also provide support to the Science, Technology, Engineering, or Mathematics students with disabilities and encourage others to pursue those majors if they have not selected a major field of study.

CHAPTER 4

ANALYSIS OF THE DATA

Overview

There is a scarcity of literature regarding the promotion, support, and encouragement of students with disabilities and their involvement in Science, Technology, Engineering and Mathematic (STEM) field disciplines. The purpose of this study is to document experiences and perceptions of students with disabilities who pursue, and may consider pursuing, careers in the STEM field disciplines.

The Career Decision Self-Efficacy Scale-Short Form (CDSE-SF) survey was administered to students who chose to participate. The total scores were determined for each of the participants using a Likert scale 5 level confidence continuum. The participants were also asked to identify those individuals who supported, discouraged or otherwise influenced their academic major choice in STEM and/or Non-STEM field disciplines from family members, friends, advisors, counselors and instructors.

The survey collection extended over four consecutive university semesters at a public Midwestern University with a Fall 2014 enrollment of 17,072 students (UMSystem.edu, para. 3). The survey was approved as an online instrument through an Institutional Review Board (IRB). An email invitation that included the online instrument was created by the principal investigator and was sent by the Program Coordinator of the Disability Access Services to the students with disabilities through an authorized university Information Technology Services programmer.

Several modifications to the original proposal were approved by the Institutional Review Board Full Committee Review due to poor participation of the students with

disabilities. The modifications included adding a hard copy version of the online survey to be distributed by the approved personnel in Disability Access Services (DAS), the addition of a gift incentive to participate, and the request of the principal investigator to have limited access to students in DAS.

There was a decrease in access to the students with disabilities due to unforeseen structural damages to the DAS testing area; therefore there was a request made by this principal investigator that the students can be accessed through the Campus Testing Center (CTC) with authorization of the Coordinator of the DAS. The CTC is an extension service site for the Disabilities Access Services Department designed to conduct online and traditional testing; therefore it became an additional distribution site for the hard copy version of the survey.

This chapter will review the research questions and hypotheses of the study. The details of the data collection, modifications and results of the study will also be presented.

Research Questions

The following research questions were developed to address the limitation of literature regarding students with disabilities, in relationship to career decision-making and the STEM field disciplines.

Research Question One: Do students with diagnosed disabilities receive academic and/or personal support when selecting Science, Technology, Engineering, or Mathematics majors?

Research Question Two: Do male college students with diagnosed disabilities in STEM and non-STEM majors have a different perception of their

career decision self-efficacy than female students with diagnosed disabilities in STEM and non-STEM majors?

Research Question Three: Does the students' disability type influence his or her confidence level results as it pertains to the CDSE-SF scores?

Research Question Four: Do students with diagnosed disabilities differ in CDSE-SF scores by college major choice and type of disability?

Study Results

There were a total of 87 surveys collected over a total of 13 months. The total number of online survey responses was 45 surveys. Two of the online survey responses were excluded because the participants did not complete them; therefore the total number of completed online surveys was 43 surveys. The total number of completed paper survey responses was 42 surveys. The total number of completed surveys for this research study was 85 surveys.

The online survey was released by email through the DAS Program Coordinator at the end of November during the Fall Semester 2013. The response rate was very slow. The ability to obtain a response rate that could be used to generalize the results to the students with disabilities population was very challenging. Two modifications of the original proposal were approved by the Institutional Review Board. An increase in the survey response rate was impacted by the gift card drawing incentive. The principal investigator discovered that the CTC was identified as the location where most of the students with disabilities have chosen to take their examinations. The use of this secondary testing site of the DAS Department successfully provided more access and exposure to the survey which increased the number of students with disabilities

participating in the survey. This produced a significant increase in the survey response rate. Table 1 details the university semesters, sample size and progress of the survey collection.

Table 1

Students with Disabilities Sample Size, Collection Progress, and Response Rates per Semester

Semester	Sample Size	Online Version	DAS Hard Copy Version	CTC Hard Copy Version	Total	Response Rate %
FA 2013	376	8	N/A	N/A	8	2.13
SP 2014	367	4	2	N/A	6	1.63
SU 2014	143	33	4	N/A	37	25.87
FA 2014	380	0	2	34	36	9.47
Total/Average	1266/317	45	8	34	87	27.49

Note. DAS = Disabilities Access Service, CTC = Campus Testing Center, N/A = Not Applicable. Semesters = Fall 2013 (8/19/2013 – 12/04/2013), Spring 2014 (1/20/2014 – 5/18/2014), Summer 2014 (5/19/2014 – 8/09/2014), Fall 2014 (8/25/2014 – 12/20/2014).

Each semester, the students with identified documented disabilities register with the DAS Department in order to receive approval of their specific accommodations. The number of students enrolled during the Summer Semester 2014 listed in Table 1 was reported by the Institution's Information Technology Services Programmer, who is authorized to work with the DAS Program Coordinator. The DAS Program Coordinator reported from a department document labeled "Received Services" the sample sizes for the remaining semesters.

There were 376 students registered during the last week of November of the fall semester of 2013 when the first Invitation to Participate email message was sent to the students with disabilities. As a result, only eight students participated for a 2.13% response rate during the Fall Semester 2013. Two friendly reminder email messages were distributed one week later and two weeks subsequent to that, resulting in zero responses from the students with disabilities.

During the spring semester of 2014 another Invitation to Participate email message was distributed to the 367 registered students with disabilities. Four additional students submitted surveys, bringing the total number of student participates to 12. A modification of the proposal was considered. The first modification of the proposal to include a hard copy version of the online survey was requested by this investigator and approved by the Institutional Review Board. A friendly reminder email message was distributed to the students with disabilities by the DAS Program Coordinator explaining the availability of the hard copy version of the online survey which could be conveniently accessed in the DAS Department. An additional friendly reminder email message was distributed to the students to remind them about the additional access to the survey. During the spring semester of 2014, two additional survey participants submitted surveys. This increased the cumulative total amount of surveys to fourteen surveys, for a 1.63% response rate during the Spring Semester 2014.

Before the summer semester of 2014 began, a second modification request of the proposal was designed. The request included a gift card drawing incentive, which was reviewed and approved by the Campus IRB. The updated Invitation to Participate email message sent to the 143 registered students with disabilities was delayed two weeks. There were two reasons for the delay: The DAS Program Coordinator was unavailable and off campus for a week due to personal matters, and the DAS Program Coordinator was waiting for a new Information Technology Programmer to be assigned to take the place of the former programmer that had retired. Eventually, the new email and new friendly reminder messages were distributed to the students. The addition of the incentive increased the response to 33 student participants for the online survey and four student

participants for the hard copy version of the survey. That resulted in a 25.87% response rate for the summer semester of 2014. At the end of the Summer Semester of 2014, there was a cumulative collection of 51 survey response.

In the fall semester of 2014, the Disabilities Access Services testing extension site was now the preferred location used by the students with disabilities for testing accommodation services. The paper surveys, informed consent documents, and an instruction sheet were left with the staff (See Appendix G). The CTC Coordinator and staff randomly asked the students with disabilities to voluntarily complete the paper survey and participate in the gift card drawing. The coordinator of the CTC, stated that the students were very receptive and most completed the survey when they were asked to participate. Unfortunately, there was a two week time period during the fall 2014 semester in which students limited their presence on campus due to protests in the community which were close to the location of the university. Eventually, more students scheduled their exams at the CTC. During the fall semester of 2014, 34 paper surveys were completed in the CTC and two paper surveys were completed in the DAS Department, for a total of 36 surveys and a 9.47% semester response rate.

Online survey participation ceased near the end of the summer semester of 2014, even though friendly reminder email messages were sent to the students. DAS personnel indicated that they also have had difficulty encouraging students to respond to their university email messages. Upon evaluating the results, an observation was made that the DAS Department had eight participants that filled out the paper survey within 42 weeks after it was introduced to the students as compared to the CTC having 34 participants fill

out the paper survey within nine weeks of the surveys being delivered to that location. The CTC was an asset to this research progressing.

There was an expectation that by the addition of a semester at a time with modifications, the response would increase. The Summer Semester 2014 had the best response rate of participants out of the four consecutive university semester time frame of this research. In Table 1, an average of the total sample size of the four semesters was calculated to be 317 students with disabilities. The cumulative total of participants for this research was 87 students with disabilities. An average response rate for the four semesters was calculated as being 27.49%.

In order to verify that there were no repeat participants during the length of access to the online survey and paper survey, all the demographic responses were evaluated for duplication. This was a concern for the online portion of the survey more so than the hard copy version of the survey. The hard copy version of the survey was distributed by the personnel of the DAS and the CTC. Those approved personnel knew which students filled out the hard copy versions of the survey which prevented duplication of the hard copy versions. No duplicate participants were discovered during the process of the evaluation of the online version and the hard copy version of the survey instrument.

Demographic Results

Demographic questions were asked of the student with disabilities participants within the design of the survey. These questions served to provide the background as to why each respondent may have been influenced in his/her response as a participant in the survey. Of the cumulative total of 87 surveys that were collected, 85 were used in the study. Two of the online surveys were incomplete and had to be discarded. The

demographic variables used included gender, academic standing, transfer status, marital status, age, ethnicity/race, disability type, academic college and field of study within the academic college. Each of the demographic variables is summarized in various tables and explained in the following sections.

Gender, Academic Standing, and Transfer Student Status. Table 2 summarizes the students with disabilities demographic results relating to gender, academic standing, and the transfer student status groups.

The majority of the 85 respondents were female 58.82% (N = 50). The remaining respondents were 41.18% male (N = 35). There were no responses for the "Other" gender option that was designated on the survey instrument.

There were six choices under the academic standing demographic. The majority of the participants were 50.59% seniors (N = 43), 30.59% were juniors (N = 26), 11.76% were graduate students (N = 10), 5.88% were sophomores (N = 5), 1.18% were freshman (N = 1), and 0% were professional students.

Table 2

Students with Disabilities Survey Participants Demographics Relating to Gender, Academic Standing, and Transfer Student Status (N = 85)

Variable	Number	Percent
Gender		
Female	50	58.82
Male	35	41.18
Other	0	0.00
Academic Standing		
Freshman	1	1.18
Sophomore	5	5.88
Junior	26	30.59
Senior	43	50.59

Table 2 cont'd

Students with Disabilities Survey Participants Demographics Relating to Gender, Academic Standing, and Transfer Student Status (N = 85)

Variable	Number	Percent
Academic Standing		
Graduate Student	10	11.76
Professional Student	0	0.00
Transfer Student		
Yes	69	81.18
No	16	18.82

Based upon the survey results obtained, the graduate student group with disabilities were spread throughout five of the colleges. These students represented the College of Arts and Sciences (N = 2), the College of Business Administration (N = 2), the College of Education (N = 4), the College of Fine Arts and Communication (N = 1), and the College of Nursing (N=1).

The undergraduate student classification for a Freshman is 0 to 29 semester hours of credit, a Sophomore is 30-59 semester hours of credit, a Junior is 60 to 89 semester hours of credit and a Senior is 90 or more semester hours of credit (Admissions staff, personal communication, July 6, 2015). The graduate student classification is designated after the applicant has verified by transcript that the applicant has a bachelor's degree, has appropriately applied to the Graduate School, and fulfills the requirements that are dictated by the applicant's program of choice (Graduate School Policies, 2015). Professional students on the campus of the university under study are part of the College of Optometry. The College of Optometry has a separate admissions policy in which the applicant must complete 90 semester hours and "the applicant cannot apply more than 60

semester hours earned at a two-year institution toward the credit hour requirement" (College of Optometry Prospective, 2015).

The students with disabilities that were the least represented in this study were the freshman group. Demographic data from three DAS departmental satisfaction surveys were obtained from the DAS Department Coordinator which demonstrated that the freshman group of students with disabilities (4%, 4%, and 11%) were also the least represented among the academic standing classifications (L. Williams, personal communication, August 18, 2011; July 27, 2012).

The university in which the study had taken place is a commuter campus in which many are transfer students who have come from other institutional programs in order to complete their degree at this larger university. The majority of participants (81.18%) indicated that they were transfer students from other institutions (N = 69). The native students with disabilities represented 18.82% (N = 16) of the student population/survey participants.

Marital Status and Age Range. In Table 3, marital status and age range data was compiled. These variables were chosen for inclusion on the survey because these terms and ranges were familiar to the students from when they have taken DAS departmental surveys.

Table 3

SWD Survey Participants Demographics Relating to Marital Status, Age Range (N = 85)

Variable	Number	Percent
Marital Status		
Single	58	68.24
Married	15	17.65
Same Sex Partnership/Union	1	1.18
Divorced	11	12.94
Widowed	0	0.00
Age Range		
17-22	15	17.65
23-27	29	34.12
28-36	10	11.76
37-46	14	16.47
47-55	12	14.12
56+	5	5.88

Note: SWD = Students with Disabilities.

Single was the marital status that was reported by the majority of the respondents at 68.24% (N = 58). The second and third categories yielded similar results of 17.65% (N = 15) for married variable and 12.94% (N =11) for the divorced variable. The same sex partnership/union status variable resulted in 1.18% (N = 1).

The age demographic was listed with a range from 17 to 56+ years of age. The age range was divided into 6 categories. The majority of respondents indicated that they were between the ages of 23-27 at 34.12% (N = 29). The next four highest age range categories were similar regarding in the number of respondents who were 17-22 years of age at 17.65% (N = 15), 37-46 years of age at 16.47% (N =14), 47-55 years of age at 14.12% (N = 12), and 28-36 years of age at 11.76% (N = 10). The remaining 5.88% (N = 5) of respondents were 56 years of age or older.

Ethnicity/Race. The ethnicity/race variable contained 10 different categories from which participants could select. There were only two categories that yielded a

significant number of responses. The majority of students with disabilities (71.76 %; N = 6) responded that they are White/Caucasian (Non-Hispanic). The second highest category was Black/African American (16.47% ; N = 14). The remaining eight categories included the data of the remaining 10 respondents, which is summarized in Table 4. Table 4 also includes a notation that details the description written by three of the respondents relating to the "other" category of ethnicity/race.

Table 4

SWD Survey Participants Demographic results of Ethnicity/Race (N = 85)

Variable	Number	Percent
American Indian/Alaskan Native	0	0.00
Asian	2	2.35
Black/African American	14	16.47
Latino/Hispanic	1	1.18
Native Hawaiian/other Pacific Islander	0	0.00
White/Caucasian (Non-Hispanic)	61	71.76
International Student	1	1.18
Multiracial	2	2.35
Race/Ethnicity unknown	1	1.18
Other	3	3.53

Note. SWD = Students with Disabilities. The "Other" in Ethnicity/Race responses are "American Indian/Alaskan Native and Black/African American", "Arab/North African", and "Caucasian and American Indian".

Disability Types. At the time of the design of this research project, the DAS Department Coordinator gave the principal investigator a list of the disability categories used to identify students who had requested accommodations. The categories were outlined by the Diagnostic and Statistical Manual of Mental Disorders-version (DSM-IV). The DSM-IV is the reference that was used to determine students' diagnosis and classification provided by a medical clinician in order that they could legally be able to receive accommodations from the DAS Department.

The categories listed in Table 5 are those created from the student's diagnosis documentation. If the documentation delineated a combination of disabilities, the DAS Program Coordinator created a separate category to be consistent with the student's documentation. There are various combinations of disabilities listed that were not combinations formed by the DSM-IV. The student's documentation could have former diagnoses provided during any period of their formal education: elementary, secondary, undergraduate, graduate or professional.

Table 5

SWD Survey Participants Demographics Relating to DAS Disability Types (N=85)

Variable	Number	Percent
Attention Deficit/Hyperactivity Disorder (ADHD)	12	14.12
Attention Deficit Disorder (ADD)	6	7.06
Asperger's	2	2.35
Autism	1	1.18
Blind/Visual Impairment/Low Vision	2	2.35
Deaf and Hard of Hearing	5	5.88
General Medical Conditions	7	8.24
Intellectual Developmental Disability	0	0.00
Learning Disabilities/Specific Learning Disorder (LD)	16	18.82
Learning Disabilities/Attention Deficit Disorder (LD/ADD)	4	4.71
Mental Health	21	24.71
Mobility/Wheelchair	0	0.00
Orthopedic	7	8.24
Traumatic Brain Injury	2	2.35
Other	0	0.00

Note. SWD = Students with Disabilities. DAS = Disabilities Access Services. General Medical Conditions include: Diabetes, Fibromyalgia, Multiple Sclerosis, and Renal Failure. Mental Health includes: Anxiety, Bi-Polar, Depression, and Post Traumatic Stress Disorder. Orthopedic includes: Back/Neck/Leg problems, Cerebral Palsy, Fracture, and Nerve problems.

There were three main disability types that were notable during the data collection relevant to the 15 disability categories. The majority of respondents (24.71%; N = 21) had a mental health disability. The second highest category consisted of students with a

documented disability which was characterized as "learning disabilities/specific learning disorder" (LD) 18.82% (N = 16). The third largest category consisted of students documented with a disability that was classified as "attention deficit/hyperactivity disorder" (ADHD) 14.12% (N = 12). The remaining categories are summarized in Table 5. There is also a specific notation that explains what the DAS Program Coordinator has identified as General Medical Conditions among the students with disabilities population at the university.

Disability Types-Adaptation to DSM-V. The American Psychological Association published a fifth edition of the Diagnostic and Statistical Manual of Mental Disorders in May of 2013 (Table 6). There were significant changes in the Disability Types from the Fourth Version to the Fifth Version. Many of the Disability Types were combined and were listed under new named categories. Table 5 reports the adaptation of the DSM-IV Disability Types to the DSM-V Disability Types using the data from this study. When the DSM-IV adaptation could not be accomplished, the respondent data was included in the "Other" category.

Table 6

SWD Survey Participants DAS Disability Types Adapted to the DSM-V (N=85)

Variable	Number	Percent
Attention Deficit Hyperactivity Disorder	18	21.18
Autism Spectrum Disorders	3	3.53
Blind/Visual Impairment/Low Vision	2	2.35
Deaf and Hard of Hearing	5	5.88
General Medical Conditions	7	8.24
Learning Disabilities/Specific Learning Disorder	16	18.82
Mental Health	23	27.06
Orthopedic	7	8.24
Other (Learning Disabilities/Attention Deficit Disorder)	4	4.71

Note. SWD = Students with Disabilities. DAS = Disability Access Services, DSM-V = Diagnostic and Statistical Manual of Mental Disorders Fifth Edition.

There were three main disability types that were distinct in the data collection relating to the nine different categories. The majority of respondents were from the Mental Health category at 27.06% (N = 23). The second highest category consisted of students documented with Learning disabilities/Specific Learning Disorder at 18.82% (N = 16). The third largest category documented is Attention Deficit/Hyperactivity Disorder at 21.18% (N = 18). The remaining categories are summarized in Table 6.

Academic College. The students with disabilities reported their Academic College at the university. The majority of the respondents indicated that they were in the College of Arts & Sciences at 44.71% (N = 38). There were two other high frequencies that were as follows: the College of Business Administration at 23.53% (N = 20) and the College of Fine Arts & Communication at 12.94% (N = 11). The remaining categories are summarized in Table 7.

Table 7

Academic College Responses of the SWD Survey Participants (N = 85)

Variable	Number	Percent
Academic College		
Arts & Sciences	38	44.71
Business Administration	20	23.53
Education	8	9.41
Fine Arts & Communication	11	12.94
Joint Engineering	3	3.53
Nursing	5	5.88
Optometry	0	0.00

Note: SWD = Students with Disabilities.

Academic Majors by Academic College. There are seven Colleges at the university under study which are summarized in Table 8. Six of the Colleges have

specific majors associated with them which were identified by the university online catalog. The seventh College at the university is the College of Optometry.

In the College of Arts and Sciences, 38 respondents were spread across 15 categories of academic majors. The majority of the respondents were Social Work students (9.41%; N = 8). The next three highest categories were Biology (8.24%; N = 7), Criminology/Criminal Justice (7.06%; N = 6), and Psychology (5.88%; N = 5). The remaining respondents declared majors as follows: Chemistry/Biochemistry (3.53%; N = 3) and Political Science (3.53%; N = 3); Math & Computer Science (2.35%; N = 2) and Physics/Astronomy (2.35%; N = 2); Anthropology/Sociology/Languages (1.18%; N = 1) and Economics (1.18%; N = 1)

In the College of Business, there were 20 respondents spread among seven academic major categories. The majority of the respondents in the College of Business were in the Academic majors of Business Administration-Management at 8.24% (N = 7) and Accounting at 7.06% (N = 6). The remaining respondent information is summarized in Table 8.

The College of Education had a total of eight respondents. The majority of students were in the Master's Program (4.71%; N = 4) in some capacity. The remaining respondent data is summarized in Table 8.

The College of Fine Arts & Communication had a total of 11 respondents. The majority of the respondents were in Communication (8.24%; N =7) and Theatre, Dance, and Media Studies (4.71%; N = 4).

The College of Joint Engineering had 3 total respondents within the four Academic Major categories. The highest frequencies were identified as Civil Engineering (2.35%; N = 2) and Electrical Engineering (1.18%; (N = 1).

There were 5 respondents (5.88%) who were students in the College of Nursing. The College of Nursing provides programs for applicants who are interested in attaining a Bachelor's Degree or a Graduate Degree.

The College of Optometry is the only academic unit within the university that offers a Professional Degree of Optometric Doctor. There were zero respondents who participated from the students with disabilities surveyed.

The Academic Major with the largest amount of respondents was Social Work (N = 8). The rest of the majors had less than eight respondents and are summarized in Table 8.

Table 8

Academic Majors by Academic College Responses of the Students with Disabilities Survey Participants (N = 85)

Variable	Number	Percent
College of Arts and Sciences		
Anthropology/Sociology/Languages	1	1.18
Biology	7	8.24
Chemistry/Biochemistry	3	3.53
Criminology/Criminal Justice	6	7.06
Economics	1	1.15
English	0	0.00
History	0	0.00
Math & Computer Science	2	2.35
Military Science/ROTC	0	0.00
Philosophy	0	0.00
Physics/Astronomy	2	2.35
Political Science	3	3.53
Psychology	5	5.88
Social Work	8	9.41
Gender Studies	0	0.00
College of Business		
Accounting	6	7.06
Business Administration-Finance	1	1.18
Business Administration-International Business	1	1.18
Business Administration-Logistics & Operations Manager	1	1.18
Business Administration-Management	7	8.24
Business Administration-Marketing	0	0.00
Information Systems	4	4.71
College of Education		
Early Childhood	2	2.35
Art Education	0	0.00
Music Education	0	0.00
Middle School Education	1	1.18
Physical Education	0	0.00
Secondary School Education	1	1.18
Master's Program	4	4.71
Doctoral Program	0	0.00
College of Fine Arts & Communication		
Art & History	0	0.00
Communication	7	8.24
Music	0	0.00
Theatre, Dance, and Media Studies	4	4.71
College of Joint Engineering		
Pre-Engineering	0	0.00
Civil Engineering	2	2.35
Electrical Engineering	1	1.18
Mechanical Engineering	0	0.00
College of Nursing - Nursing	5	5.88
College of Optometry - Optometry	0	0.00

Career Decision Self-Efficacy Scale Participant Results

The CDSE-SF Survey consisted of 25 questions. The participants responded to the questions relating to a Confidence Likert type Scale. The types of Confidence were described as: No Confidence at all, Very Little Confidence, Moderate Confidence, Much Confidence, and Complete Confidence. The summary of the respondents results frequency are listed in Table 9. The 25 items responses were totaled and divided by 25 to determine the CDSE-SF Total Score. This total CDSE score was used to answer three of the research questions.

The results of the 25 question items revealed the following areas of career decision-making, that resulted in providing "Moderate Confidence" to the students with disabilities: "Determine the steps to take if you are having academic trouble with an aspect of your chosen major" (34.12%), "Accurately assess your abilities" (36.47%), "Prepare a good resume" (32.94%), "Change majors if you did not like your first choice" (28.24%) and "Make a career decision and then not worry whether it was right or wrong" (29.41%) (Betz & Taylor, 2001).

"Identify some reasonable major or career alternatives if you are unable to get your first choice" (24.71%) resulted with the same percentage for "Moderate Confidence" and "Much Confidence" and "Make a plan of your goals for the next five years" (28.24%) was the same percentage resulting from "Much Confidence" and "Complete Confidence" (Betz & Taylor, 2001). "Find out the employment trends for an occupation over the next ten years" result was responded to with a high percentage of "Complete Confidence" (28.24%); however the percentages spread very closely from

"Very Little Confidence" (21.18), to "Moderate Confidence" (22.35%), too "Much Confidence" (23.53%). (Betz & Taylor, 2001)

The CDSE-SF is designed to be divided into five subscales of five items each, Self-Appraisal, Occupational Information, Goal Selection, Planning, and Problem Solving. The subscale scores are calculated by totaling the scores of each scale and dividing by five.

There are five specific questions from the 25 items that are designated to each of the subscales. Scale One is named Self-Appraisal, which relates to questions 5, 9, 14, 18 and 22. Scale Two is named Occupational Information, which relates to questions 1, 10, 15, 19, and 23. Scale Three is named Goal Selection, which relates to questions 2, 6, 11, 16, and 20. Scale Four is named Planning, which relates to questions 3, 7, 12, 21, and 24. Scale Five is named Problem Solving, which relates to questions 4, 8, 13, 17, and 25.

The subscales were used in the calculations to determine the Reliability of the survey instrument. The Reliability calculations to determine internal consistency were calculated by using Cronbach's alpha and are listed in Table 22.

Table 9

Frequency and Percent for Survey Participants Responses to the CDSE-SF Questions (N=85)

Variable	Likert Scale				
	No Confidence At All	Very Little Confidence	Moderate Confidence	Much Confidence	Complete Confidence
	N (%)	N (%)	N (%)	N (%)	N (%)
Q1	0 (0.00)	4 (4.71)	18 (21.18)	22 (25.88)	41 (48.24)
Q2	0 (0.00)	3 (3.53)	16 (18.82)	31 (36.47)	35 (41.18)
Q3	3 (3.53)	13 (15.29)	21 (24.71)	24 (28.24)	24 (28.24)
Q4	1 (1.18)	13 (15.29)	29 (34.12)	20 (23.53)	22 (25.88)
Q5	1 (1.18)	7 (8.24)	31 (36.47)	30 (35.29)	16 (18.82)
Q6	0 (0.00)	10 (11.76)	22 (25.88)	29 (34.12)	24 (28.24)
Q7	1 (1.18)	7 (8.24)	19 (22.35)	34 (40.00)	24 (28.24)
Q8	3 (3.53)	6 (7.06)	17 (20.00)	32 (37.65)	27 (31.76)
Q9	2 (2.35)	9 (10.59)	25 (29.41)	22 (25.88)	27 (31.76)
Q10	4 (4.71)	18 (21.18)	19 (22.35)	20 (23.53)	24 (28.24)
Q11	2 (2.35)	5 (5.88)	25 (29.41)	30 (35.29)	23 (27.06)
Q12	3 (3.53)	11 (12.94)	28 (32.94)	23 (27.06)	20 (23.53)
Q13	4 (4.71)	12 (14.12)	24 (28.24)	22 (25.88)	23 (27.06)
Q14	1 (1.18)	3 (3.53)	27 (31.76)	25 (29.41)	29 (34.12)
Q15	3 (3.53)	7 (8.24)	16 (18.82)	30 (35.29)	29 (34.12)
Q16	8 (9.41)	20 (23.53)	25 (29.41)	18 (21.18)	14 (16.47)
Q17	6 (7.06)	19 (22.35)	20 (23.53)	22 (25.88)	18 (21.18)
Q18	1 (1.18)	14 (16.47)	20 (23.53)	30 (35.29)	20 (23.53)
Q19	4 (4.71)	8 (9.41)	17 (20.00)	21 (24.71)	35 (41.18)
Q20	0 (0.00)	6 (7.06)	18 (21.18)	30 (35.29)	31 (36.47)
Q21	4 (4.71)	11 (12.94)	22 (25.88)	23 (27.06)	25 (29.41)
Q22	0 (0.00)	8 (9.41)	17 (20.00)	26 (30.59)	34 (40.00)
Q23	2 (2.35)	8 (9.41)	22 (25.80)	23 (27.06)	30 (35.29)
Q24	6 (7.06)	13 (15.29)	24 (28.24)	27 (31.76)	15 (17.65)
Q25	7 (8.24)	19 (22.35)	21 (24.71)	21 (24.71)	17 (20.00)

Research Question One

The Research Question One asked: Do students with diagnosed disabilities receive academic and/or personal support when selecting STEM majors? The research revealed that the students with disabilities did not perceive a higher frequency of academic and/or personal support when considering enrollment in STEM as academic majors.

Two frequency and percentage tables were developed from the students with disabilities responses from the two questions designed by the principal investigator. The two questions were on Influence in Academic Major Choice and Influence in the choosing of a career or Academic Major in STEM Field Disciplines. Those two additional questions were placed at the end of the CDSE-SF survey.

The first additional survey question (Table 10) had 10 components that were a Likert Scale design relating to the Level of Influence on the student with disabilities in the decision-making of an Academic Major. Those components were a list of 10 different individuals or groups of individuals. The Influence scale choices ranged from "No Influence" to "Complete Influence". A Frequency analysis was used to answer this first additional research question. The frequencies and percentage results are listed in Table 10.

The respondents were asked to indicate how much influence a particular individual or group of individuals had on career-decision-making and/or academic major choice. In Table 10, the majority of the responses from the participants indicated that there was "No Influence" on career decision-making and/or academic major choice with the External Counseling Agency (62.35%; N =53), High School Advisor/Counselor (52.94%; N = 45), Spouse or Partner (51.76%; N = 44), High School Teacher (35.29%; N = 30), Peer Group (35.29%; N = 30), College Counseling Services (35.29%; N = 30), and Friend(s) (24.71%; N = 21). Academic Advisor had a one response difference between "No Influence" (N = 23) and "Moderate Influence" (N = 22).

There was “Moderate Influence” that was encouraged relating to Academic Major choice by the Parent (23.53%; N = 20) and College Instructor (37.65%; N = 32). The College Instructor provided the most influence of the two.

Table 10

Influence in Academic Major Frequency and Percentage Responses of Survey Participants (N=85)

Variable	Likert Scale				
	No Influence	Very Little Influence	Moderate Influence	Much Influence	Complete Influence
	N (%)	N (%)	N (%)	N (%)	N (%)
Parent	18 (21.18)	15 (17.65)	20 (23.53)	19 (22.35)	13 (15.29)
High School Advisor/Counselor	45 (52.94)	21 (24.71)	10 (11.76)	4 (4.71)	5 (5.88)
High School Teacher	30 (35.29)	21 (24.71)	15 (17.65)	13 (15.29)	6 (7.06)
Academic Advisor	23 (27.06)	17 (20.00)	22 (25.88)	16 (18.82)	7 (8.24)
College Counseling Services	30 (35.29)	18 (21.18)	26 (30.59)	6 (7.06)	5 (5.88)
College Instructor	15 (17.65)	7 (8.24)	32 (37.65)	21 (24.71)	10 (11.76)
Spouse or Partner	44 (51.76)	13 (15.29)	12 (14.12)	5 (5.88)	11 (12.94)
External Counseling Agency	53 (62.35)	8 (9.41)	12 (14.12)	8 (9.41)	4 (4.71)
Friend(s)	21 (24.71)	22 (25.88)	21 (24.71)	13 (15.29)	8 (9.41)
Peer Group	30 (35.29)	26 (30.59)	13 (15.29)	8 (9.41)	8 (9.41)

The second additional survey question contained 10 components that were also a Likert Scale design relating to the level of Influence in the decision-making of choosing a major in a STEM Field Discipline by the student with disabilities. Those questions used the same 10 individuals or groups of individuals that the student with disabilities may experience contact with in career decision-making. The Influence scale choices ranged from “No Influence” to “Complete Influence”. The frequencies and percentage results to the second additionally designed question are in Table 11.

The participants were asked to indicate how much influence the same individuals or groups of individuals had in his/her consideration of an academic major or career in the STEM Field Disciplines. In Table 11, the results indicated that all of the individuals or groups of individuals had "No Influence" on the respondent's career decision-making of an academic major or career in the STEM Field Disciplines. The Null Hypothesis One indicates that the students with disabilities will not perceive a higher frequency of academic and/or personal support when considering enrollment in STEM as academic majors. The Null Hypothesis One is supported and not rejected. The highest four frequencies that resulted in "No Influence" are: External Counseling Agency (70.59%; N = 60), High School Advisor/Counselor (65.88%; N = 56), Spouse or Partner (58.8%; N = 50), and College Counseling Services (54.12%; N = 46). The rest of the responses are summarized in Table 11.

Table 11

Influence in STEM Field Disciplines Frequency and Percentage Responses of Survey Participants (N=85)

Variable	Likert Scale				
	No Influence	Very Little Influence	Moderate Influence	Much Influence	Complete Influence
	N (%)	N (%)	N (%)	N (%)	N (%)
Parent	28 (32.94)	15 (17.65)	22 (25.88)	10 (11.76)	10 (11.76)
High School Advisor/Counselor	56 (65.88)	15 (17.65)	7 (8.24)	4 (4.71)	3 (3.53)
High School Teacher	41 (48.24)	16 (18.82)	15 (17.65)	10 (11.76)	3 (3.53)
Academic Advisor	37 (43.53)	15 (17.65)	20 (23.53)	8 (9.41)	5 (5.88)
College Counseling Services	46 (54.12)	18 (21.18)	11 (12.94)	5 (5.88)	5 (5.88)
College Instructor	28 (32.94)	8 (9.41)	20 (23.53)	20 (23.53)	9 (10.59)
Spouse or Partner	50 (58.82)	7 (8.24)	9 (10.59)	9 (10.59)	10 (11.76)
External Counseling Agency	60 (70.59)	7 (8.24)	8 (9.41)	6 (7.06)	4 (4.71)
Friend(s)	33 (38.82)	17 (20.00)	18 (21.18)	11 (12.94)	6 (7.06)
Peer Group	46 (54.12)	8 (9.41)	14 (16.47)	11 (12.94)	6 (7.06)

In comparing the Influence of Academic Major choice to Influence of a choice of a major in a STEM Field Discipline question responses, the External Counseling Agency, College Counseling Services, High School Counselor/Advisor and the Academic Advisor were not of great influence for the students with disabilities.

Research Question Two

Research question two asked: Do male college students with diagnosed disabilities in STEM and non-STEM majors have a different perception of their career decision self-efficacy than female students with diagnosed disabilities in STEM and non-STEM majors? The research revealed that Male students with disabilities in STEM and non-STEM majors did not score higher in confidence than female students with disabilities in STEM or non-STEM majors with regard to career decision-making self-efficacy total scores.

Gender Descriptive statistics for Mean and Standard Deviation results are in Table 12. The survey descriptive results indicated that there were more female gender (59%) participants than male gender (41%) participants in this study. Even though the Mean appears slightly higher for the male compared to the female gender, (Table 12), a One-way Analysis of Variance (ANOVA) indicates that there was not a significant difference between the variances of male and female genders and the CDSE-SF Total Scores ($F(1, 83) = 3.482$, $p = .066$), as reported in Table 13. The Null Hypothesis Two was supported and not rejected.

Table 12

Descriptive Results of Career Decision Self-Efficacy –SF Total Scores and Gender

Gender	N	Mean	SD	SE	95% Confidence Interval for Mean	
					Upper Bound	Lower Bound
Male	35	3.89	0.785	.133	3.622	4.161
Female	50	3.58	0.741	.105	3.369	3.790
Total	85	3.71	0.770	.084	3.542	3.874

A test of the Homogeneity of Variances by using Levene's Statistic was performed to verify that the variances of the two groups involved were similar enough in equality. The result was a significance of 0.665 which was considered high ($p > .05$) verifying the data satisfied the homogeneity of variance test in that it was not violated. There were only two groups assessed therefore no Post Hoc Tests could be calculated.

Eta Squared was calculated to give the idea about how much variance the dependent variable of the CDSE-SF Total Scores was accounted for by the independent variable gender. The result was an Eta Squared effect size of 0.040. This indicates that 4% of the variance of the CDSE-SF Total Score is explained by gender.

Table 13

One Way ANOVA of Career Decision Self-Efficacy Total Score and Gender

Gender	Sum of Squares	df	Mean Square	F	Significance
Between Groups	2.007	1	2.007	3.482	0.066
Within Groups	47.849	83	0.576		
Total	49.856	84			

Note. Significant at $p < 0.05$ level.

A further analysis was performed with the five subscales of the CDSE-SF and gender to see if the breakdown into subscales made a significant difference. The analysis

is reported in two tables. Gender Descriptive statistics (Table 14) include Mean and Standard Deviation values of the CDSE-SF Subscale results.

Table 14

Descriptive Results of Career Decision Self-Efficacy –SF Subscale Scores and Gender

					95% Confidence Interval for Mean	
Gender	N	Mean	SD	SE	Upper Bound	Lower Bound
Self-Appraisal						
Male	35	4.029	0.742	0.126	3.774	4.284
Female	50	3.616	0.770	0.109	3.397	3.835
Total	85	3.786	0.781	0.085	3.617	3.954
Occupational Information						
Male	35	4.006	0.809	0.137	3.728	4.283
Female	50	3.748	0.883	0.125	3.497	3.999
Total	85	3.854	0.858	0.093	3.669	4.039
Goal Selection						
Male	35	4.011	0.771	0.130	3.746	4.276
Female	50	3.604	0.794	0.112	3.378	3.830
Total	85	3.772	0.806	0.087	3.598	3.946
Planning						
Male	35	3.731	0.881	0.149	3.429	4.034
Female	50	3.520	0.780	0.110	3.298	3.742
Total	85	3.607	0.825	0.089	3.429	3.785
Problem Solving						
Male	35	3.680	1.006	0.170	3.334	4.026
Female	50	3.408	0.881	0.125	3.158	3.658
Total	85	3.520	0.938	0.102	3.318	3.722

Note. SD = Standard Deviation, SE = Standard Error.

A One-way Analysis of Variance (ANOVA) (Table 15) was performed on the five subscales from the CDSE-SF survey results. There was not a significant difference between the variances of Male and Female genders relating to the subscales of Occupational Information ($F(1,83) = 1.876$, $p = .175$), Planning ($F(1,83) = 1.358$, $p = .247$), and Problem Solving ($F(1,83) = 1.746$, $p = .190$). The Null Hypothesis Two, "male students with disabilities in STEM or non-STEM majors will not score higher in

confidence than female students with disabilities in STEM or non-STEM majors in career decision self-efficacy" was supported and not rejected for those three subscales.

There was a significant difference between the variances of Male and Female genders of the subscales of Self-Appraisal ($F(1,83) = 6.090$, $p = .016$ and Goal Selection ($F(1,83) = 5.545$, $p = .021$). The Null Hypothesis Two would be rejected for both of these subscales.

The Self-Appraisal questions related to self-efficacy in accurately assessing the student's abilities in determining the ideal job, in deciding what he/she valued most in an occupation, and figuring out what one could sacrifice to achieve career goals. The Goal Selection questions related to the self-efficacy of the student in selecting one major from a list of potential majors, the selection of one occupation from a list of potential occupations, choosing a career that will fit his/her lifestyle, the ability to make a career decision and not being apprehensive whether it was the right decision, and being able to choose a career that would fit the student's best interests.

Table 15

One Way ANOVA of Career Decision Self-Efficacy Subscale Scores and Gender

Subscales	Sum of Squares	df	Mean Square	F	Sig.
Self-Appraisal					
Between Groups	3.504	1	3.504	6.090	0.016
Within Groups	47.759	83	0.575		
Total	51.263	84			
Occupational Information					
Between Groups	1.367	1	1.367	1.876	0.175
Within Groups	60.504	83	0.729		
Total	61.871	84			
Goal Selection					
Between Groups	3.418	1	3.418	5.545	0.021
Within Groups	51.155	83	0.616		
Total	54.572	84			
Planning					
Between Groups	0.920	1	0.920	1.358	0.247
Within Groups	56.235	83	0.678		
Total	57.156	84			

Table 15 cont'd

One Way ANOVA of Career Decision Self-Efficacy Subscale Scores and Gender

Subscales	Sum of Squares	df	Mean Square	F	Sig.
Problem Solving					
Between Groups	1.523	1	1.523	1.746	0.190
Within Groups	72.413	83	0.872		
Total	73.936	83			

Note: Significance is $p < 0.05$ level.

A test of the Homogeneity of Variances by using Levene's Statistic was performed to verify that the variances of the subgroups involved were similar enough in equality. The result was a significance of 0.805 for the Self-Appraisal scores, 0.415 for the Occupational Information scores, 0.800 for the Goal Selection scores, 0.729 for the Planning scores and 0.489 for the Problem Solving scores. They were all considered high ($p > .05$) verifying the data satisfied the homogeneity of variance test in that it was not violated. As seen in Table 13, there were only two gender groups assessed therefore no Post Hoc Tests were completed.

Eta Squared was calculated to reflect how much of the variance of the dependent variable CDSE-SF Subscales scores were accounted for by the independent variable gender. An Eta squared effect size of 0.068 indicated that 7% of the Self-Appraisal dependent variable variance was explained by the independent variable gender in the sample data. An Eta squared effect size of 0.022 indicated that 2% of the Occupational Information dependent variable variance was explained by the independent variable gender in the sample data. An Eta squared effect size of 0.063 indicated that 6% of the Goal Selection dependent variable variance was explained by the independent variable

gender in the sample data. An Eta squared effect size of 0.016 indicated that 2% of the Planning dependent variable variance was explained by the independent variable gender in the sample data. An Eta squared effect size of 0.021 indicated that 2% of the Problem Solving dependent variable variance was explained by the independent variable gender in the sample data.

Research Question Three

Research question three asked: Does the student's disability type influence his or her confidence level results as it pertains to the career decision self-efficacy scores? The research revealed that there was no relationship between the student's type of disability and the career decision self-efficacy total scores.

Descriptive statistics of Mean and Standard Deviation results are listed in Table 16 for the CDSE-SF Total Scores and the Disability types relating to the Diagnostic and Statistical Manual-V (DSM-V). The "Other" category is a combination of Learning Disabilities and Attention Deficit Disorder from the response of four of the survey participants. The DSM-V does not have such a combined category. The DAS Coordinator created (Table 6) that category from the departments records received from the students with disabilities registered documentation.

Table 16

Descriptive Results of CDSE –SF Total Scores and DSM-V Disability Types

Disability Types	N	Mean	SD	SE	95% Confidence Interval Level	
					UB	LB
Attention Deficit/Hyperactivity Disorder	18	3.702	0.852	0.201	3.279	4.126
Autism	3	3.173	0.611	0.353	1.656	4.691
Blind/Visual Impairment/Low Vision	2	4.020	0.481	0.340	- .300	8.340
Deaf and Hard of Hearing	5	3.744	0.758	0.339	2.803	4.685
General Medical Conditions	7	3.874	0.360	0.136	3.541	4.207
Learning Disabilities/Specific Learning Disorder	16	3.545	0.769	0.192	3.135	3.954
Mental Health	23	3.793	0.854	0.178	3.424	4.162
Orthopedic	7	3.554	0.804	0.304	2.810	4.300
Other	4	4.070	0.848	0.424	2.721	5.419
Total	85	3.708	0.770	0.084	3.542	3.874

Note. CDSE-SF = Career Decision Self-Efficacy-Short Form, DSM-V = Diagnostic and Statistical Manual of Mental Disorders Fifth Edition. Other is a combination of Learning Disabilities/Attention Deficit Disorder in which the DSM-V does not have a combined category. These are the participants that identified themselves with those two combined disabilities.

A one-way analysis of variance (ANOVA) (Table 17) was calculated on the participants' CDSE-SF Total Scores and their diagnosed disability types as presented to the DAS Coordinator. The analysis indicated there was not a significant difference between the variances of disability types and the CDSE-SF Total Scores ($F(8, 76)$ =

0.509, p = .846). Null Hypothesis three, "there is no relationship between a student's type of disability and career decision self-efficacy scores" was supported and not rejected.

Table 17

One Way ANOVA of Career Decision Self-Efficacy Total Score and DSM-V Disability Types

Disability Types	Sum of Squares	df	Mean Square	F	Significance
Between Groups	2.534	8	0.317	0.509	0.846
Within Groups	47.322	76	0.623		
Total	49.856	84			

Note. Significant at $p < 0.05$ level.

A test of the Homogeneity of Variances by using Levene's Statistic was performed to verify that the variances of the groups involved were similar enough in equality. The result was a significance of 0.164 which was considered high ($p > .05$) verifying the data satisfied the homogeneity of variance test in that it was not violated. As seen in Table 13, there was not a significant F test result therefore no Post Hoc Tests were calculated.

Eta Squared was calculated to give the idea about how much variance the dependent variable of the CDSE-SF Total Scores was accounted for by the independent variable disability types. The result was an Eta Squared effect size of 0.051. This indicated that 5% of the variance of the CDSE-SF Total Score was explained by disability types.

Research Question Four

Research question four asked: Do students with diagnosed disabilities differ in career decision self-efficacy by college major choice and type of disability? The research revealed that there was not a significant difference between student with disabilities

disability type, college major choice (STEM major and non-STEM major) and career decision self-efficacy total scores.

A two-way analysis of variance (ANOVA) (Table 18) was calculated on the dependent variable of each of the 85 students with disabilities participants' CDSE-SF Total Scores and the independent variables of disability types and academic major choice. The analysis indicated there was not a significant main effect difference between the variances of disability types ($F(8, 70) = 0.577$, $p = .793$) and the CDSE-SF Total Scores. The main effect of STEM and non-STEM academic major choice was not significant ($F(1,70) = 2.534$, $p = 0.116$). There was a non-significant Academic Major x Disability interaction ($F(5,70) = 0.605$, $p = 0.696$. The Null Hypothesis four, "there is not a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores" was supported and not rejected.

Table 18

Two Way ANOVA of Career Decision Self-Efficacy Total Score, DSM-V Disability Types, Academic Major, and the Interaction

Source	Sum of Squares	df	Mean Square	F	Significance
Academic Majors	1.531	1	1.531	2.534	0.116
Disability Types	2.789	8	0.349	0.577	0.793
AM x DT Interaction	1.827	5	0.365	0.605	0.696
Error	42.299	70	0.604		
Total	1218.395	85			
Corrected Total	49.856	84			

Note. Significant at $p < 0.05$ level. AM = Academic Major, DT = Disability Type.

A test of the Homogeneity of Variances by using Levene's Statistic was performed. The result was a significance of 0.240 ($p > 0.05$) to verify that the variance of

the CDSE-SF scores were equal across all groups verifying the data satisfied the homogeneity of variance test in that it was not violated.

Eta Squared was calculated to give the idea about how much variance the dependent variable of the CDSE-SF Total Scores was accounted for by the independent variable disability types, academic major, and the interaction. The result was an Eta Squared effect size of 0.035 for academic major. This indicates that 3% of the variance of the CDSE-SF Total Scores is explained by academic major choice of STEM and non-STEM types. An Eta Squared effect size of 0.062 for disability type indicated that 6% of the variance of the CDSE-SF Scores is explained by disability type. The Eta Squared effect size result for the interaction of Academic Major and Disability type on the dependent variable was 0.041. This indicates that 4% of the variance in the CDSE-SF Scores is explained by the interaction of the two independent variables.

Additional Analysis

The data from 57 student participants chosen from the three highest Disability Type frequencies was selected for further analysis. The three highest frequencies of participants in the study were Mental Health (N = 23), Attention Deficit/Hyperactivity Disorder (N = 18) and Learning Disabilities/Specific Learning Disorder (N = 16).

A Two-way analysis of variance (ANOVA) (Table 19) was calculated on the dependent variable of these students with disabilities participants' CDSE-SF Total Scores and the independent variables of a specific group of disability types and academic major choice. The analysis indicated that the Academic Major (STEM and non-STEM) choice does have a significant main effect on CDSE-SF Total Scores ($F(1, 51) = 5.230$, $p =$

0.026). The Null Hypothesis four was rejected if using only the three highest frequency disability types.

The three highest frequency Disability Types did not have a significant effect on the dependent variable CDSE-SF Total Scores ($F(2,51) = 0.693$, $p = 0.504$). Academic Major Choice x Disability Types interaction had no significant effect on the CDSE-SF Total Scores ($F(2,51) = 0.757$, $p = 0.474$). The Null Hypothesis four, "there is not a significant difference between a student with disabilities college major choice (STEM major and non-STEM major) and career decision self-efficacy scores was supported and not rejected for the interaction between the Academic Major choice and the three highest frequency Disability Types.

Table 19

Two Way ANOVA of Career Decision Self-Efficacy Total Score, Three Highest Frequencies of DSM-V Disability Types, Academic Major, and the Interaction

Source	Sum of Squares	df	Mean Square	F	Significance
Academic Majors	3.358	1	3.358	5.230	0.026
Disability Types	0.891	2	0.445	0.693	0.504
Academic Major x Disability Types Interaction	0.971	2	0.486	0.757	0.474
Error	32.745	51	0.642		
Total	815.925	57			
Corrected Total	37.813	56			

Note. Significant at $p < 0.05$ level. Three highest frequency Disability Types: Mental Health, Learning Disabilities/Specific Disorder, and Attention Deficit Hyperactivity Disorder.

A test of the Homogeneity of Variances by using Levene's Statistic was performed. The result was a significance of 0.704 ($p > 0.05$) to verify that the variance of the CDSE-SF scores were equal across all groups verifying the data satisfied the homogeneity of variance test in that it was not violated.

Eta Squared was calculated to give the idea about how much variance the dependent variable of the CDSE-SF Total Scores was accounted for by the independent variable disability types, academic major, and the interaction. The result was an Eta Squared effect size of 0.093 for Academic Major choice. This indicated that 9% of the variance of the CDSE-SF Total Scores was explained by academic major choice of STEM and non-STEM types. An Eta Squared effect size of 0.026 for Disability Type indicated that 2% of the variance of the CDSE-SF Total Scores was explained by disability type. The Eta Squared effect size result for the interaction of Academic Major choice and Disability type on the dependent variable was 0.029. This indicated that 3% of the variance in the CDSE-SF Total Scores was explained by the interaction of the two independent variables.

Further observations were explored with the data in which a One-Way Analysis of Variance (ANOVA) (Table 20) was performed with the 85 participants CDSE-SF Total Scores as the dependent variable and the independent variable being Academic Major choice of STEM or non-STEM. The research revealed that there was a significant difference between student with disabilities Academic Major choice (STEM major and non-STEM major) and CDSE-SF Total scores.

The analysis indicated there a significant main effect difference between the variances of Academic Major choice ($F(1, 83) = 5.608$, $p = 0.02$) and the CDSE-SF Total Scores. The null hypothesis would be rejected if the question pertained to the CDSE-SF scores and Academic Major choice.

Table 20

One Way ANOVA Descriptive Results of CDSE–SF Total Score and Academic Major Choice

Variable	N	Mean	Standard Deviation	Standard Error	95% Confidence Interval Level	
					UB	LB
STEM Major	28	3.433	0.734	0.139	3.148	3.718
Non-STEM Major	57	3.843	0.758	0.100	3.642	4.044
Total	85	3.708	0.770	0.084	3.542	3.874

Note. CDSE-SF = Career Decision Self-Efficacy-Short Form; STEM = Science, Technology, Engineering, and Mathematics; UB = Upper Bound; LB = Lower Bound.

A test of the Homogeneity of Variances by using Levene's Statistic was performed. The result was a significance of 0.579 ($p > 0.05$) to verify that the variances were equal across all groups verifying the data satisfied the homogeneity of variance test in that it was not violated.

Eta Squared was calculated to assess how much variance the CDSE-SF Total Scores were accounted for by the Academic Major choice. The result was an Eta Squared effect size of 0.063. This indicated that 6% of the variance of the CDSE-SF Total Score was explained by Academic Major choice.

The Descriptive results of the CDSE-SF Total Score and Academic Major Choice for the One Way ANOVA is in Table 20. The One Way ANOVA of CDSE-SF Total Scores and Academic Major Choice results are in Table 21.

Table 21

One Way ANOVA of CDSE-SF Total Score and Academic Major Choice

Gender	Sum of Squares	df	Mean Square	F	Significance
Between Groups	3.156	1	3.156	5.608	0.020
Within Groups	46.701	83	0.563		
Total	49.856	84			

Note. Significant at $p < 0.05$ level. CDSE-SF = Career Decision Self-Efficacy-Short Form.

Reliability

A Likert Multi-item scale was used with the CDSE-SF scale survey questions numbered one to 25. Questions 26 through 35 related to an Influence Scale on the student's choice of Academic Major and Questions 36 through 45 related to an Influence Scale on the student's choice of STEM field majors, which were all designed as Likert Multi-item scales by the principal investigator.

The Cronbach's alpha test was used to measure Reliability. In this research project, Reliability was essential in that all the questions in the testing instrument were measuring the same thing. The Cronbach's alpha test ranges from zero to 1.00 and the closer to 1.00, the more reliable the results. According to George and Mallery (2011), the Cronbach's alpha ranges of internal consistency of the scales are defined as follows: $\alpha >$ 0.9 is excellent; $\alpha > 0.8$ is good; $\alpha > 0.7$ is acceptable; $\alpha > 0.6$ is questionable; $\alpha > 0.5$ is poor; and $\alpha < 0.5$ is unacceptable.

The CDSE-SF survey questions Cronbach's alpha results are for the subscales that are listed in Table 22. The total CDSE-SF total score alpha result was 0.960 which is considered excellent reliability for internal consistency. The Cronbach alpha results compare to or are higher than the values obtained by the original Taylor and Betz normative study in 1983 using the CDSE-SF 25-item survey with the results being: Self-Appraisal 0.73, Occupational Information 0.78, Goal Selection 0.83, Planning 0.81, Problem Solving 0.75 and the Total CDSE score as 0.94 (Betz, Klein, & Taylor, 1996).

Table 22

Cronbach's Alpha Reliability for Career Decision Self-Efficacy-Short Form (N = 85)

Total and Subscales	Alpha Reliability (Betz, Klein & Taylor)	Number of items
Total CDSE-SF score	.960 (0.94)	5
Self-Appraisal	.835 (0.73)	5
Occupational Information	.831 (0.78)	5
Goal Selection	.862 (0.83)	5
Planning	.796 (0.84)	5
Problem Solving	.869 (0.75)	5

Note. CDSE-SF is Career Decision Self-Efficacy-Short Form.

The Influence Questions about Academic Major Choice Cronbach's alpha results are listed in Table 23 for each sub-item choice. The total Cronbach's alpha result was 0.864, which is considered good reliability of internal consistency.

Table 23

Cronbach's Alpha Reliability for Influence of Academic Major Choice

Total and Sub-items	Alpha Reliability	Number of items
Total	.864	10
Parent	.869	85
High School Advisor/Counselor	.848	85
High School Teacher	.857	85
Academic Advisor	.847	85
College Counseling Services	.850	85
College Instructor	.845	85
Spouse or Partner	.858	85
External Counseling Agency	.854	85
Friend (s)	.838	85
Peer Group	.840	85

The Influence Questions about the choice of STEM Field Discipline Majors results are listed in Table 24 for each sub-item choice. The total Cronbach's Alpha result is 0.909 which demonstrates excellent reliability of internal consistency.

Table 24

Cronbach's Alpha Reliability for Influence of STEM Field Discipline Majors

Total and Sub-items	Alpha Reliability	Number
Total	.909	10
Parent	.910	85
High School Advisor/Counselor	.901	85
High School Teacher	.904	85
Academic Advisor	.896	85
College Counseling Services	.898	85
College Instructor	.893	85
Spouse or Partner	.901	85
External Counseling Agency	.899	85
Friend (s)	.898	85
Peer Group	.893	85

Summary

This fourth chapter represents results that were related to four research questions in which three were associated with the CDSE-SF scale. The principal investigator designed two additional questions that would additionally support the purpose of the study and answer the additional research question. The purpose of this study was to document experiences and perceptions of students with disabilities who pursue and may consider pursuing careers in the STEM field disciplines. The perceptions included the type of influence the students with disabilities had experienced when choosing their academic majors.

Descriptive statistics, frequency distribution tables, reliability analysis and analysis of variance were performed with the sample size of 85 students with disabilities from one Midwestern university. Demographics were included to provide an over-all view of the student with disabilities participants.

The results of the data for the four research questions for this study as directly answered by the student participants represented a sample size being more limited than hoped. However, this study was designed to seek information that was lacking in the literature relating to students with disabilities and their career decision-making process.

There were significant findings within the data that went beyond the original research questions. Relating to Influence on the student with disabilities in the choice of an academic major, it was noted that there was very low level of influence on students with disabilities from the individuals or groups that would be typically known to support that influence in an academic setting. Those individuals or groups that were indicated with the result of No Influence were High School Advisor/Counselor, High School Teacher, Academic Advisor, College Counseling Services, and External Counseling.

When the CDSE-SF scale was divided into the five specific subscales, there was a significant difference found between the gender groups of male and female with the Self-Appraisal and Goal Selection subscales. The effect sizes for those subscales were larger that the remaining three subscales.

85 students with disabilities had documentation of one of nine different disability types. The disability types were wide-spread in frequencies. There three disability types represented more frequently which were Mental Health, Attention Deficit/Hyperactivity Disorder and Learning Disabilities/Specific Learning Disorder. The findings were

significant when isolating those three groups, with an N of 57 total respondents, in relationship to Academic Major Choice in a STEM or non-STEM Discipline and the CDSE-SF Total Scores.

A further analysis was explored using the sample size of 85 participants and performing a one-way analysis of variance with the dependent variable of CDSE-SF Total Scores and Academic Major Choice of STEM and non-STEM Disciplines. That analysis resulted in a significant difference in that relationship.

Chapter Five will include a discussion and interpretation of the results. It will also analyze literature in the relationships of students with disabilities and career decision-making self-efficacy. Conclusions and recommendations made for future research are presented in Chapter Five.

CHAPTER 5

SUMMARY/DISCUSSION/RECOMMENDATIONS

The purpose of this research study is to document experiences and perceptions of students with disabilities who pursue, and may consider pursuing, careers in the STEM field disciplines by exploring the career decision-making self-efficacy of students with disabilities. This study documented the level of influence that the students with disabilities had or may not have had encountered from parents, friends, advisors, counselors, and instructors as they managed their decision-making choice relating to their academic major/career in the STEM or non-STEM field disciplines.

Various research studies have indicated that the United States is a driving force in the world's economy, and as a country of innovators, it needs to maintain its competitive edge by increasing its human capital in the Science, Technology, Engineering, and Mathematics (STEM) field disciplines (Jones, 2008; National Science Foundation, 2010; National Science Foundation, 2014; National Science Board, 2010; National Science Board, 2015). The publication *Revisiting the STEM workforce* has emphasized that there is a need to redefine what it is meant to be an individual in the "STEM workforce" and "address roadblocks to the participation of groups traditionally underrepresented in STEM (e.g. minorities, women, individuals with disabilities…)" (National Science Board, 2015, p. 2).

According to Lee (2014), there is still a problematic research gap which is demonstrated as a lack of research literature relating to students with disabilities who are categorized as underrepresented minorities who are not identified as a group for the consideration of choosing academic majors in STEM field disciplines. Therefore, the

focus of this study was directed towards exploring college students with disabilities as an unrepresented minority group in the STEM field disciplines (Lee, 2014).

With the continued increase in diversity of the United States population, attention can be aimed in the direction of college students with disabilities to increase diversity in enrollment of this population of students who have an interest in the STEM field academic majors. As a unified group, a National Science Board report (2015) determined that there is a vital need to act on the lack of participation of traditionally underrepresented minorities in the STEM workforce, including those students with disabilities. Once this group of underrepresented minorities are recognized, they can identify the barriers to their access that may occur with the STEM field disciplines within which they have interest. After the barriers are identified, a barrier-free streamlined career pathway program can be developed to direct those who have interests in declaring for academic majors in STEM at academic institutions.

Research in career decision-making and academic majors pertaining to the Science, Technology, Engineering and Mathematics (STEM) field disciplines have been disproportionately underrepresented by students with disabilities. The results of the data collected from the American Community Survey of 2012 indicated that 12% of the United States population has described themselves as having at least one disability that has restricted their performance in activities of daily living (National Science Foundation, 2015b). The same 2012 survey revealed that within the science and engineering field majors, 11% of undergraduate students and 7% of graduate students reported that they had at least one disability (National Science Foundation, 2015b). In 2011, the National Science Foundation also reported that 3% of doctoral graduates have reported having at

least one disability, which slightly rose to 5% of doctoral graduates in 2012 (National Science Foundation, 2015a, 2015b). According to *Science and Engineering Indicators 2014*, graduate education enrollment in 2011 was represented by Asians and Pacific Islanders at 6 %; blacks, Hispanics, American Indians, and Alaska Natives at 12%; and whites at 47%.

The Committee on Equal Opportunities in Science and Engineering (CEOSE) presents a biennial report to the Congress of the United States, as an advisory group to the National Science Foundation. According to the 2013-2014 CEOSE report, the underrepresented groups of women, African Americans, Hispanics, and Native Americans have risen in the attainment of degrees in the STEM field disciplines, however, the representation of students with disabilities in those same STEM field disciplines has been daunting at an attainment of 5 % of the doctorates with little variation by what academic major that they choose (National Science Foundation, 2015a).

Chapter Five provides a summary of the following results relating to the four research questions:

1) Do students with diagnosed disabilities receive academic and/or personal support when selecting Science, Technology, Engineering, or Mathematics majors?;

2) Do male college students with diagnosed disabilities in STEM and non-STEM majors have a different perception of their career decision self-efficacy than female students with diagnosed disabilities in STEM and non-STEM majors?;

3) Does the students' disability type influence confidence level results as it pertains to the CDSE-SF scores?; and

4) Do students with diagnosed disabilities differ in CDSE-SF scores by college major choice and type of disability?

This chapter will also identify the limitations of the study, provide implications for action, and provide recommendations for future research.

Discussion of the Results

Students with disabilities who participated in this study were students at a public Midwestern university. They were self-registered students with the Disability Access Services Department. They are provided accommodations for their disability as per Section 504 of the Rehabilitation Act and the Americans with Disabilities Act.

Approximately one-half of the students with disabilities reported their academic standing as senior (50.59%), and the second largest group of students reported that they were juniors (30.59%). A large majority of the students with disabilities were transfer students (81.18%). Of the 85 respondents who completed the survey, 58.82% were female between the ages of 23 and 27. With regard to the category "marital status", 68.24% of the participants were single, and 71.76% indicated that they were White (non-Hispanic).

The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition was used to define and categorize the various disability types. There were nine disability types represented by this group of respondents. The three highest disability types identified through the results of this study were Mental Health (27.06%), Attention Deficit Hyperactivity Disorder (21.18%), and Learning Disabilities/Specific Learning Disorder (18.82%).

The Academic College with the most participants was the College of Arts & Sciences (44.71%) in which the academic major of Social Work was at the highest

participation level of 9.41%. The second highest academic major became a three way tie according to percentage but derived from three different academic colleges. They were the major of Biology (8.24%) from the College of Arts & Sciences, the major of Business Administration-Manager (8.24%) from the College of Business, and the major of Communication (8.24%) from the College of Fine Arts & Communication.

The research revealed that the students with disabilities did not perceive a higher frequency of academic and/or personal support when considering enrollment in STEM academic majors. The individuals and groups of individuals who had no influence and did not provide support for students with disabilities during the career decision-making process as it relates to the selection of STEM as an academic major include the following: Parent, High School Advisor/Counselor, High School Teacher, Academic Advisor, College Counseling Services, College Instructor, Spouse or Partner, External Counseling, Friend(s), and Peer Group. The respondents indicated that there were zero individuals or groups of individuals who had any influence in guiding them towards an academic major in the STEM field disciplines.

The results of this study demonstrate that there continues to be a lack of encouragement for students with disabilities who may be interested in or need support from a support network of family, friends, counselors, advisors, and instructors as they consider selecting STEM as an academic major. *The Handbook of Attitudes* references how attitudes of a particular group could influence a situation and could promote what direction an individual may lean towards in major decision-making such as career decision-making (Ajzen & Fishbein, 2005). The literature has shown that with regard to disciplines such as Science, Technology, Engineering, and Mathematics, students with

disabilities are disregarded as a group who has the academic fortitude necessary to be successful in those disciplines (Bayer Corporation, 2010; Hill et al., 2010; Lee, 2014). Alston and Hampton (2000) indicated in their research that Parents and Teachers agreed that students with disabilities were encouraged to select academic majors other that Science and Engineering by counselors and teachers. However, teachers indicated that parents also encourage their children to pursue a career other than Science or Engineering.

This study revealed that there were more female respondents who were not influenced by high school teachers to pursue a STEM major. Research by the National Science Board, indicated that "half of mathematics and science teachers at most levels" [could support counseling the] female students in mathematics and science" (National Science Foundation, 2014, p. 1-5). It was also reported that only 30% of elementary school teachers felt confident in supporting female students to pursue STEM disciplines (National Science Foundation, 2014).

Academic advisors and college counseling services are major resources at educational institutions for college students who are establishing future professional goals. The results of this research revealed that students with disabilities were not influenced by academic advisors to pursue career pathways relating to the STEM disciplines. This outcome is consistent with the research conducted by Hitchings et al. (2001) in that college students did not consult with their counselors regarding their academic plan.

There is a need to close the gap as it relates to collaboration among the student with disabilities and the academic advisors and counselors in institutions. Glynn et al

(2011) used a Science Motivation Questionnaire to find the motivation for individuals who desire to take coursework in the science fields. They found that this tool was useful in identifying strategies of encouragement that academic advisors can use to become more effective when discussing career decisions with all students. The literature states that when individuals have a favorable attitude toward a situation or goal, others will be drawn towards the positive features of that situation or goal and influenced in a positive direction which will lead to success (Ajzen & Fishbein, 2005; Bandura, 1994).

In this research study, it was found that 81.18% of the respondents stated that they were transfer students. Students with disabilities must be involved in the development of their academic plans, especially when they are transferring to another institution. Part of their educational plan is to know the laws and accommodations relating to their disability and understand their disability. Hitchings et al. (2001) emphasized that students with disabilities should be involved with career development during the first two years of their college experience. Providing effective support services to students with disabilities will increase their awareness of career options (Madaus et al., 2003).

This research study also determined that the Parent was not an influence for the students with disabilities who may have expressed interest in seeking a STEM academic major. This relates to research conducted by the Bayer Corporation (2010), in that 26% of the underrepresented minority chemists and engineers were discouraged from pursuing a career in a STEM discipline by their parents or a family member.

No Influence or encouragement from the Parent to consider the STEM academic majors could also relate to the Parent's own personal experience. The Parent may not have attended college. The Parent may not have had any experience or understanding of

how to find resources available to students when considering career choices. The Parent may be employed in a STEM career that he or she does not want to encourage for his or her child. Parents who had not successfully navigated accommodations when they had been diagnosed with a disability may not be able to assist their own child with determining career choice. A Parent that is not disabled may not know that there exists different types of accommodations that are provided in the elementary, secondary, undergraduate and graduate levels of education. Smith, English and Vasek (2002) did indicate in their research that parents who did not understand the process of helping their child with disabilities in school would more than likely not understand how to help them with career planning. This lack of knowledge and participation among parents could discourage their children from self-advocacy regarding their educational plans when transitioning from high school to college admission. This would result in a delay in the provisions of accommodations and appropriate incorporation of accessible Universal Design tools and instruction (Orr & Hammig, 2009).

Alston and Hampton (2000) surveyed 140 Parents and 323 Teachers and agreed that there were not enough role models or teachers with disabilities who taught science courses or students with disabilities in the science courses at the schools for other students with disabilities to consider wanting to enter the science and engineering fields. It was determined by Lent, Brown, and Larkin (1984) that when students are placed in a career planning program and they have interest in STEM academic majors, their self-efficacy will increase.

This research study also revealed that male students with disabilities in STEM and non-STEM majors did not score higher in confidence than female students with

disabilities in STEM or non-STEM majors with regard to career decision-making self-efficacy total scores.

Betz and Hackett (1981) researched gender differences using traditional and non-traditional careers as two categories and self-efficacy as the theoretical basis of Bandura's research. They found gender differences relating to self-efficacy as it pertains to traditional careers for men in comparison to traditional careers for women. The careers were categorized as traditional and non-traditional careers based on United States government employment statistics provided during the time of their research study. There was a higher self-efficacy for men regarding both types of career categories. The research indicated that females had higher self-efficacy when pursuing traditional careers as opposed to non-traditional careers. Betz and Taylor (1993) further developed Bandura's work in self-efficacy and created a Career Decision Self-Efficacy Scale-Short Form to bifurcate the work into the vocational realm and career decision-making. The results of this research revealed that there was no significant difference between male and female career decision-making self-efficacy with regard to the Career Decision-Making Self-Efficacy Total scores (Betz, Klein, & Taylor, 1996). Lent, Larkin, and Brown (1989) found that there were no differences between genders in relationship to self-efficacy and interests in pursuing STEM field disciplines.

This researcher did additional analysis relating to the subscales of the CDSE-SF. By separating the CDSE-SF Total score into the subscales, it provided an opportunity for the researcher to understand the Total score in a deeper way without the benefit of a qualitative piece to this study design. There was not a significant variance of Male and Female genders relating to the subscales of Occupational Information, Planning, and

Problem Solving. However, there was a significant difference by genders and the subscales of Self-Appraisal and Goal Selection.

It is important for academic advisors to focus on the Self-Appraisal and Goal Selection areas of the participants' results to be able to provide academic counseling to students with disabilities. This research finding concurs with research that recommends that institutions should establish a climate for success to encourage women to pursue academic fields, such as STEM careers (Perna, et al., 2009). Because women are not valued and are perceived as incapable of sacrifice to be successful in those fields, they may not aspire to pursue such vocations (Hill et al., 2010). In contrast, Betz and Hackett (1983) stressed in their research that women were adaptable to change in any academic college environment chosen more often than men in the same instances. Programs could be created to help women be successful in improving their ability to have a higher Self-Appraisal and increase their level of comfort with setting goals and reaching their potential.

The research also revealed that there was no relationship between the student's type of disability and the career decision self-efficacy total scores. There was an interest on the part of this principal investigator to find if a disability could affect the Total scores of career decision self-efficacy since there was no research found in the literature relating those scores to students' disabilities. It appears from the results of this study that barriers that may impede academic success for students with disabilities do not affect their confidence in continuing to pursue their education.

In 2015, the National Science Foundation reported that 25% of undergraduate students with at least one disability registered for an academic major in a STEM field

discipline. Furthermore, the Science and Engineering Indicators 2014 reports that one-third of the doctoral recipients of a degree in those fields were diagnosed with a learning disability, 17% blind or visually impaired, 13% physical or orthopedic disability, 12% deaf or hard of hearing, 4% speech disability and 21% were not specified from a category (National Science Foundation, 2014).

In contrast, according to Luzzo, Hitchings, Retish, and Shoemaker (1999), college students with disabilities may avoid career decision-making steps because of their disability type. It was reported that the students with disabilities tend to feel that they do not have the control over their own course and they in turn lack the confidence to make career decisions. One hundred twenty-one undergraduate students with and without disabilities were compared using the CDSE-SF scale by Luzzo et al, with the specific learning disability listed as the disability with the largest frequency. It was found that the students with disabilities had "significantly lower levels of career decision-making [self-efficacy]" (Luzzo et al., 1999, p. 48).

Based upon the research of Orr & Hammig (2009) to that of Raue and Lewis (2011), there has been an increase of postsecondary undergraduates who have a disability. The population of students with disabilities enrolling in 2 and 4 year institutions is growing, making students with disabilities a new generation of diverse students on college campuses.

Even though this research study revealed that career decision-making self-efficacy total scores are not affected by the students' disability, Moon, Todd, Morton and Ivey found in their research for the National Science Foundation (2012) that these students do not persist to degree completion like students without disabilities. They found

that 10% of the United States workforce has at least one disability, with 2 percent of that workforce in a STEM career (National Science Foundation, 2012).

The research revealed that there was not a significant difference among disability type, college major choice (STEM major and non-STEM major) and career decision self-efficacy total scores.

Since the Null Hypothesis four was supported and not rejected, the data from 57 student participants chosen from the three highest Disability Type frequencies was selected for further analysis. The three highest frequencies of participants in the study were Mental Health (N = 23), Attention Deficit/Hyperactivity Disorder (N = 18) and Learning Disabilities/Specific Learning Disorder (N = 16). Using the three highest Disability Types, the research revealed that there was a significant difference between the variable "student with disabilities Academic Major" choice (STEM major and non-STEM major) and CDSE-SF Total scores.

Luzzo, Hitchings, Retish, and Shoemaker (1999) found in their research that the attitude of students with disabilities regarding career decision-making was less positive than students who did not have disabilities. They indicated that by increasing the exposure of students with disabilities to career development programs, the students would have better awareness of their ability to make informed decisions and increase their understanding of their career path.

Students with disabilities could increase their career decision self-efficacy by being engaged more in Universal Design type of programs that include a variety of instructional methods (Roberts et al., 2011). The Universal Design programs will assist the student with the teacher in finding the right fit and way of learning per the STEM or

non-STEM Academic Major chosen (Orr & Hammig, 2009). Perna et al. (2009) agree that with creating ways to help underrepresented minorities in the STEM field programs by looking at styles and types of learning, these students will want to persist once entering the STEM academic program. When students are put in a situation where their self-esteem can grow and their self-worth is identified to them they can build up their self-determination (Getzel, 2008).

Hinkelman and Luzzo (2007) draw attention to individuals with mental health issues that could interfere with academic major choices which could eventually limit career development. Stress and anxiety are not new to students with disabilities, or any other student on today's college campuses. Since this research identified that the Mental Health documented students with disabilities are a major portion of the disabled population at the university under study, the institution needs to be aware of the gap in counseling these students. With these findings, teachers and counselors may need to be trained in mental health counseling and mental health awareness as the population of students becomes more diverse in hidden documented diagnoses.

Delimitations and Limitations

The delimitations and the limitations of the study affected the results and led to various modifications of the initial research proposal. The delimitations of this study were the use of one public, urban Midwest university, and the use of the students with disabilities that registered with the Disability Access Services Department at the institution in the time frame of the research study. The proximity to the students and institution under study was what influenced those decisions. The use of one institution minimized the generalizability of the results of this study to the population of students with disabilities. According to Section 504 of the Rehabilitation Act of 1973, students

that have been officially identified and documented with a disability prior to coming to the university level have the obligation to self-identify to the Disabilities Access Services Department at the university level in order to receive services (Boyer-Stephens et al., 2010). Depending on a student's needs, the choice of when to self-identify is up to the student. Students that have not been identified and documented with having a disability until going through a particular sequence of the curriculum may not identify until later in their academic program at the institution.

Another delimitation was the decision to not have an incentive for the study. The survey response rate was significantly low during the first two semesters of the time frame of the study (Chapter 4, Table 1). A gift card drawing incentive was introduced by approval of the Institutional Review Board during the Summer 2014. This introduction of the incentive increased the Spring 2014 response rate of 1.63% to the Summer 2014 response rate of 25.87%.

The limitations to this research study were the number of students who have documented disabilities on campus and who identified themselves to the Disability Access Services Department. As listed in Table 1, the sample sizes varied from the Fall 2013 semester through the Fall 2014 semester. The sample size did not increase for those two semesters, at which time an incentive was introduced into the research study. Given the number of disability categories that exist according to the *Diagnostic and Statistical Manual of Mental Disorders Fifth Edition*, some of the categories had minimal participants (Chapter 4, Table 6).

The willingness and honesty of the participants to complete the online survey or paper format of the survey instrument was a limitation in the study. There were a total of

87 participants who completed the paper and online versions of the survey instrument. There were two participants who were excluded from the study who did not complete a portion of the survey and the demographic section of the online version of the survey. This reduced the number of completed surveys to 85.

Another limitation was the unanticipated change in Disability Access Services Department policy on the use of the Campus Testing Center for the students to take examinations. There was an expansion of the Campus Testing Center on campus; therefore the Disability Access Services Coordinator indicated that more students were using that extension of the department in order to take their examinations. The students with disabilities were not visiting the Disabilities Access Services Department as often in order to be exposed to possible participation in the research study. The extension service of the Campus Testing Center came into more use by the students when the testing rooms at the Disabilities Access Services Department were closed due to physical water damage.

An additional limitation to the study was the requirement to maintain anonymity of the participants. There was a need to use authorized individuals to access the students with disabilities. Anonymity policy and the American Disabilities Act law dictated how the students with disabilities participants in this research study could be contacted. The Disability Access Services Coordinator had full access to the students under study, except when sending out a mass blinded email invitation. The dependence on the coordination between the Disability Access Services Coordinator and Information Technology Services programmer was crucial for the survey instrument invitation and the informed consent form to be received by the population under study through a mass email. There

were times when the DAS Coordinator and the Information Technology Services programmer were not available to each other at the times when the survey instrument reminders needed to be sent out by emails to the students under study.

Implications and Future Research

The design of this study can be enhanced by focusing on the use of more than one institution to gain a larger sample size so that the results could be generalized to the population under study. The use of convenience sampling was restrictive, especially with the added restriction of having to use authorized personnel to have contact with the students with disabilities. The authorized personnel who do have greater access to the students with disabilities could collaborate with the Institutional Research Department to aid in research design. This collaboration could assist in increasing access to the students with disabilities which could take away a potential barrier from future researchers considering designing research studies using students with disabilities. The gap in the literature that exists could be closed even more quickly because the individuals that have direct access to this protected group of students would not experience the barriers that this researcher experienced throughout the project in achieving the sample size that was eventually attained.

The design of this research used students with disabilities as participants because of the lack of literature relating to this population, career decision-making and the STEM field disciplines. Future research can be focused on students with disabilities who are specifically part of the other underrepresented minority groups in the STEM field disciplines such as Women, Hispanics, and African Americans. The literature focuses on other groups of underrepresented minorities, but there is more of a gender and racial

focus and less of a focus on adding another layer for those minorities who are disabled individuals.

Academic advisors, advisor/counselors at secondary and postsecondary institutions play a vital role in assisting individuals with academic planning and determining a career path. This study has revealed that students with disabilities were not influenced by academic advisors and advisor/counselors to pursue entering STEM field academic majors. Future research questions could focus on the extent to which students with disabilities do use these services at the institution as it relates to students who do not have disabilities. It would be beneficial to study the resources available to students with disabilities. Academic advisors and counselors could be surveyed regarding professional development and training that could address the various needs of students with disabilities, including the federal laws that relate to students with disabilities.

Students have many choices of educational institutions when choosing to further their education after high school. There are trade schools, community colleges and institutions of higher education that are public and private, to name a few. Students with disabilities research can be explored at the high school level, or even the middle school level, regarding their parents' understanding regarding the accommodations available that are at the postsecondary school level and beyond. The focus of the research can be how much the parent is aware of or understands the rights and federal laws that pertain to their child with disabilities when considering educational programs beyond high school. Once a child is identified with a disability at any level of education prior to college attendance, are the parents aware of the availability of accommodations at the college and university level once a student with a disability graduates from high school? Do the parents feel that

they have the knowledge necessary to encourage smooth transitions for their children? Parents and students with disabilities may not be aware that accommodations that were received in the secondary school system can continue in another way at the college and university level. Results from this suggested research could aid college and university orientation programs.

As reported in Chapter 4, there was a significant number of students with disabilities who identified with the disability category of Mental Health. Research could be focused on the Mental Health disability and career decision-making relating to careers in STEM field disciplines. This research was a quantitative study that could be repeated using the Mental Health disability category and adding a qualitative component. Hinkelman and Luzzo (2007) reported that institutions that counsel mental health students at counseling centers on campus may not be collaborating with the academic counselors and career advisors that work with the same students on campus. The counseling centers and academic counselors that assist the student with the Mental Health disability are typically located at different areas on the campus and may not easily connect with the academic counselors that would provide opportunity for guidance in a career.

In addition, obtaining research data using focus groups could give deeper understanding to the "why" and "how" students with disabilities experience what they do in career decision-making and academic major choice. This additional data could provide more information beyond the boundaries of this qualitatively designed study.

Conclusion

This research was a challenge from the inception of its design in focusing on the population of college students with disabilities. This population was chosen because of the lack presentation in the current literature of data relating to their needs in academic major selection of careers relating to the Science, Technology, Engineering, and Mathematics field disciplines. There is an enormous amount of literature on other underrepresented minority groups relating to the STEM academic majors, such and Women, Hispanics, and African-Americans.

Based upon the results, college students with disabilities are not currently being influenced by individuals and groups of individuals to pursue the STEM field disciplines. Students with disabilities are a cohort of individuals who can be marketed to increase enrollment in the STEM programs at academic institutions.

This research study found that gender differences at the institution under study did not affect the career decision-making self-efficacy scores. The men did not score any higher in confidence in career decision-making than the women. There were more female students who responded to the survey.

Surveying the students with disabilities on one campus brought to the results a variety of disability categories in which some of the categories had a few respondents. Taking another look at the results, by taking the top three disability categories, gave a glimpse of a changing campus environment. Of those three disability types represented more frequently, students with disabilities with the Mental Health disability were found to be a growing disability at the institution under study. Disability Type did not

significantly affect the relationship between the Career Decision-Making Self-Efficacy Total Scores or college major choice.

A problem was identified in the research literature at the start of this project in that students with disabilities were found to be an underrepresented minority in the STEM field disciplines. This research was beneficial and able to document that the specific levels of influence perceived by students with disabilities from parents, friends, advisors, counselors, and instructors do relate to their academic career decision-making and academic major choices.

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Appendix A

Career Decision Self-Efficacy Scale–Short Form © Sample

Survey respondents were given 25 statements that they had to rate according to their chosen confidence level. If the respondent chose "Complete Confidence," the value recorded was a 5. The following confidence scale with designated values was used:

NO CONFIDENCE AT ALL	VERY LITTLE CONFIDENCE	MODERATE CONFIDENCE	MUCH CONFIDENCE	COMPLETE CONFIDENCE
1	2	3	4	5

Example: How much confidence do you have that you could:

Select one major from a list of potential majors you are considering.

More information can be obtained by contacting Dr. Betz:

Nancy E. Betz, Professor
Department of Psychology
The Ohio State University
Columbus OH 43210
614-847-0517
betz.3@osu.edu

Appendix B

Electronic Mail Permission for Use of Documents

From: Betz, Nancy [betz.3@osu.edu]
Sent: Wednesday, May 09, 2012 3:58 PM
To: Dishauzi, Karen M. (UMSL-Student)
Subject: RE: Permission request for using the Career Decision-Making Self-Efficacy Scale Instruments

Here you go - you have my permission to use! You do not need taylor and klein's permission- until Mindgarden takes it (under contract but not signed yet) I distribute it.

Best wishes
NB

Nancy E. Betz, Professor
Department of Psychology
The Ohio State University
Columbus OH 43210
614-847-0517
betz.3@osu.edu

Appendix C

Demographic Survey Questions

1. What is your gender? Male, Female, Other

2. What year in school are you? Freshman, Sophomore, Junior, Senior, Graduate student, Professional student

3. What is your marital status? Single, Married, Same Sex Partnership/Union, Divorced, Separated,Widowed

4. What is your age range? 17-22, 23-27, 28-36, 37-46, 46-55, 56+

5. How would you describe your ethnicity/race?

American Indian/Alaskan Native, Asian or Pacific Islander, Black/African American, Hispanic, non-Hispanic, White, non-Hispanic, International Student, Multiracial, No response, Other: please specify_____

6. How would you describe your disability type?

Attention Deficit/Hyperactivity Disorder (ADHD), Blindness and Low Vision, Autism, Deaf and Hard of Hearing, Learning Disabilities (LD), Attention Deficit Disorder (ADD), LD/ADD, Mental Health (ex; Bi-Polar, Depression, Anxiety), General/Medical conditions (ex: Diabetes, Renal Failure), Orthopedic, Mobility/Wheelchair, Other: please specify _____

7. Are you a transfer student? Yes, No

8. My Academic College at this institution is: Undecided, Arts & Sciences, Business Administration, Education, Fine Arts & Communication, Joint Engineering, Nursing, Optometry

9. Choose your major field of study in the Academic College that you are enrolled in:

Undecided (Does not Apply; Undecided at this time)

Arts & Science (Does not Apply; Anthropology/Sociology/ Languages; Biology; Chemistry/Biochemistry; Criminology/Criminal Justice; Economics; English; History; Math & Computer Science; Military Science/ Army ROTC; Philosophy; Physics/Astronomy; Political Science; Psychology; Social Work; Gender Studies)

Business Administration (Does not Apply; Accounting; Business Administration – Finance; Business Administration – International Business; Business Administration –

Logistics & Operations Manager; Business Administration – Management; Business Administration – Marketing; Information Systems)

Education (Does not Apply; Early Childhood; Art Education; Music Education; Middle School Education; Physical Education; Secondary School Education; Master's Program; Doctoral Program)

Fine Arts & Communication (Does not Apply; Art & Art History; Communication; Music; Theatre, Dance, & Media Studies)

Joint Engineering (Does not apply; Pre-Engineering; Civil Engineering; Electrical Engineering; Mechanical Engineering)

Nursing (Does not apply; Nursing)

Optometry (Does not apply; Optometry)

Appendix D

Supplemental Questions

1. INSTRUCTIONS: Please read carefully. For each individual or group listed below indicate how much influence each has had on your career decision-making/academic major.

   1 = No Influence
   2 = Very Little Influence
   3 = Moderate Influence
   4 = Much Influence
   5 = Complete Influence

   1) Parent 1 2 3 4 5

   2) High School Advisor/Counselor 1 2 3 4 5

   3) High School Teacher 1 2 3 4 5

   4) Academic Advisor 1 2 3 4 5

   5) College counseling services 1 2 3 4 5

   6) College instructor 1 2 3 4 5

   7) Spouse or partner 1 2 3 4 5

   8) External counseling agency 1 2 3 4 5

   9) Friend(s) 1 2 3 4 5

   10) Peer group 1 2 3 4 5

2. INSTRUCTIONS: Please read carefully. For each individual or group listed below indicate how much influence each has had in your consideration of an academic major/career in the Science, Technology, Engineering, or Mathematics field disciplines.

1 = No Influence
2= Very Little Influence
3 = Moderate Influence
4 = Much Influence
5 = Complete Influence

1) Parent 1 2 3 4 5

2) High School Advisor/Counselor 1 2 3 4 5

3) High School Teacher 1 2 3 4 5

4) Academic Advisor 1 2 3 4 5

5) College counseling services 1 2 3 4 5

6) College instructor 1 2 3 4 5

7) Spouse or partner 1 2 3 4 5

8) External counseling agency 1 2 3 4 5

9) Friend(s) 1 2 3 4 5

10) Peer group 1 2 3 4 5

Appendix E

Invitation to Participate

Dear Student,

I am currently a doctoral candidate at the University of Missouri-St. Louis in the College of Education. The Disability Access Services Program Coordinator, Linder Williams, has sent this email to you on my behalf. I am surveying students with disabilities and would like to invite you participate to share your perceptions.

The purpose of this research study is to explore students with disabilities in career decision-making and compare that to their career decision-making self-efficacy. Career decision-making self-efficacy could be described as one's belief in the ability to make a career decision.

Your participation will be completely voluntary and your name will remain anonymous (unknown). You will not be able to be identified from any of your responses from the survey.

You may choose not to participate in this research study or to withdraw your consent at any time by exiting out of the survey. While taking the survey, you may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw by exiting out of the survey.

If you have any questions or concerns regarding this study, or if any problems arise while you are taking it, you may call the Disability Access Services Program Coordinator, Linder Williams at 314-516-6554 or email her at linder@umsl.edu. She will be your contact to address any of the questions or concerns about the research. If you have any questions or concerns, Linder Williams will withhold your identification from me and ONLY provide your questions and concerns regarding the study so that you, the participant of the research, will remain anonymous.

The link listed below in this Invitation to Participate email will take you to a secured website called SurveyMonkey. The website is secured and I will have the only access by use of a User Identification and the use of password protection. All data will be stored on the secured website and then on a password-protected computer and in a locked office.

I greatly value your perspective on this important topic. Your participation is vitally important to the success of this research.

An Informed Consent document is attached to this email above. Please read it and decide if you would like to participate in the survey.

Please click on the following link to enter survey: www.surveymonkey.com/XXXXX

I want to sincerely thank you for your participation.

Karen Dishauzi, Principal Investigator of the Research
Linder Williams, Disability Access Services Program Coordinator

Appendix F

Invitation to Participate Revised

Dear Student,

I am currently a doctoral candidate at the University of Missouri-St. Louis in the College of Education. The Disability Access Services Program Coordinator, Linder Williams, has sent this email to you on my behalf.

The purpose of this research study is to survey students with disabilities about their career decision-making and compare that to their career decision-making self-efficacy. Career decision-making self-efficacy could be described as your belief in your ability to make a career decision.

After completing the survey, you are eligible to enter a drawing for a $10 gift card to the UMSL bookstore.

There have been prior emails sent out to you and a few of you have already have taken the opportunity to complete the online or paper version of this survey entitled **Supporting Students with Disabilities**. If you have already filled out the survey from a prior invitation to participate, *thank you very much*! By completing the survey, you can choose to enter the new gift card drawing by contacting Linder Williams, Disability Access Services Program Coordinator, and tell her that you have already taken the survey and give her your preferred contact information if you should win a drawing.

For those of you that have not participated in completing a paper version or online survey, please take this opportunity to help us understand how to **Support You!** Your perspective on this important topic is very valuable, and your participation is vitally important to the success of this research.

This survey should take no longer than 5 to 8 minutes to complete; however, you may take as long as you want to complete it. There are instructions at the end of the survey on how to enter the drawing from taking it online. If you appear in person at the Disabilities Access Services department to take the paper format of the survey, you can choose to enter the drawing by giving your preferred contact information to Disability Access Services at that time. There are more details about the drawing explained in the attached Informed Consent form.

Your participation will be completely voluntary and there will be no identifying information asked so you will remain anonymous (unknown). You will not be able to be identified from any of your responses from the survey. Please read the attached Informed Consent form for more details on how to help you to decide whether or not to participate in this survey.

If you have any questions or concerns regarding this study, or if any problems arise while you are taking it, you may contact the Disability Access Services Program Coordinator at her contact information listed below. She will be your contact to address any of the questions or concerns about the research. If you have any questions or concerns, Linder

Williams will withhold your identification from me and ONLY provide your questions and concerns regarding the study to me so that you, the participant of the research, will remain anonymous. If you are not your own Legal Guardian, (ask Disabilities Access Services Program Coordinator if you are not sure) please do not participate in this survey.

The link below will take you to a secured website called SurveyMonkey. The website is secured and I will have the only access to the results by the use of a protected User Identification and password. All data will be stored on the secured website and then on a password-protected computer and in a locked office.

Again, an **Informed Consent document** is attached to this email above. **Please read** it and decide if you would like to participate in the survey.

Please click on the following link to enter the survey:
https://www.surveymonkey.com/s/XXXXX

We want to sincerely thank you for your participation!

Karen Dishauzi, Principal Investigator of the Research

Linder Williams, Program Coordinator
Disability Access Services

This message is for the designated recipient(s) only and may contain privileged or confidential information. If you received it in error, please notify the sender immediately and delete the original.

Appendix G

Informed Consent

Division of Educational Leadership and Policy Studies

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-5944

Informed Consent for Participation in Research Activities

Supporting Students with Disabilities entering the STEM field disciplines

1. You are invited to participate in a research study conducted by Karen Dishauzi, doctoral student under the advisement of Dr. Shawn Woodhouse, Associate Professor for Educational Leadership and Policy Studies in Higher Education at the University of Missouri-St. Louis. The purpose of this research is to explore students with disabilities in career decision-making and compare that to their career decision-making self-efficacy. Career decision-making self-efficacy could be described as one's belief in the ability to make a career decision.

2. a) Your participation will involve following this link, www.surveymonkey.com/XXXXX, to answer an online survey that will have questions about your career decision-making experiences. Approximately 340 students with disabilities may be involved in this research at the University of Missouri-St. Louis.

b) The amount of time involved in your participation will be unlimited for you to answer questions on the online survey (www.surveymonkey.com/XXXXX).

3. There are no anticipated risks associated with participating in this research. However, there may be certain discomforts associated with this research. You may be uncomfortable in answering certain questions. If you feel uncomfortable, you may choose not to answer any questions that you do not want to answer.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge base of students with disabilities in their career decision-making experiences. Your participation in this research experience may

also help various institutional departments gain insight on how to support your needs as you progress towards graduation and search for employment.

5. Your participation is voluntary and your name will remain anonymous (unknown). You may choose not to participate in this research study or to withdraw your consent at any time. You may withdraw from the study at any time by exiting out of the survey at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw by exiting out of the survey.

6. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your data. In addition, all data will be stored on a password-protected computer and in a locked office. The SurveyMonkey website is secured with the researcher having the only access to the data by use of a User ID and the use of password protection.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Disability Access Services Program Coordinator, Linder Williams at 314-xxx-xxxx or email her at linder@umsl.edu. She will be your contact to address any of the questions or concerns about the research with the Investigator, Karen Dishauzi, or the Faculty Advisor, Dr. Shawn Woodhouse. If you have any questions or concerns, Linder Williams will withhold your identification from the Investigator and Faculty Advisor and ONLY provide your questions and concerns regarding the study so that you, the participant of the research, will remain anonymous. You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 314-516-5897.

8**. If you choose to click on the SurveyMonkey survey link within the Invitation to Participate email to take the survey, your participation indicates that you have read this consent form and have been given the opportunity to ask questions and hereby consent to participation in the research described above. . It is also recommended that you print a copy of this Letter of Consent to keep for your records.**

9. Your participation in this research study by way of the online survey at www.surveymonkey.com is greatly appreciated and completely voluntary.

Appendix H

Informed Consent Revised

Division of Educational Leadership and Policy Studies

One University Blvd.
St. Louis, Missouri 63121-4499
Telephone: 314-516-5944

Informed Consent for Participation in Research Activities

Supporting Students with Disabilities entering the STEM field disciplines

1. You are invited to participate in a research study conducted by Karen Dishauzi, doctoral student under the advisement of Dr. Shawn Woodhouse, Associate Professor for Educational Leadership and Policy Studies in Higher Education at the University of Missouri-St. Louis. The purpose of this research is to explore students with disabilities in career decision-making and compare that to their career decision-making self-efficacy. Career decision-making self-efficacy could be described as one's belief in the ability to make a career decision.

2. a) Your participation will involve following this link, https://www.surveymonkey.com/s/XXXXX, to answer an online survey or a paper version of the survey that will have questions about your career decision-making experiences. Approximately 340 students with disabilities may be involved in this research at the University of Missouri-St. Louis.

b) ***If you are not your own legal guardian, please do not participate in this Survey.*** The Disability Access Services Program Coordinator will assist you if you have any questions about legal guardianship.

c) The amount of time involved in your participation will be approximately 5-8 minutes; however you have an unlimited amount of time to answer the questions on the online or paper version of the survey.

d) For your participation in completing the survey and contributing to this research, you will have the opportunity to enter a weekly drawing to possibly win a $10 gift card to the UMSL Bookstore. If you choose to complete a paper format of the survey in the Disability Access Services department, you will provide your preferred contact information when you present to the Disability Access Services proctor the completed survey instrument. If you choose to complete an online survey, there will be instructions

at the end of the survey about the procedure on how to voluntarily enter the drawing. You will be notified from your preferred contact information by Disability Access Services if you have won a drawing. If you did not win, your preferred contact information will remain in the drawing pool so you will have another weekly chance to win. Your odds in winning are 1 in a maximum of 340 participants. If you report to Disability Access Services that you have already filled out a survey from a prior invitation about this research project, relay your preferred contact information to the Program Coordinator to be placed into the drawing pool. The principal investigator will have no access to or knowledge of the winners of the drawings and no access to any identify information about you.

3. There are no anticipated risks associated with participating in this research. However, there may be certain discomforts associated with this research. While you are completing either format of the survey you may be uncomfortable in answering certain questions. If you feel uncomfortable, you may choose not to answer any questions that you do not want to answer.

4. The possible benefit for you from this study is the opportunity to participate in a drawing to possibly win a gift certificate as mentioned in number 2 (d) above. Your participation will also contribute to the knowledge base of students with disabilities in their career decision-making experiences. Your participation in this research experience may also help various institutional departments gain insight on how to support your needs as you progress towards graduation and search for employment.

5. Your participation is voluntary and there will be no identifying information asked of you so you will remain anonymous (unknown). All contact information that you prefer to provide to the Disability Access Services will remain in that department. The principal investigator will not have access to that information. You may choose not to participate in this research study or to withdraw your consent at any time. You may withdraw from the study at any time by exiting out of the survey at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or withdraw from the survey.

6. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your data. In addition, all data will be stored on a password-protected computer and in a locked office. The SurveyMonkey website is secured with the researcher having the only access to the data by use of a User ID and the use of password protection.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Disability Access Services Program Coordinator, Linder Williams at 314-XXX-XXXX or email her at linder@umsl.edu. She will be your contact to address

any of the questions or concerns about the research with the Investigator, Karen Dishauzi, or the Faculty Advisor, Dr. Shawn Woodhouse.

If you have any questions or concerns, Linder Williams will withhold your identification from the Investigator and Faculty Advisor and ONLY provide your questions and concerns regarding the study so that you, the participant of the research, will remain anonymous. You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 314-516-5897.

8. **If you choose to click on the SurveyMonkey survey link within the Invitation to Participate email to take the survey, or choose to fill out the paper version, your participation indicates that you have read this consent form, *You are Your Own Legal Guardian*, and have been given the opportunity to ask questions and hereby consent to participation in the research described above.**

It is recommended that you print a copy of this Letter of Consent to keep for your records if this was taken online, or keep this copy if you have chosen to participate in the paper version of the survey.

9. Your participation in this research study by way of the online survey at www.surveymonkey.com, or participation by the paper version of the survey is greatly appreciated and completely voluntary.

Appendix I

Campus Testing Center Staff Survey Instructions

Dissertation survey distribution instructions

1) Disability Access Services students (DAS) are eligible.

2) Each student fills out one survey.
Each student is to receive an informed consent form to read.

3) The student is to return the survey to the Campus Testing Center authorized individual.

4) The student may KEEP the informed consent form.

5) After returning the completed survey, each participating student may fill out Gift Card Ticket with contact information that DAS will only use. The Campus Testing Center authorized individual will place the completed ticket into the dedicated envelope.

6) Karen Dishauzi will pick up the sealed envelope at a random time and give it to DAS to enter the gift card tickets into the drawing pool.

7) Karen Dishauzi will leave a new envelope for Campus Testing Center authorized individuals to place new filled out Gift Card Tickets within it.

Appendix J

End of the Online Survey Gift Card Instructions

Thank you for participating in this survey.

In order to enter the drawing for a $10 gift card to the bookstore, please do the following:
1) Print this page
2) Return this printed page to Disabilities Access Services at 144 Millennium Student Center
3) Provide your preferred contact information to Disabilities Access Services on how you would like to be contacted if you win the drawing.

Appendix K

Project Approval

Office of Research Administration
One University Boulevard
St. Louis, Missouri 63121-4499
Telephone: 314-516-5899
E-mail: ora@umsl.edu

DATE: November 9, 2013

TO: Karen Dishauzi
FROM: University of Missouri-St. Louis IRB

PROJECT TITLE: [521569-1] SUPPORTING STUDENTS WITH DISABILITIES ENTERING THE SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELD DISCIPLINES

REFERENCE #:
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: November 9, 2013

REVIEW CATEGORY: Exemption category #2

The chairperson of the University of Missouri-St. Louis IRB has APPROVED has reviewed the above mentioned protocol for research involving human subjects and determined that the project qualifies for exemption from full committee review under Title 45 Code of Federal Regulations Part 46.101b. The time period for this approval expires one year from the date listed above. You must notify the University of Missouri-St. Louis IRB in advance of any proposed major changes in your approved protocol, e.g., addition of research sites or research instruments.

You must file an annual report with the committee. This report must indicate the starting date of the project and the number of subjects to date from start of project, or since last annual report, whichever is more recent.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.
This action is officially recorded in the minutes of the committee.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.

Appendix L

Modification One Approval

Office of Research Administration
One University Boulevard
St. Louis, Missouri 63121-4499
Telephone: 314-516-5899
E-mail: ora@umsl.edu

DATE: February 20, 2014

TO: Karen Dishauzi
FROM: University of Missouri-St. Louis IRB

PROJECT TITLE: [521569-2] SUPPORTING STUDENTS WITH DISABILITIES ENTERING THE SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELD DISCIPLINES

REFERENCE #:
SUBMISSION TYPE: Amendment/Modification

ACTION: MODIFICATIONS APPROVED
DECISION DATE: February 20, 2014
EXPIRATION DATE: November 9, 2014
REVIEW TYPE: Full Committee Review

This modification was approved by the University of Missouri-St. Louis IRB for the term of this protocol. The University of Missouri-St. Louis IRB must be notified in writing prior to major changes in the approved protocol. Examples of major changes are the addition of research sites or research instruments.

An annual report must be filed with the committee. This report should indicate the starting date of the project and the number of subjects since the start of project, or since last annual report.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.
This action is officially recorded in the minutes of the committee.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.

Appendix M

IRB Modifications Required of Project Second Modification Request

Office of Research Administration

One University Boulevard
St. Louis, Missouri 63121-4499
Telephone: 314-516-5899
E-mail: ora@umsl.edu

DATE: March 20, 2014

TO: Karen Dishauzi
FROM: University of Missouri-St. Louis IRB

PROJECT TITLE: [521569-3] SUPPORTING STUDENTS WITH DISABILITIES ENTERING THE SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELD DISCIPLINES

REFERENCE #:
SUBMISSION TYPE: Amendment/Modification

ACTION: MODIFICATIONS REQUIRED
DECISION DATE: March 20, 2014
EXPIRATION DATE: November 9, 2014
REVIEW TYPE: Full Committee Review

Thank you for your submission of Amendment/Modification materials for this project. University of Missouri-St. Louis IRB has reviewed your submission and has determined that the following MODIFICATIONS are REQUIRED in order to secure approval:

You must include information on the consent about the raffle, the odds.

Provide a copy of the email being sent out.

Your study is no longer anonymous with the PI present during recording.

Research activities in accordance with this submission may not begin until this office has received a response to these conditions and issued final approval.

This submission has received Full Committee Review based on the applicable federal regulation.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.

Appendix N

Modification Two Approval

Office of Research Administration
One University Boulevard
St. Louis, Missouri 63121-4499
Telephone: 314-516-5899
E-mail: ora@umsl.edu

DATE: April 18, 2014

TO: Karen Dishauzi
FROM: University of Missouri-St. Louis IRB

PROJECT TITLE: [521569-4] SUPPORTING STUDENTS WITH DISABILITIES ENTERING THE SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELD DISCIPLINES

REFERENCE #:
SUBMISSION TYPE: Amendment/Modification

ACTION: MODIFICATIONS APPROVED

DECISION DATE: April 18, 2014
EXPIRATION DATE: November 9, 2014
REVIEW TYPE: Full Committee Review

This modification was approved by the University of Missouri-St. Louis IRB for the term of this protocol. The University of Missouri-St. Louis IRB must be notified in writing prior to major changes in the approved protocol. Examples of major changes are the addition of research sites or research instruments.

An annual report must be filed with the committee. This report should indicate the starting date of the project and the number of subjects since the start of project, or since last annual report.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.

This action is officially recorded in the minutes of the committee.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.