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Math and Employment

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by

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Abstract

Children in the United States have not made adequate gains on national assessments in mathematics (Strickland & Maccini, 2013). Based on the National Assessment of Education Progress (NAEP), 65% of 8th graders and 76% of 12th graders scored below proficiency level, along with over 90% of secondary students (Strickland & Maccini, 2013). This is especially troubling since math is used outside of the classroom setting so commonly in the workplace, especially vocational (trade) jobs. Students with disabilities tend to have a hard time with basic math facts and this can become problematic later on when trying to obtain employment (Leach, 2016). According to the U.S. Bureau of Labor Statistics, approximately 18.4% of youth with a disability who are 16 to 19 years old are employed compared to their non-disabled peers who are employed at 31.4%. Then, approximately 40.2% of people with a disability between the ages 20-24 are employed, compared to their non-disabled peers at 68.5% (U.S. Bureau of Labor Statistics, 2020). These statistics indicate that having a strong mathematical foundation helps with employment opportunities, especially trade jobs. This study will survey local trade employers to see what mathematical skills are necessary for employment.

Keywords: Mathematics, Special Education, Employment

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Chapter 1: Introduction

Children in the United States have not made adequate gains on national assessments in mathematics. Based on the National Assessment of Education Progress (NAEP), 65% of 8th graders and 76% of 12th graders scored below proficiency level, along with over 90% of secondary students (Strickland & Maccini, 2013). This is especially troubling since math is used outside of the classroom setting so commonly in the workplace, especially vocational (trade) jobs. A booklet series put together by Lawrence Newton (1981) outlines math that is needed in vocational jobs such as construction laborer, pluming, and welding. A math skill that all of these occupations have in common is a basic understanding of fractions.

Programs such as Vocational Rehabilitation Services (VRS) help individuals find employment. A study done examining VRS programs found that individuals who utilize this service have low mathematical skills. Having low mathematical skills makes gaining employment more difficult than those individuals who have higher mathematical skills (Schmeling, et al., 2006). The purpose of this thesis is two folded, first is to explore if mathematics is important for employment. Second, to determine if understanding the why behind learning math will help students with disabilities become invested in learning, thus increasing their mathematic abilities.

Students in Minnesota take the following routes in their mathematics education. During grades 6 through 8, students learn portions of numbers, operations, algebra, geometry/measurement, and data analysis/probability (Minnesota Department of Education, n.d.). Students need to take three credits in mathematics during their high school careers in Minnesota. Generally, the courses in grades 9 through 12 include algebra, geometry, statistics,

and probability. Since 2015, students need to complete an Algebra II credit or equivalent as part of the 3-credit requirement (Minnesota Department of Education, n.d.).

Students with disabilities have a much harder time with mathematics and are not performing at grade level relative to their peers (Strickland & Maccini, 2013). For example, fractions are an area where studies have shown students with disabilities struggle. Examining the comprehension of fractions, the 2013 NAEP found that 40% of 4th graders had a hard time understanding thirds were bigger than fourths, fifths. In addition, 65% of 8th graders were unable to add fractions accurately to determine if the sum was greater than a whole (Malone & Fuchs, 2017).

It is important for students to be mathematically literate because it helps with decision making as well as finding employment. Secondary students (students in grades 6-12) tend to take math classes to prepare them for the workforce. Individuals with lower math skills have less opportunity to grow in a competitive employment market. A study by Parsons and Bynner (1997) found if an individual had good reading skills, but had poor math skills, their chances of being employed were less. In their study of 17,000 people, they found that individuals with poor math skills had lower rates of full-time employment, were more decision-making likely to paid lower wages, experienced more periods of unemployment, and had difficulty making advances in employment.

According to the U.S. Department of Labor in 2022, 28.9% of youth with a disability who are 16 to 19 years old are employed compared to their non-disabled peers who are employed at 37.2%. Then, approximately 50% of people with a disability between the ages 20-24 are employed, compared to their non-disabled peers at 72.1% (U.S. Department of Labor, n.d.). Finding employment with a disability proves to be problematic. A study appointed by the

National Organization on Disability (NOD) found that 35% of people with disabilities reported having employment of either full or part-time compared to 75% of individuals without a disability that reported employment (Schmeling, et al., 2006).

Joensen and Nielson (2009) found that students who had a greater math understanding, especially in geometry and algebra, earned 20-30% increased income, than those without. Career and technical education (CTE) courses have positive effects for students with disabilities transitioning into the workforce. Students who have access to CTE courses perform better on standardized measures since skills, such as math, are connected to life applicable situations (Dougherty, et al., 2018). Accesses to these courses are beneficial for students with disabilities, it reduces the dropout rate, increases employment opportunities, and makes math more applicable. The high school dropout rate for students with disabilities is 10.7%, which is twice of the dropout rate of students without disabilities at 4.7% (NCES, 2020). There are several consequences of dropping out of high school, these include lower earning potential, unemployment risks, and susceptibility to lifestyle problems. Students with disabilities that dropout tend to not have basic skills that are demanded in employment and often time are limited to lower wages (Dalton, et al., 2013).

To help students with disabilities to be more employable after high school it is important that they have basic math concepts. There are specific interventions to help them be successful, such as concrete examples, explicit teaching, concrete-representational-abstract model, graphic organizers, and cognitive thinking strategies (Watt, et al., 2016). Another strategy to help increase math understanding is by making it functional. Math can take on a greater meaning when the learner is able to apply the content to a real-life situation as well as knowing the why behind what is being taught. A study done by Collins et al. (2011) supports the importance of

knowing the why when teaching concepts to students with disabilities. Their study had teachers combine core content with functional content when teaching students with disabilities. They found when they were able to make connections to the material being taught there was an increase in understanding. This can also be done in CTE classes where students are able to connect workplace skills and classroom instruction to help make sense of a traditional difficult area of study like math.

Research Questions

Two research questions guided the review of this literature:

1. What do employers expect students to know mathematically when entering the work force?
2. Does having certain mathematical knowledge increase employment opportunities for students with disabilities?

Theoretical Background

As an educator of secondary students, it is important to help prepare students for transitioning out of high school and obtaining employment. To increase the chances of employment out of high school or transitional program a student needs to have a great understanding of basic math skills. Basic math skills consist of adding, subtracting, multiplying, and dividing. Several jobs require these basic skills to be successful, but other additional math skills might be needed, such as geometry. Helping a student build their ability in basic math skills means teachers can help them become more employable. An intervention to help reach this goal is to teach math concepts in a functional way.

An academic study done combining math concepts and functional concepts saw improvement in understanding mathematical concepts among students with disabilities. There are several programs to help students with disabilities transition into employment, one of them

being vocational rehabilitation services (VRS). Programs such as VRS have noticed students with disabilities have a lower mathematical concept, which makes it harder to place them in jobs. The higher the mathematical proficiency and understanding the more job opportunities await.

Focus of the Paper

The focus of this research is to show having a strong mathematical understanding can open more employment opportunities. To help students with disabilities have more job opportunities they will need to increase their math proficiency, especially in fractions. Teaching math concepts in a functional way and applying it to their career choice will help them become more successful once they graduate high school or transitional program.

Importance of the Topic

Math is not limited to the classroom, rather, math is used in employment. Individuals who work in trade jobs use basic mathematics skills, such as adding and subtracting fractions. For example, a combination welder will need to know how to scale a drawing. To accomplish this a student would need an understanding of how to multiply fractions by the scaled information given. It is important for students to have a strong understanding of basic math since studies have shown that students with disabilities have a harder time obtaining employment. Thus, students who have better mathematical concepts can acquire more job opportunities.

Definitions of Terms

Concrete-representational-abstract (CRA): teaching sequence that is an explicit way of using multiple representations, which include objects that students can physically manipulate (concrete), visual representations such as pictures, drawings, and/or number lines (representational), and symbols such as numbers (abstract). (Strickland & Maccini, 2013).

Career and Technical Education (CTE): name given to programs that were once called vocational education but have now expanded to include growing fields such as information technology, health services, and advanced manufacturing (Dougherty, et al., 2018).

Direct Instruction (DI): instructional approach that is structured, sequenced, and lead by the teacher. (Watt, et al., 2016)

Vocational Education: organized educational activities that offer a sequence of courses that provide individuals with the academic and technical knowledge and skills the individuals need to prepare for further education and for careers in current or emerging employment sectors (Harvey, 2001).

Vocational Rehabilitation Services (VRS): a service that helps people with disabilities obtain employment (Hayward and Schmidt, 2003).

Vocational (Trade) Jobs: fields of work which employees apply hands-on setting, since vocation is a trade, it can be used interchangeably when referring to both types of work (FitzSimons, 2014).

Summary of Chapter II to be Reviewed

Literature about mathematical skills, employment for students with disabilities, and career and technical education (also known as vocational education) was selected to help illustrate the importance of having a good math foundation and how that can open up employment for students who may not seek further schooling. Publications that were published within the last ten years (2013-2023) were chosen to maintain relevance. However, later publications are used to help with defining terms and explaining the type of math employers are seeking. It was also important that articles distinguished the difference between students with

disabilities and students without disabilities. To be able to compare the differences between the two groups helps to illustrate the importance of basic math skills for employment opportunities.

Table 1

Summary of Chapter Two

Section 1: Students with Disabilities and Mathematical Performance				
Author(s)	Study Design	Participants	Procedure	Findings
Wei, Lenz, & Blackorby (2013)	SEELS Database and growth curve analysis.	11,512 students ages 7-17 (grades 6-12), mixture of disabilities.	Descriptive statistics.	Students with disabilities have lower math achievement and grow slower than general education students in elementary school. In secondary school, students with disabilities math achievement stagnates.
Watt, Watkins & Abbitt (2016)	Effective interventions for teaching algebra.	10 experimental and 5 single-subject designs, total of 15.	Reviewed results of both designs to see which interventions were effective for students with learning disabilities.	Found that five strategies for teaching algebra are best for students with disabilities: CRA, cognitive strategy instruction, EAI, tutoring, and graphic organizers.
Strickland & Maccini (2013)	Multiple probe design.	3 boys, secondary students with learning disabilities.	Students were given generalized algebraic material and worked with researchers using concrete-	Integration of the concrete manipulatives, sketches of manipulatives, and abstract notation with the support of a

			representational-abstract (CRA).	graphic organize is an effective strategy to improve students' understanding with generalized algebraic material.
Shin & Bryant (2015)	Literature search, studies published from 1975-2011 that focused on the mathematical and cognitive performances of students with mathematics learning disability (MLD).	23 studies met the criteria.	The 23 studies, which qualified for the study, were identified and coded for the number of participants, gender, ethnicity, socioeconomic status, achievement measures and scores.	Findings revealed students with mathematics LD demonstrated significantly lower performance compared to age- or grade-matched students with no LD on both mathematical and cognitive measures.
Section 2: Students with Disabilities and Employment Outcomes				
Author(s)	Study Design	Participants	Procedure	Findings
Wagner, Newman, & Javitz (2016)	National Longitudinal Transition Study – 2 (NLTS2) survey.	11,000 high school students ages 13-16, special education with a learning disability (LD).	Examined data collected from the NLTS2 and career and technical education (CTE) course taking of high school students with LD.	No benefits of CTE course taking overall, but significant positive effect for participating in employment after high school.
Ju, Pacha, Moore, & Zhang (2014)	Survey.	115 educators and 168 employers.	Survey administered online or paper copy, 283 individuals participated.	Educators and employers both share preparing students for employment are important but have different ideas of what skills are

				necessary. Educators believe social skills are important, whereas employers view basic skills (i.e., math) as important.
Wehman, Sima, Ketchum, West, Chan, & Luecking, (2015)	Longitudinal survey design.	2,900 high school special education students that graduated in 2002/2003.	Logistic regression analysis to identify predictors of successful transition from school to employment outcomes for youth with disabilities.	For students with disabilities to be successful with employment post-high, employment training and work experience and parental expectations are important.
Wagner, Newman, & Javitz (2017)	National Longitudinal Transition Study – 2 (NLTS2) survey.	11,000 high school students ages 13-16, special education with an emotional disturbance (ED).	Examined data collected from the NLTS2 and career and technical education (CTE) course taking of high school students with ED.	No benefits of CTE course taking overall, but significant positive effect for participating in employment after high school.
Section 3: Mathematics in Employment				
Author(s)	Study Design	Participants	Procedure	Findings
LaCroix (2014)	Interpretive study, examine mathematics learning within construction trades.	15 students, not with disabilities.	Examine student's mathematical skills in trade job.	Found that students going into trade jobs were not prepared to complete mathematics that were required for construction trades.

Hayward & Schmidt-Davis (2003)	Multistage design of a random sample.	40 local vocational rehabilitation (VR) offices, resulting in 8,500 applicants.	Computer-aided interviews, data from case records, and surveys to VR agencies.	Only looking at math, students in VR have poor math skills and there is a need to increase these skills as they help with decision making and prepare for the workplace.
Koedel & Tyhurst (2012)	Experimental design, researchers created resumes and sent them out to employers.	3,236 fictitious resumes were sent out to employers.	Sent out resumes with high math skills and those with low math skills.	Researchers found that resumes that demonstrated stronger math skills received more calls and interest from employers than those who had lower skills.
Watts, Duncan, Siegler, & Davis-Kean (2014)	Multi-site longitudinal data.	1,364 children from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD).	The Woodcock Johnson-Revised (WJ-R) Applied Problems subtest was used to measure mathematics achievement.	Findings clearly demonstrate the importance of early mathematical skills for students' long-term achievement and obtaining better employment.
Section 4: Life Applicable Math and Employment Outcomes for Students with Disabilities				
Author(s)	Study Design	Participants	Procedure	Findings
Fatimah & Prabawanto (2020)	Descriptive case study method.	11^{th}-graders going into horticulture agribusiness.	Data collected from tasks, observations, and interviews.	It is helpful for students to learn math that pertains to their career/job as it will minimize feeling ill-prepared entering into their career.

Dougherty, Grindal, & Hehir (2018)	Longitudinal data.	252,511 students for 2008-2012 cohort in the Massachusetts Comprehensive Assessment System (MCAS).	Examine multiple years of administrative data from Massachusetts to estimate effects of participating in CTE on the academic outcomes for students with disabilities.	Found students with disabilities that participated in CTE courses, did better than students with disabilities who did not. Students that participated in CTE courses had higher achievement in graduating and earning employment.
Parr, K., Parr, B., & Mohon (2019)	Pre-test and post-test.	The study included teachers and students enrolled in at least one CTE course in the fall of 2017.	The Kentucky Online Testing (KYOTE) mathematical placement exam was used to determine students' levels of mathematical comprehension. Students were tested before implementation of the mathematically enhanced curriculum and at the end of the course of study.	Results of the KYOTE exam were statistically significant suggesting that the curriculum had a positive influence on math comprehension.
Jitendra, Lein, Im, Alghamdi, Hefte,& Mouanoutoua (2018)	Meta-analysis of mathematical intervention programs implemented in secondary schools for students with learning disabilities and mathematics difficulties.	19 experimental and quasi-experimental studies containing 20 independent samples met study inclusion criteria.	Conducted a literature search of mathematics intervention studies ending in May 2017.	Mathematical interventions influence mathematics outcomes which can help obtain better jobs.

Chapter 2: Review of Related Literature

Introduction

The purpose of this study is to find if mathematical skills are important for employment, especially for students with disabilities. This chapter is divided into four sections: students with disabilities and mathematical performance, students with disabilities and employment outcomes, mathematics and employment, and life applicable math and employment outcomes for students with disabilities. In looking at different aspects of employment and mathematics, chapter two is dived into these different sections to provide background knowledge.

Section 1: Students with Disabilities and Mathematical Performance

As schools prepare students for careers and/or post-secondary education, high school mathematics requirements continue to rise more. In the United States, 45 states have adopted the rigorous mathematics standards of Common Core State Standards Initiative (CCSSI). These standards ensure that if a student masters them, they will be prepared for college and work (Strickland & Maccini, 2013). As state standards increase, mathematical proficiency decreases. The United States has not made achievement gains in mathematics, based on 2009 data from National Center for Education Statistics (NCES) 65% of 8th-graders and 76% of 12th-graders performed below proficiency level. Students with disabilities have even larger discrepancies, with 91% of 8th-graders and 94% of 12th-graders performing below the proficiency level (NCES, 2009, 2010).

Researchers Strickland and Maccini (2013) examined results from NCES and found that algebra is where most learners experience difficulties. This becomes problematic as algebra is viewed as a necessary skill for employment. Researchers wanted to develop an instructional practice for special education students to help them become more proficient in mathematics.

Strickland and Maccini decided to blend instructional practices of concrete-representational-abstract (CRA) sequence, graphic organizers, and explicit instruction to help increase math understanding. In their study they had three boys participate, but math criteria for special education. Each student had an individualized education plan (IEP) that had a mathematics goal.

However, after incorporating these three different strategies, they found no definitive conclusions could be drawn. The small sample size of three students did improve, but which of the 3 strategies helped increase algebra competency for these secondary students with a disability is unknown. The researchers state that although their results are promising there needs to be further research to indicate if combining CRA, graphic organizers, and explicit instruction is effective. It is important that students with disabilities are accountable to learn the rigorous math standards to be better prepared for employment opportunities (Strickland & Maccini, 2013).

Strickland and Maccini indicated that algebra was an important mathematic skill to master. Researchers Watt et al. (2016) reflect the same sentiment that algebra is an important skill to master for students with disabilities. Researchers also concurred that mathematical standards have increased to help with employment and post-secondary education. In examining student performance, researchers in the study examined the National Assessment of Educational Progress and found that there was a gap between performance between students without disabilities and students with disabilities. For example, they found on average there was a 46-point difference in average scores between students without disabilities and students with disabilities. This examination supports Strickland and Maccini's observation that students with disabilities struggle in math.

Watt et al. (2016) reviewed effective interventions for teaching algebra to students with disabilities. Across all studies, the researchers had a total of 827 participants, grades 3rd-12th. Of

these students there were multiple disabilities, such as learning disability (LD) and behavioral/emotional disorders (EBD). Research found after examining interventions that the one which produced the best results was direct instruction (DI) (Watt, et al., 2016). It is important for students with disabilities to receive interventions in mathematics, especially algebra, as it is a gateway to employment opportunities and post-secondary education opportunities.

Math will always be an area of difficulty for students with disabilities, especially as math standards increase. Teaching mathematical concepts to students with disabilities can become difficult as not every disability category is homogeneous. Research by Wei et al. (2013) and Shin and Bryant (2015) examine math growth of students with disabilities. Shin and Bryan (2015) focus on students with learning disabilities (LD), as Wei et al. (2013) look at multiple disability categories.

When comparing growth trajectories by disability category to the general population, the disability that is closest to the general public are those with speech impairments followed by the visually impaired. Disabilities that have the smallest growth trajectory in math are individuals with multiple disabilities and intellectual disabilities (ID) (Wei et. al, 2013) These findings support findings by Shin and Bryant (2015) which show students with mathematics LD demonstrated significantly lower performance compared to age- or grade-matched students with no LD on both mathematical and cognitive measures. Both studies indicate that students with disabilities have lower math achievement. Wei et al. (2013) found that students with disabilities grow slower than general education students in elementary school and growth stagnates when students go into high school.

Section 2: Students with Disabilities and Employment Outcomes

Literature continues to highlight the disadvantages students with disabilities have when it comes to employment. Several studies have found that students with disabilities experience difficulties with employment because they do not possess the skills employers are looking for. A study done by Ju et al. (2014) reported that after looking at the Current Population Survey (CPS) employment rates for individuals with disabilities were at 18.6%, whereas individuals without disabilities are employed at 63.5%. As jobs are becoming more skilled there is a higher demand for skilled workers and for programs to teach students with disabilities skills needed to be career ready.

Ju et al. (2014) created a survey to send to employers and educators to see what skills employers are looking for. The purpose of sending the survey to educators was to see if their perception of employable skills matched what employers are actually looking for in candidates. Researchers received responses back from 283 individuals, 115 educators and 168 employers. From their findings they found that both educators and employers feel that employment skills need to be taught in school, but responses varied on what each deemed as important, especially when it comes to students with disabilities. Supporting this, a report from the Secretary's Commission on Achieving Necessary Skills (SCANS) found that 50% of students do not have adequate employment skills.

Educators indicated for students with disabilities that teaching social skills are most important, whereas employers ranked basic work skills as important. Overall results indicate employers and educators rate employability skills differently than each other. Employers emphasize skills that are related to job performance and productivity versus social skills, whereas educators focus more on social skills. Researchers also found that teachers and employers have

lower expectations for students with disabilities and there are different attitudes toward individuals with disabilities too (Ju et al., 2014).

Work experience is an option for students with disabilities to participate in. This can help the student decide what type of employment would best fit their strengths. Vocational rehabilitation (VR) agencies were created to work with schools and students with disabilities to help transition them into the workforce. Even with VR programs evidence continues to show high unemployment among students with disabilities. Wehman et al. (2015) designed a survey that looked at what services provided by VR programs helped students hold employment after high school. The sample was 2,900 students who qualified for special education and graduated high school in 2002-2003 and measured their employment for six years.

From their survey results, they found that there were several different factors that indicated whether a student would obtain and hold a job after high school. Such factors included regular attendance at school, participation in a work-based program, and no arrest record. However, the factors that were the strongest were employment experience in high school and parent involvement (Wehman et al., 2015). The results of this study indicate, for a student with a disability to have employment after high school it is necessary for them to get work experience and employment training in high school, as well as parent involvement. Although these results can go for any disability group, the research did find that for students with emotional behavior disorder (EBD), low employment continues to be problematic.

Interestingly, career and technical education (CTE) has been linked to improve employment after high school. As the previous research illustrated, students with EBD struggle with employment, however, the study by Wagner et al. (2017) finds that students with EBD who participate in a CTE course can be beneficial since it teaches applicable skills that help in

obtaining jobs. Although the study by Wagner et al. (2017) has shown great outcomes for students with EBD the big factor is students need to participate. Students that refuse to enroll into a CTE course do not reap the benefits of obtaining full-time employment after high school.

Wagner et al. (2016) examined the benefits of high school CTE courses for youth with LD. In this study they looked at existing data from the National Longitudinal Transition Study – 2 (NLTS2) and focused on high school students with LD. In using descriptive analyses the researchers were able to find that students with LD were engaged in their program and the skills they were learning would help with post- high school employment. Researchers found no benefits of CTE course taking long term, but significant positive effect for participating in employment the first 2 years after high school (Wagner et al., 2016).

Section 3: Mathematical Employment

There are several studies that have examined the relationship between mathematics and employment. In these studies, all have the same consensus that having high school mathematical skills can have positive adult outcomes, such as job quality and salary (Watts, et al., 2014). Difficulties in understanding mathematical concepts begin to show early, thus, researchers Watts et al., (2014) examine early-year mathematical interventions and the trajectory of growth in understanding higher mathematical concepts that are presented in high school. Researchers examined data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD). The participants in this study began early and were followed through their educational years, the total amount of participants were 1,364 children. To measure mathematical understanding, researchers used the Woodcock Johnson-Revised (WJ-R) and it was administered to children at 54 months, 1st grade, 3rd grade, 5th grade, and age 15.

Watts et al. (2014) concluded from their study that if students at an early age, between 54 months and 1st grade have a high mathematical achievement and have a positive math ability has a strong correlation to being successful in later math achievement. Students who struggle in the early stages, 54 months and 1st grade, should get an early intervention to help them be successful as they get older. Researchers stress the importance of early mathematical interventions since having poor mathematical skills as one gets older can make it difficult to obtain positive outcomes in job quality and salary (Watts et al, 2014). A limitation of this study is that it did not examine the difference in mathematical achievement between students without disabilities to students with disabilities. However, it is important for all students to know math to help prepare them for the workforce (Hayward & Davis, 2003).

As society is becoming more technologically advanced, mathematical skills are becoming more important and employers are setting higher standards when it comes to hiring. A study completed by Hayward and Davis (2003) found that many high school graduates do not have the math skills that are required for today's job market. Students with disabilities that struggle in mathematics are limited to certain employment options. Researchers concluded this after a multi-stage random sample from 40 VR offices, resulting in 8,500 applicants. Examining math skills, researchers realized students in VR have poor math skills. Due to these poor math skills, their employment options are limited. Thus, there is a need to increase these skills as they help open employment options. Most employers expect hires to have an 8th-grade mathematical understanding whereas many of the individuals in this study had a 5th-grade mathematical understanding or lower. Among individuals with disabilities that had higher mathematical understandings, they had more job opportunities (Hayward & Davis, 2003).

A study done by Koedel and Tyhurst (2012) supports the work done by Hayward and Davis (2003). In their study they examined the link between math skills and labor-market outcomes. Researchers wanted to see if individuals who alluded to having higher math skills on their resume would get more interest from employers versus those who did not indicate strong mathematical skills. In this experimental design, researchers created 3,236 fictitious resumes and sent them out to employers. Researchers found that resumes that demonstrated stronger math skills received more calls and interest from employers than those who had lower skills (Koedel & Tyhurst, 2012). Both studies indicate the importance of having strong mathematical skills in opening employment opportunities for individuals with disabilities.

As mentioned previously, employers are demanding more when it comes to hiring. A study completed by LaCroix (2014) found that students enrolled in a pipe trades pre-apprenticeship were not prepared adequately through high school math curriculum. Through an interpretive study, LaCroix (2014) examined mathematics learning within pipe trades. The sample size was 15 students without disabilities that were going into the pipe trade after high school. LaCroix (2014) interviewed the teacher to examine the student's mathematical skills in trade jobs. They also interviewed the students to see if they felt prepared for the math that was required of them. The overall results indicated that students going into trade jobs were not prepared to complete mathematics that were required for pipe trades.

Section 4: Life Applicable Math and Employment Outcomes for Students with Disabilities

Helping students with disabilities improve their mathematical ability to help open the employment field can be done through interventions. There are several mathematical interventions that can help increase one's mathematical understanding. A study by Jitendra et al. (2018) completed a meta-analysis of mathematical intervention programs implemented in

secondary schools for students with learning disabilities and mathematics difficulties. Researchers were able to identify 19 experimental and quasi-experimental studies containing 20 independent samples that met the study inclusion criteria. Their criteria were conducted through a literature review search of mathematics intervention studies ending in May 2017. From these results, they found that the best way for students with disabilities to learn math is through well-designed mathematical interventions that use visual models combined with other strategies. Mathematical interventions influence mathematics outcomes which can help obtain better jobs (Jitendra et al., 2018).

To help motivate students to learn mathematics, a key element is to teach it in a way that is meaningful for the student. Fatimah and Prabawanto (2020) did a descriptive case study method with 11th-graders going into horticulture agribusiness. From their study, they found that it is helpful for students to learn math that pertains to their career/job as it will minimize feeling ill-prepared entering their career (Fatimah & Prabawaanto, 2020). A limitation of this study is that was completed on students without disabilities who live in Indonesia. However, studies have been conducted in the United States that mirror the positive outcomes of teaching mathematical skills that are necessary for employment.

Dougherty et al. (2018) completed a longitudinal study on 252,511 students for the 2008-2012 cohort in the Massachusetts Comprehensive Assessment System (MCAS). Students in this sample size had individuals with and without disabilities. Researchers examined multiple years of administrative data from Massachusetts to estimate the effects of participating in CTE on the academic outcomes of students with disabilities. After analyzing the data researchers concluded that students with disabilities that participated in CTE courses did better than students with

disabilities who did not. Students that participated in CTE courses had higher achievement in graduating and earning employment (Dougherty et al., 2018).

Another study completed in the United States reflects the data from Dougherty et al. (2018) findings. Parr et al. (2019) did a study on students who were enrolled in a CTE course. Researchers conducted a pre-test and post-test to measure mathematical achievement. The Kentucky Online Testing (KYOTE) mathematical placement exam was used to determine students' levels of mathematical comprehension. Students were tested before the implementation of the mathematically enhanced curriculum and at the end of the course of study. Results of the KYOTE exam were statistically significant suggesting that the curriculum had a positive influence on math comprehension.

Conclusion

Chapter Two explored four different components of math readiness: special education and mathematics, special education and employment outcomes, mathematics and employment, and life-applicable math and employment outcomes for students with disabilities. The first two sections in this chapter highlight that students with disabilities experience a disadvantage when it comes to mathematical performance and employment outcomes. Students with disabilities have performed below average in mathematics and have had difficulty obtaining and holding employment. Section three examined how having mathematical skills can open job opportunities, especially for individuals with disabilities. Lastly, section four examined how CTE courses have helped students with disabilities learn mathematical concepts and gain job experience. In examining previous research there was little conducted on employer’s views on student readiness for employment after high school and what schools to do to make students more employable.

Chapter 3: Methods

Introduction

The purpose of this study is to determine employment readiness out of high school for students with disabilities and how special education teachers can help students with disabilities strengthen their mathematical skills that are needed for employment by understanding the why of what they are learning. After laying out the research question, the remainder of this chapter will focus on the participation of this study, followed by the setting. Employer questionnaire will be mentioned as it helps determine if schools are preparing students for employment, especially that of trade or vocational jobs. The first research question will help determine what mathematical skills employers are looking for when hiring. The second research question will help future special education teachers understand that once students understand why they are learning a concept, they will be more motivated to learn it. The final section of this chapter will be used to discuss the limitations of the study.

Research Questions

1. What do employers expect students to know mathematically when entering the workforce?
2. Does having certain mathematical knowledge increase employment opportunities for students with disabilities?

Participants

The study consisted of 43 Minnesota employers, the largest respondent age range being 35-44 years old at 34.69%, followed by 45-54 years old (24.49%), 55+ (20.41%), 25-34 years old (16.33%) and both under 18 and 18-24 at 2.04%. Of the respondents, 54.17% identified as female while 45.83% identified as male. Most respondents identified as white or Caucasian (97.96%) while a small portion identified as Hispanic/Latino (2.04%). When it came to the

highest degree of school completed, most respondents identified having a bachelor's degree (33.33%) followed by a high school diploma or equivalent (27.08%). The survey provided a variety of employment categories, these can be viewed in Appendix A. However, most respondents categorized their employment as business/management/administration (22.45%), followed by education and installation/repair/maintenance at 14.29%. The lowest response of employment recorded was farming at 2.04%. Most respondents had their business in a town (42.86%) and most respondents had been employed at their business for 15 or more years (24.49%). A more detailed report regarding respondent information can be found in Appendix B.

Participants were selected based on knowing the researcher and reaching out to other employers to complete the survey; a convenience sample. All participants volunteered and were able to stop the survey at any time, they also did not have to answer a question(s) if they felt uncomfortable. From exporting the data of the 54 respondents who responded to the survey, data that had no response was eliminated, with eliminating no response the final respondent sample was 43 responses.

Materials

Materials for this study included an online survey that was created by the researcher after examining the literature review. This survey was designed to measure how well employers felt students with disabilities were ready for employment after high school. The study occurred online between March and April 2023 and contained 25 questions pertaining to employment and disabilities. It took the participants approximately 10-20 minutes to complete. The online survey format that was used was *Qualtrics*. See Appendix A for the complete list of survey questions and Appendix B for survey results.

Procedure

The participants were told that this survey was the measure of how prepared they felt students with disabilities were for employment in their particular field. It was also mentioned that the results of this study would help provide insight into what schools can do to better prepare students with disabilities to be more employable after high school and to get students with disabilities employed.

Participants were informed by continuing with the survey that they were giving consent. They were also informed that they could stop at any time and could not answer a question(s) if they felt uncomfortable or if it would identify their employment. The link to the survey provided anonymity as it did not ask for an email address and could not be traced back to them. As participants had the option to choose to take the survey the sample was convenient.

Once the participants started the online survey, they were given a set of questions in three separate sections. The first section asked the participants about their demographics. The second section provided multiple choice and Likert-scale questions on mathematical skills and their employment. The last section was open questions asking the employer more about the skills they feel are necessary to be successful in their line of work. Participants on average completed the survey in 15 minutes. Participants are allowed to contact the researcher if they would like to see the results and how they will be used for future employment opportunities for students with disabilities. All participants were thanked for providing feedback and that it will benefit them in the near future.

Research Method

The research design consisted of a 25-question online survey asking questions to employers about students with disabilities and readiness for employment. This study is a mixed

methods study measuring the readiness of students with disabilities for employment and their mathematical capabilities using qualitative and quantitative data. The researcher reached out to employers to complete an online survey and asked for employers to distribute the survey to other employers; a convenient sample. There were 54 employers who responded to the survey, once the data was cleaned, the total number of respondents was 43.

Measure

The survey was created on January 28th, 2023, distributed on March 24th, 2023, and was closed on March 28th, 2023, due to reaching the goal of 50 respondents. The total number of respondents was 54, but once the data was cleaned up, the end number of respondents was 43. Participation was voluntary and participants could choose not to answer questions. Since participants were allowed not to answer questions, those that did not answer questions were removed from the data set.

The first section of the survey was looking at employers' demographics. This section used multiple-choice questions to gather results. In the second section, data was measured through a Likert Scale where participants identified areas of mathematics, they found to be important for general work and their specific employment. Lastly, the third section provided five open-ended questions gathering more specific data on what schools can do better to prepare students with disabilities for employment.

Chapter 4: Results

The purpose of this study was to determine whether or not having higher mathematical skills will help students who have disabilities with employment opportunities. The study used a survey to ask employers what they are looking for when it comes to hiring and if having better mathematical capabilities makes high-school students with disabilities more employable. The survey consisted of 25 questions; the first ten questions were measuring employers' demographics. The next ten questions were examining mathematical skills needed in the workplace and the likelihood of hiring a student with a disability and lower mathematical capabilities. Finally, the last five questions asked employers more specifically what they are looking for when they hire and what schools can do to help students with disabilities be more employable after graduation.

Data Breakdown

The following sections will briefly describe the data results from the three sections of the employer survey. It will begin with the first section examining employers' demographics, followed by how employers view the importance of math when hiring and finishing with how schools can better prepare students with disabilities for employment.

Demographics

The study consisted of 43 Minnesota employers, the largest respondent age range being 35-44 years old at 34.69%, followed by 45-54 years old (24.49%), 55+ (20.41%), 25-34 years old (16.33%) and both under 18 and 18-24 at 2.04%. Of the respondents, 54.17% identified as female while 45.83% identified as male. Most respondents identified as white or Caucasian (97.96%) while a small portion identified as Hispanic/Latino (2.04%). When it came to the highest degree of school completed, most respondents identified having a bachelor's degree

(33.33%) followed by a high school diploma or equivalent (27.08%). The survey provided a variety of employment categories, these can be viewed in Appendix A. However, most respondents categorized their employment as business/management/administration (22.45%), followed by education and installation/repair/maintenance at 14.29%. The lowest response of employment recorded was farming at 2.04%. Most respondents had their business in a town (42.86%) and most respondents had been employed at their business for 15 or more years (24.49%).

In addition to employers' demographics, there were a few questions to measure if employers know individuals with disabilities and if they have worked with an individual with a disability and if so, what type of disability. Asking employers if they knew of a person with a disability, 93.88% responded yes and only 6.12% indicated they did not know someone with a disability. Besides knowing if a person had a disability, the following question measured the type of disability employers have hired. The highest percentage from the given responses was the other with 36.51% followed by the next largest category of physical, mental, or emotional problems, difficulty remembering, concentrating, or making decisions at 26.98%. The longest span of time employers worked with an individual with a disability was between one to four years (30.61%). A more detailed report regarding respondent information can be found in Appendix B.

Math and Employment

This section of the survey asked employers questions specifically looking at math skills and the importance of needing skills when looking for employers. The first two questions in this section used a Likert Scale from one to five to measure the importance of the four main mathematical categories: geometry, algebra, basic math computation, and measurements. From the 43 respondents, the largest mathematical category employers found necessary for general

employment was basic math skills with a mean of 4.20, followed by measurements (mean of 3.84), algebra (mean of 3.14), and geometry (mean of 3.07). The next question asked employers to use the same scale, but this time thinking about the importance of each math category when it comes to their employment field. Results were very similar to the prior question with basic math skills scoring the highest with a mean of 4.34, followed by measurement (mean of 3.70), algebra (mean of 3.17), and geometry (mean of 3.07).

Previous research mentioned individuals with disabilities having a high dropout rate. The next questions in this survey asked employers how likely they would be to hire individuals who did not have a high school diploma. This part used a rating scale providing options of not at all likely, somewhat unlikely, neutral, somewhat likely, and very likely. Employers stated that when it came to hiring individuals without a high school diploma, 30.77% mentioned they would be somewhat likely to hire an individual without a high school diploma. However, there was an even percentage of employers that mentioned they would not at all or would be somewhat unlikely to hire individuals without a high school diploma (23.08%).

Research has also mentioned how individuals with disabilities have lower employment rates when compared to non-disabled peers. The purpose of the following question was to determine if this would be true. Only a small percentage of employers stated they were not at all likely to hire an individual with a disability (5.13%) whereas the highest percentage of employers that responded were somewhat likely (46.15%). Moving to the next question, it examined students without a diploma and also with a disability. From employers surveyed, 30.77% would be somewhat likely to hire an individual with a disability and without a high school diploma. However, the very likely responses were smaller with 5.13% and the not at all likely, somewhat unlikely, and neutral were very close in responses.

Lastly, the following questions examined employing individuals who struggle with basic mathematical concepts and if employers feel CTE (career technical education) helps students who graduate high school be prepared for employment. As mentioned, employers noted that having basic math skills are important for general employment and their type of employment. Results from this question mirror that when most respondents responded with it being somewhat unlikely that they would hire someone that struggles with basic mathematical concepts (30.77%) this percentage was tied with neutral. Employers also felt that high school graduates need to have math skills necessary for positions they hire for, responding to somewhat likely at 47.37%.

Previous research has indicated that CTE courses have helped individuals with disabilities understand mathematical concepts as well as helping them gain employment. The following sections asked employers how they felt regarding what previous research has found. In asking if trade school graduates have math skills necessary for positions employers hire a large percentage of employers mentioned somewhat likely 44.74% followed by very likely at 28.95%. Regarding CTE courses, employers felt these somewhat and very likely prepared students for employment, both tied at 35.14%. There were very few respondents that felt CTE courses do not help prepare students for employment (2.70%).

Open-Ended

The third section had five open-ended questions, providing qualitative data on what employers feel schools can do to better prepare students for employment. The first question measured are barriers to hiring individuals with a disability. As data from the previous section shown, employers are somewhat and very likely to hire an individual with a disability. When reading respondents, I coded four different categories: temperament (20), temperament (6), safety (4), math skills (3), and social skills (2). Results from employers rated a lack of work

skills to be the main reason that would prevent them from hiring an individual with a disability. Work skills were measured by responses of being able to perform the job at hand, qualifications, and work ethic.

There has been previous research that has examined the importance of students getting into work-based programs to help them with employment. From this research, the next question was designed to ask employers how they felt schools could help prepare students for employment after graduation. Many of the employers mentioned job experience as being important. In examining all employer's open-ended responses, I was able to create six categories: job experience (13), math skills (8), social skills (8), career exploration (5), life skills (5), and certificates and/or CTE courses (3). In addition to how schools can help students be successful, the next question measured what skills students need to have to be successful in the employer's field. From responses, I was able to code five categories: math skills (22), social skills (19), interpersonal skills (9), qualifications (6), and listening/taking directions (1).

The final questions asked employers how much they spend training new employers and if they have any screening tests that measure a potential employer's mathematical skills. In spending time training new employees, there were 15 respondents that mentioned they spend no time training and that hires are expected to have the skills and/or qualifications upon hire. Only three respondents provided training year-round, four respondents had no limit on training, and the remainder of respondents provided little (3-6 months) training to their employers. Most employers indicate that they do not have any screening tests. Only seven respondents mentioned they have screening tests that specifically measure individual mathematical skills.

Data Analysis

Of the 43 employers who responded to this survey, much of what has been illustrated in previous research is prominent in the results of this survey. Previous research has shown that students who have basic math skills have a higher chance of being employed. Employers from this survey have indicated that having basic mental math computation such as multiplying, dividing, adding, and subtracting is somewhat important when it comes to general employment as well as their specific field. This helps to illustrate that for students with disabilities teaching these basic mathematical concepts would be helpful when it comes to employment.

When it comes to hiring individuals with disabilities, historically, data has shown employment rates to be low. Respondents to this survey stated they are somewhat likely to very likely to hire an individual with a disability. However, if an individual struggles with basic mathematical concepts it is somewhat unlikely that they would hire them. Although only seven respondents have a screening test to measure these capabilities, it would still be good practice for students to build a strong basic mathematical foundation. Employers from this survey indicated that they felt high school graduates have math skills necessary for the positions they hire for, however, research has shown that students with disabilities continue to perform lower than their non-disabled peers in mathematics. Data from this survey would indicate if students with disabilities were able to perform basic mathematical functions the likelihood of them obtaining employment would be high.

Previous research has examined the benefits of work-based programs for students with disabilities. Employers from this survey mentioned they felt schools could better help high school graduates for employment by providing them with more employment experience through job shadowing and job experience. Employers shared the idea that having more skills would help

students know how to perform and behave in a workplace setting. In addition to having job experience, employers of this survey mentioned math skills to be successful in their field, again, specifically focusing on basic mathematical skills such as adding, subtracting, multiplying, and dividing. Although if a student is hired and is unable to perform these tasks, it won't necessarily prevent employers from hiring. A small percentage of respondents mentioned math skills as being a reason why they would not hire an individual with a disability, the highest reason would be the individual not having work skills. Providing work-based programs for students with disabilities would increase the likelihood of employers hiring them as a result of having work experience as noted by respondents.

Overall, from the results, employers do not mind if their potential hire has a disability, but they do want someone who can come in with as much of the needed knowledge as possible. Most employers know people who have a disability, so they have at least a cursory knowledge of some of the disabilities themselves and are likely desensitized that they are not put off by the disability, but also not feeling compelled to give special treatment. This is evidenced in the responses where the majority said they would hire a person readily who may have a disability and have in the past, but would not hire someone without the skills needed. The more relevant math is to that job the more important it is that the individual with the disability already knows how to do it. In addition, basic math skills are a common necessity across a wide range of job fields. Statistically, however, students with disabilities do not leave school with this knowledge base. This lack of knowledge is a shortcoming that makes them less likely to be hired. Implementing a strong program that gets students with disabilities to a point that is as comparable to their peers as possible needs to be a top priority.

In cross-referencing this with other aspects of the survey, it can be seen that generic work-related skills like temperament, social skills, and work ethic play an equally important role. Traditionally these criteria are not directly taught in school, but secondary aspects of school like turning in homework and interacting with other students do play a large part in developing these abilities. Studies also show that CTE courses positively impact learning. Interactive classes that engage students in practical activities to reinforce basic skills create the best outcome, especially for those who have a disability. These classes should mimic a work environment with hard deadlines and clear expectations to foster a good work ethic as well. As the manager of the classroom, a teacher should also have clear rewards and behavioral corrections as well as lots of interaction between students. Implementing a multipoint plan incorporating all these aspects should give the best chance of success to a student with a disability.

Chapter 5: Summary and Discussion

This section discusses the results of the study as they relate to the research questions. This discussion begins implication for practice, move into limitations of the study, and will end with recommendations for future research.

Implications for Practice

Results from this survey indicate that students with disabilities that have a deficiency in mathematics would benefit from increasing their basic mathematical skills as it can help with employment. In addition to working on increasing mathematical skills, having students participate in a work-based program would greatly increase their employment opportunities.

Limitations of the Study

The limitations of this study include it consisting of a small sample size of 43 respondents. Limited to Caucasian/White business owners in a town mostly focused on business/administration/management field. The sample was convenient, and employers might have responded to questions differently since they knew the researcher.

Recommendations for Future Research

The survey provided information regarding students with disabilities and employment but also creates more wondering questions regarding which employment puts a higher emphasis on mathematical skills. Recommendations for further research include an additional survey that would correlate mathematical capabilities with job fields. Doing this would provide more information regarding which jobs put greater importance on mathematical skills.

In the additional survey, it would be helpful to examine the disability categories and which disability category is more likely to be employed. As previous research shows, students who have an emotional behavioral disorder (EBD) are less likely to be employed due to

temperament. As the data collected in this survey highlighted, employers are less likely to employ someone based on their temperament.

Other recommendations for future research are asking employers about resumes and possibly sending out fictitious resumes. Survey results indicate that employers are willing to hire students with disabilities, but to see if this is true by sending out resumes with a diploma and without and see if employers tend to choose higher educated people over dropout/disability despite what respondents reported in this survey.

Conclusion

Employers who participated in this study indicated they do not mind hiring individuals with disabilities if they are able to perform their job duties without many accommodations. Having basic math skills is a necessity for most employers who participated in this survey and individuals who are unable to perform can have an impact on getting hired. Many employers feel that schools can better prepare students for employment by getting them work experience which can be done through work-based programs.

References

Collins, B. C., Hager, K. L., & Galloway, C. C. (2011). Addition of functional content during core content instruction with students with moderate disabilities. *Education and Training in Autism and Developmental Disabilities*, 22-39.

Disability employment statistics. (n.d.). U.S. Department of Labor. https://www.dol.gov/agencies/odep/research-evaluation/statistics

Dougherty, S. M., Grindal, T., & Hehir, T. (2018). The impact of career and technical education on students with disabilities. *Journal of Disability Policy Studies*, *29*(2), 108-118.

Fatimah, A. T., & Prabawanto, S. (2020). Mathematical understanding and reasoning of vocational school students in agriculture-based mathematical tasks. *Journal for the Education of Gifted Young Scientists*, *8*(2), 771-782.

FitzSimons, G. E. (2014). Commentary on vocational mathematics education: where mathematics education confronts the realities of people's work. *Educational Studies in Mathematics*, *86*, 291-305.

Hayward, B. J., & Schmidt-Davis, H. (2003). *Longitudinal Study of the Vocational Rehabilitation Services Program. Final Report 1: How Consumer Characteristics Affect Access to, Receipt of, and Outcomes of VR Services*. U.S. Department of Education.

Jitendra, A. K., Lein, A. E., Im, S. H., Alghamdi, A. A., Hefte, S. B., & Mouanoutoua, J. (2018). Mathematical interventions for secondary students with learning disabilities and mathematics difficulties: A meta-analysis. *Exceptional children*, *84*(2), 177-196.

Joensen, J. S., & Nielsen, H. S. (2009). Is there a causal effect of high school math on labor market outcomes? *Journal of Human Resources*, *44*(1), 171-198.

Ju, S., Pacha, J., Moore, K., & Zhang, D. (2014). Employability skills for entry-level employees with and without disabilities: A comparison between the perspectives of educators and employers. *Journal of Vocational Rehabilitation*, *40*(3), 203-212.

Koedel, C., & Tyhurst, E. (2012). Math skills and labor-market outcomes: Evidence from a resume-based field experiment. *Economics of Education Review*, *31*(1), 131-140.

LaCroix, L. (2014). Learning to see pipes mathematically: preapprentices' mathematical activity in pipe trades training. *Educational Studies in Mathematics*, *86*(2), 157-176.

Minnesota Department of Education. (n.d.). *Mathematics*. Retrieved from Education.mn.gov/MDE/dse/stds/Math

National Center for Education Statistics (NCES). (2020, January). *The Condition of Education. 2020.* https://nces.ed.gov/pubs2020/2020144.pdf

Newton, L. R. (1981). *Shop Math for the Metal Trades. Combination Welder Apprentice, Machinist Helper, Precision Metal Finisher, Sheet Metal Worker Apprentice. A Report on Metal Trades Industry Certified, Single-Concept, Mathematical Learning Projects to Eliminate Student Math Fears.*

Parr, K., Parr, B., & Mohon, V. (2019). The impact of mathematically enhanced curriculum on career and technical education student math scores. *Career and Technical Education Research*, *44*(2), 4-31.

Parsons, S., & Bynner, J. (1997). Numeracy and employment. *Education+ Training*.

Schmeling, J., Schartz, H. A., Morris, M., & Blanck, P. (2006). Tax credits and asset accumulation: Findings from the 2004 NOD/Harris Survey of Americans with Disabilities. *Disability Studies Quarterly*, *26*(1).

Shin, M., & Bryant, D. P. (2015). A synthesis of mathematical and cognitive performances of students with mathematics learning disabilities. *Journal of learning disabilities*, *48*(1), 96-112.

Strickland, T. K., & Maccini, P. (2013). The effects of the concrete–representational–abstract integration strategy on the ability of students with learning disabilities to multiply linear expressions within area problems. *Remedial and Special Education*, *34*(3), 142-153.

Wagner, M. M., Newman, L. A., & Javitz, H. S. (2016). The benefits of high school career and technical education (CTE) for youth with learning disabilities. *Journal of Learning Disabilities*, *49*(6), 658-670.

Wagner, M. M., Newman, L. A., & Javitz, H. S. (2017). Vocational education course taking and post–high school employment of youth with emotional disturbances. *Career Development and Transition for Exceptional Individuals*, *40*(3), 132-143.

Watt, S. J., Watkins, J. R., & Abbitt, J. (2016). Teaching algebra to students with learning disabilities: Where have we come and where should we go?. *Journal of Learning Disabilities*, *49*(4), 437-447.

Watts, T. W., Duncan, G. J., Siegler, R. S., & Davis-Kean, P. E. (2014). What's past is prologue: Relations between early mathematics knowledge and high school achievement. *Educational Researcher*, *43*(7), 352-360.

Wehman, P., Sima, A. P., Ketchum, J., West, M. D., Chan, F., & Luecking, R. (2015). Predictors of successful transition from school to employment for youth with disabilities. *Journal of occupational rehabilitation*, *25*, 323-334.

Wei, X., Lenz, K. B., & Blackorby, J. (2013). Math growth trajectories of students with disabilities: Disability category, gender, racial, and socioeconomic status differences from ages 7 to 17. *Remedial and Special Education*, *34*(3), 154-165.

Appendix A: Employer Survey

Section 1: Demographics

1. What is your age?

    Under 18 years old

    18-24 years old

    25-34 years old

    35-44 years old

    45-54 years old

    55 or over years old

2. What is your sex assigned at birth?

    Male

    Female

    Prefer not to say

3. What is your ethnicity?

    White/Caucasian

    Hispanic/Latino

    Black/African American

    Native American/American Indian

    Asian/Pacific Islander

    Other

4. What is the highest degree or level of school you have completed?

    Less than a high school diploma

    High school degree or equivalent

    Bachelor's degree (BA, BS)

    Master' Degree (MA, MS, MEd)

    Doctorate (PhD, EdD)

    Other

5. How would you categorize your place of employment (work)?

Architecture/Engineering

Art/Culture/Entertainment

Business/Management/Administration

Communications

Community/Social Services

Education

Science/Technology

Installation/Repair/Maintenance

Farming/Fishing/Forestry

Government

Health/Medicine

Law/Public Policy

Sales

6. Location

City

Suburb

Town

Rural

7. How long have you been employed at this position?

>6 months

6months-1year

1-4 years

5-9 years

10-14 years

15 years or more

8. Do you know someone with a disability?

No

Yes

9. Have you hired an individual or individuals with any of the following disabilities (select all that apply)?

Deaf or serious difficulty hearing

Blind or serious difficulty seeing even when wearing glasses

Serious difficulty walking or climbing stairs

Physical, mental, or emotional problem, difficulty remembering, concentrating, or making decisions

Other

To my knowledge, I have not hired an individual with any of these disabilities

10. How long have you worked with an individual with a disability?

To my knowledge, I have never worked with an individual with a disability

>6 months

6 months-1 year

1-4 years

5-9 years

10-14 years

15 years or more

Section 2: Math & Employment Questions

11. *The following questions use a Likert scale. Rate your answers using the following:*

1 – Not at all important, 2 – Somewhat important, 3 – Neutral, 4 – Somewhat important, 5 – Very important

Rate the importance of mathematical ability necessary for general employment:

_____ Geometry: area and perimeter, volume, surface area, angles, length and width,

_____ Algebra: ratios, percentages, decimals,

_____ Basic mental math computation: multiplying, dividing, adding, subtracting

_____ Measurements: reading a ruler, fractions, and conversions

12. *The following questions use a Likert scale. Rate your answers using the following:*

1 – Not at all important, 2 – Somewhat important, 3 – Neutral, 4 – Somewhat important, 5 – Very important

Rate the importance of mathematical ability necessary for your employment field:

_____ Geometry: area and perimeter, volume, surface area, angles, length and width,

_____ Algebra: ratios, percentages, decimals,

_____ Basic mental math computation: multiplying, dividing, adding, subtracting

_____ Measurements: reading a ruler, fractions, and conversions

13. Rate the likelihood you would hire an individual without a high school diploma?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

14. Rate the likelihood you would hire an individual with a disability?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

15. Rate the likelihood you would hire an individual with a disability without a high school diploma?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

16. Rate the likelihood you would hire an individual that struggles with basic mathematical concepts (i.e. adding, subtracting, multiplying, and dividing)?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

17. Are you more or less likely to hire someone that you know has a disability?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

18. How likely is it for high school graduates to have the math skills necessary for the positions you hire for?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

19. How likely is it a trade school graduate has the math skills necessary for the positions you hire for?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

20. How well do you feel CTE (career technical education) prepares students for employment?

Not at all likely

Somewhat unlikely

Neutral

Somewhat likely

Very likely

Section 3: Open-Ended Questions

21. What would prevent you from hiring an individual with a disability?

22. What could schools do better to help prepare students for employment after high school graduation?

23. In general, what skills do students need to have to be successful in the career field you work in?

24. How much time do you spend training new hires to be competent in relevant math skills?

25. Do you have any screening tests? If yes, do any of your screening tests specifically look at a person's math capabilities?

Appendix B: Survey Results

Figure 1

Age of Participants

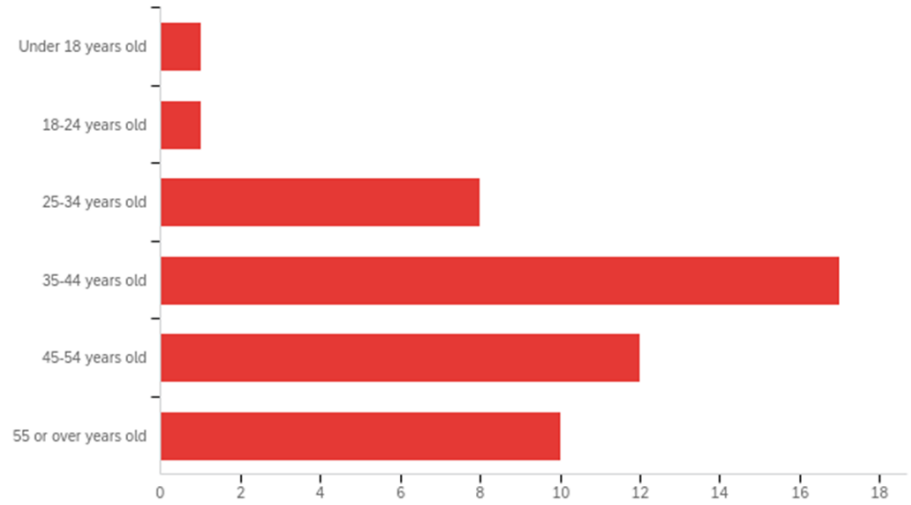

Table 2

Age of Participants

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is your age?	1.00	6.00	4.39	1.16	1.34	49

#	Answer	%	Count
1	Under 18 years old	2.04%	1
2	18-24 years old	2.04%	1
3	25-34 years old	16.33%	8
4	35-44 years old	34.69%	17
5	45-54 years old	24.49%	12
6	55 or over years old	20.41%	10

	Total	100%	49

Figure 2

Sex of Participants

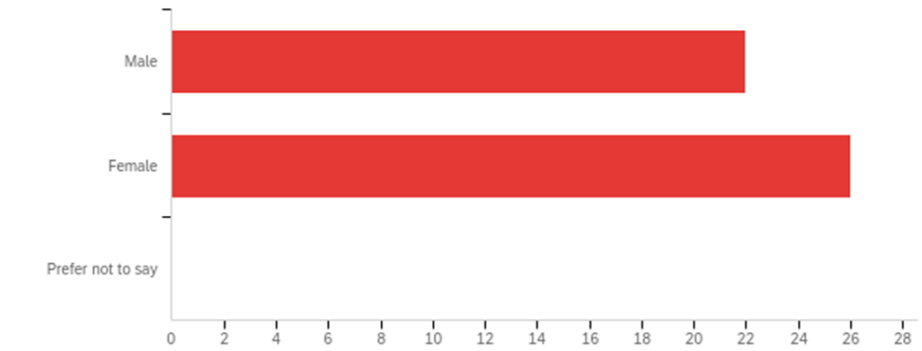

Table 3

Sex of Participants

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is your sex assigned at birth?	1.00	2.00	1.54	0.50	0.25	48

#	Answer	%	Count
1	Male	45.83%	22
2	Female	54.17%	26
3	Prefer not to say	0.00%	0
	Total	100%	48

Figure 3

Ethnicity of Participants

Q3 - What is your ethnicity?

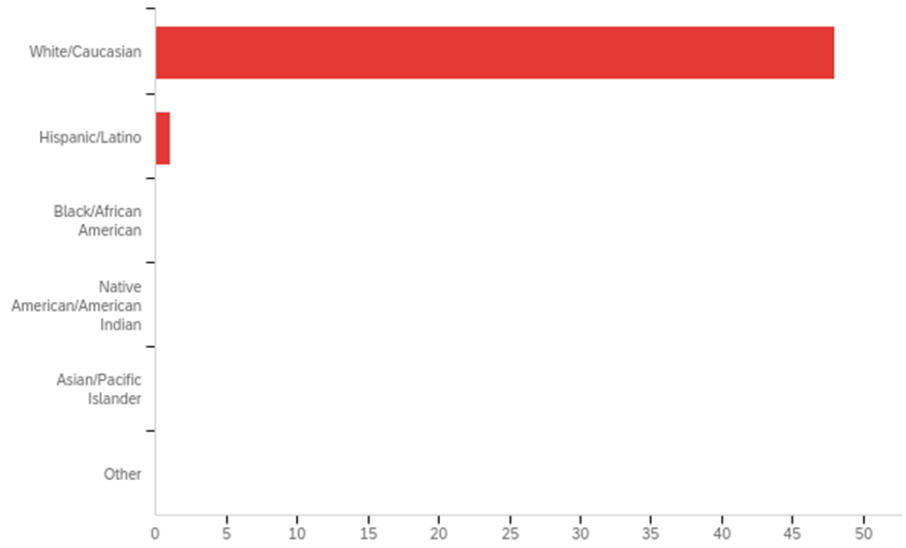

Table 4

Ethnicity of Participants

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is your ethnicity?	1.00	2.00	1.02	0.14	0.02	49

#	Answer	%	Count
1	White/Caucasian	97.96%	48
2	Hispanic/Latino	2.04%	1
3	Black/African American	0.00%	0
4	Native American/American Indian	0.00%	0

5	Asian/Pacific Islander	0.00%	0
6	Other	0.00%	0
	Total	100%	49

Figure 4

Participants Level of Education

Q4 - What is the highest degree or level of school you have completed?

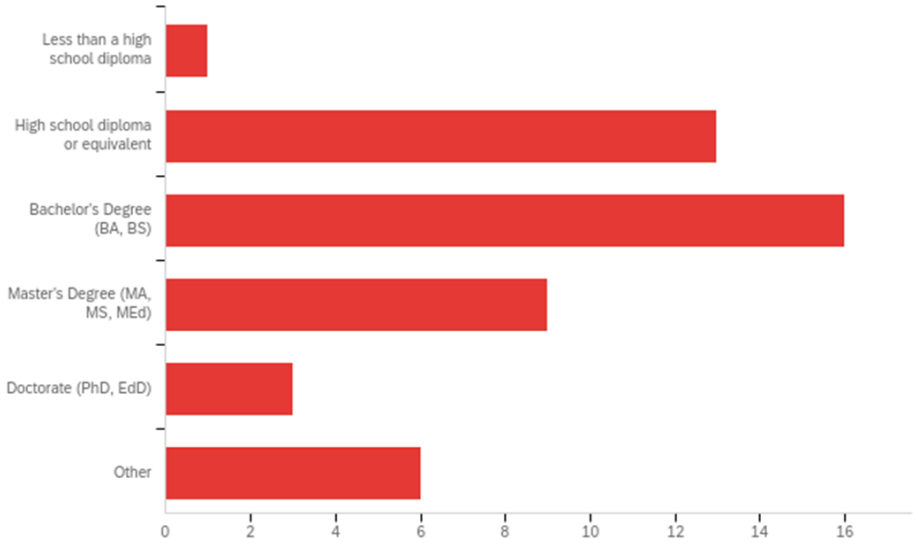

Table 5

Participants Level of Education

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is the highest degree or level of school	1.00	6.00	3.38	1.33	1.78	48

	you have completed?						

#	Answer	%	Count
1	Less than a high school diploma	2.08%	1
2	High school diploma or equivalent	27.08%	13
3	Bachelor's Degree (BA, BS)	33.33%	16
4	Master's Degree (MA, MS, MEd)	18.75%	9
5	Doctorate (PhD, EdD)	6.25%	3
6	Other	12.50%	6
	Total	100%	48

Figure 5

Employment of Participants

Q5 - How would you categorize your place of employment (work)?

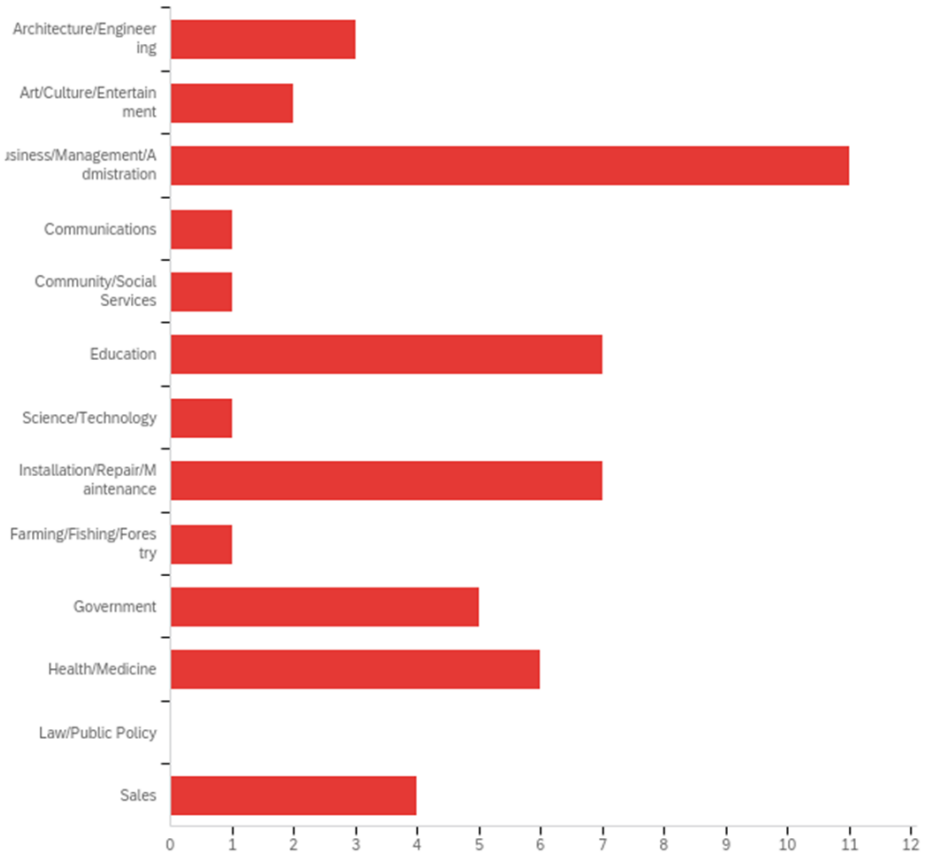

Table 6

Employment of Participants

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How would you categorize your place of employm	1.00	13.00	6.76	3.63	13.21	49

	ent (work)?						

#	Answer	%	Count
1	Architecture/Engineering	6.12%	3
2	Art/Culture/Entertainment	4.08%	2
3	Business/Management/Admistration	22.45%	11
4	Communications	2.04%	1
5	Community/Social Services	2.04%	1
6	Education	14.29%	7
7	Science/Technology	2.04%	1
8	Installation/Repair/Maintenance	14.29%	7
9	Farming/Fishing/Forestry	2.04%	1
10	Government	10.20%	5
11	Health/Medicine	12.24%	6
12	Law/Public Policy	0.00%	0
13	Sales	8.16%	4
	Total	100%	49

Figure 6

Participants Location of Business

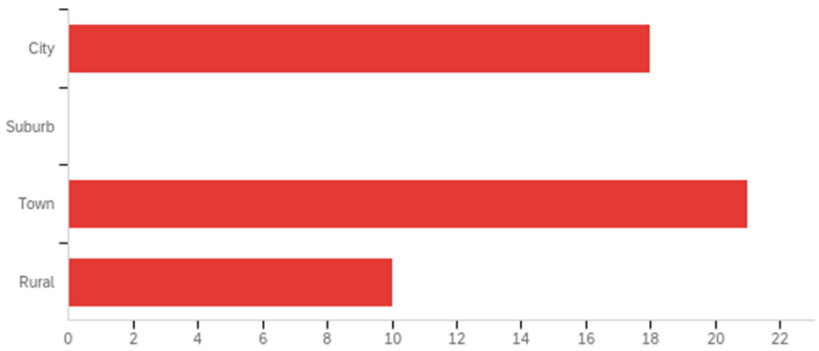

Table 7

Participants Location of Business

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Location of business	1.00	4.00	2.47	1.18	1.39	49

#	Answer	%	Count
1	City	36.73%	18
2	Suburb	0.00%	0
3	Town	42.86%	21
4	Rural	20.41%	10
	Total	100%	49

Figure 7

Participants Length of Employment

Q7 - How long have you been employed at this position?

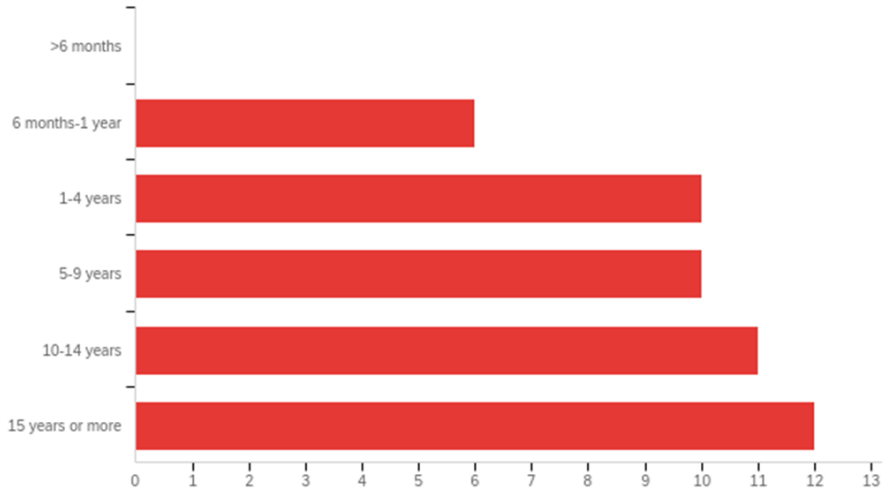

Table 8

Participants Length of Employment

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How long have you been employed at this position?	2.00	6.00	4.27	1.35	1.83	49

#	Answer	%	Count
1	>6 months	0.00%	0
2	6 months-1 year	12.24%	6
3	1-4 years	20.41%	10
4	5-9 years	20.41%	10

5	10-14 years	22.45%	11
6	15 years or more	24.49%	12
	Total	100%	49

Figure 8

Participants Relationship to a Disability

Q8 - Do you know someone with a disability?

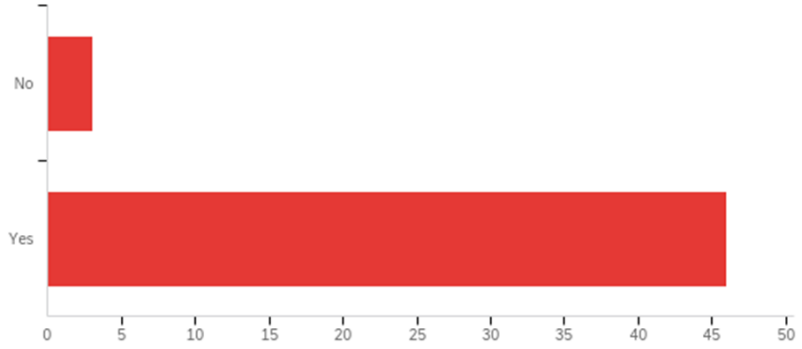

Table 9

Participants Relationship to a Disability

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Do you know someone with a disability?	1.00	2.00	1.94	0.24	0.06	49

#	Answer	%	Count
1	No	6.12%	3
2	Yes	93.88%	46
	Total	100%	49

Figure 9

Participants Hiring People with Disabilities

Q9 - Have you hired an individual or individuals with any of the following disabilities (select all that apply)?

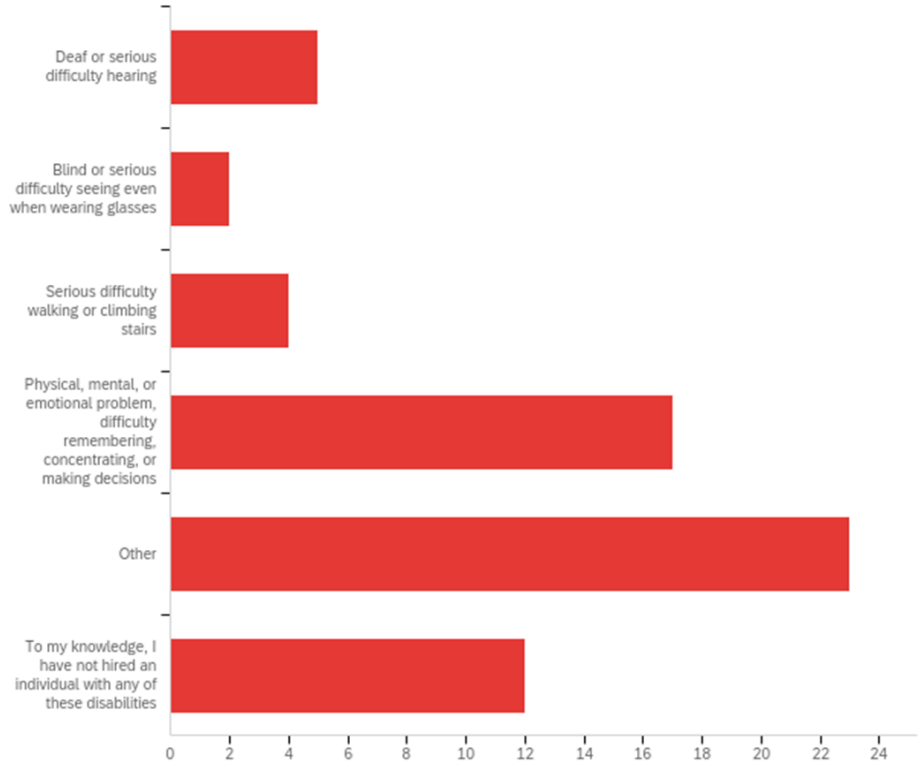

Table 10

Participants Hiring People with Disabilities

#	Answer	%	Count
1	Deaf or serious difficulty hearing	7.94%	5
2	Blind or serious difficulty seeing even when wearing glasses	3.17%	2
3	Serious difficulty walking or climbing stairs	6.35%	4
4	Physical, mental, or emotional problem,	26.98%	17

	difficulty remembering, concentrating, or making decisions		
5	Other	36.51%	23
6	To my knowledge, I have not hired an individual with any of these disabilities	19.05%	12
	Total	100%	63

Figure 10

Length Participants Worked with Disabled Peer

Q10 - How long have you worked with an individual with a disability?

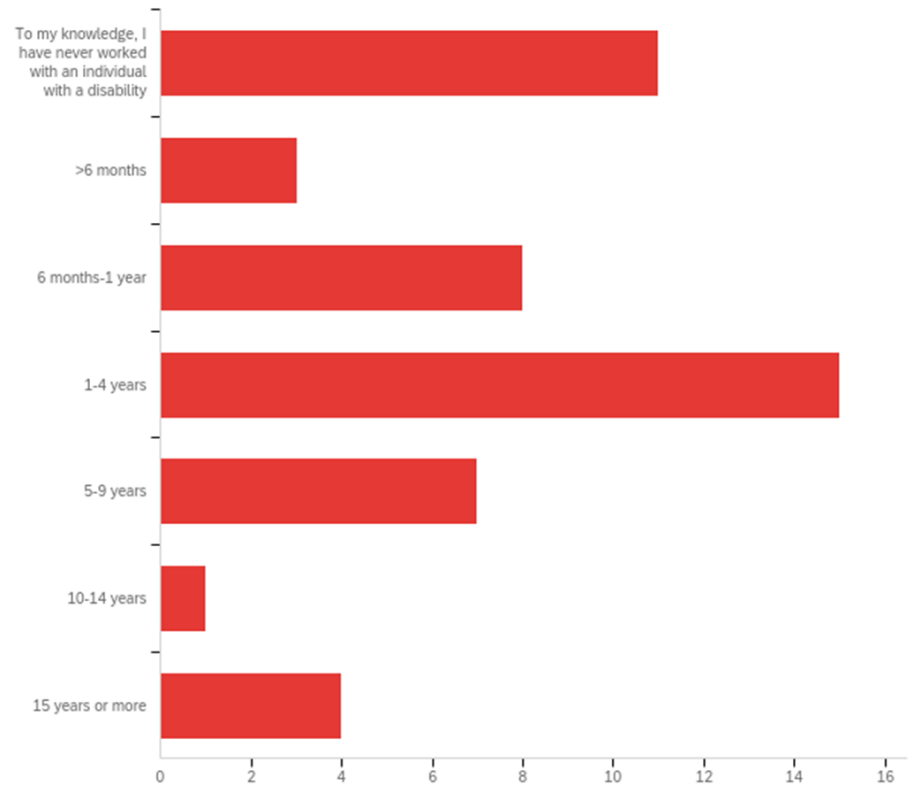

Table 11

Length Participants Worked with Disabled Peer

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How long have you worked with an individual with a disability?	1.00	7.00	3.47	1.76	3.11	49

#	Answer	%	Count
1	To my knowledge, I have never worked with an individual with a disability	22.45%	11
2	>6 months	6.12%	3
3	6 months-1 year	16.33%	8
4	1-4 years	30.61%	15
5	5-9 years	14.29%	7
6	10-14 years	2.04%	1
7	15 years or more	8.16%	4
	Total	100%	49

Table 12

Mathematical Ability Necessary for General Employment

Q11 - The following questions use a Likert scale. Rate your answers using the following: 1 - Not at all important, 2 - Somewhat important, 3 - Neutral, 4 - Somewhat important, 5 - Very important Rate the importance of mathematical ability necessary for general employment:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Geometry: area and perimeter, volume, surface area, angles, length and width	1.00	5.00	3.07	1.00	1.00	30
2	Algebra: ratios, percentages, decimals	1.00	5.00	3.14	1.06	1.12	36
3	Basic mental math computation: multiplying, dividing, adding, subtracting	1.00	5.00	4.20	1.00	1.01	40
4	Measurements: reading a	1.00	5.00	3.84	1.15	1.33	37

	ruler, fractions, conversions						

Table 13

Mathematical Ability Necessary for Participant's Employment

Q12 - The following questions use a Likert scale. Rate your answers using the following: 1 - Not at all important, 2 - Somewhat important, 3 - Neutral, 4 - Somewhat important, 5 - Very important Rate the importance of mathematical ability necessary for your employment field:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Geometry: area and perimeter, volume, surface area, angles, length and width	1.00	5.00	3.07	1.31	1.71	28
2	Algebra: ratios, percentages, decimals	1.00	5.00	3.17	1.24	1.53	36
3	Basic mental math computation: multiplying,	1.00	5.00	4.34	0.95	0.91	38

	dividing, adding, subtracting						
4	Measurements: reading a ruler, fractions, conversions	1.00	5.00	3.70	1.27	1.61	33

Table 14

Hiring on Educational Level

Q13 - Rate the likelihood you would hire an individual without a high school diploma.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Rate the likelihood you would hire an individual without a high school diploma.	1.00	5.00	2.87	1.40	1.96	39

#	Answer	%	Count
1	Not at all likely	23.08%	9
2	Somewhat unlikely	23.08%	9
3	Neutral	10.26%	4

4	Somewhat likely	30.77%	12
5	Very likely	12.82%	5
	Total	100%	39

Table 15

Hiring Disabled

Q14 - Rate the likelihood you would hire an individual with a disability.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Rate the likelihood you would hire an individual with a disability.	1.00	5.00	3.77	0.95	0.90	39

#	Answer	%	Count
1	Not at all likely	5.13%	2
2	Somewhat unlikely	0.00%	0
3	Neutral	28.21%	11
4	Somewhat likely	46.15%	18
5	Very likely	20.51%	8
	Total	100%	39

Table 16

Educational Level of Disabled

Q15 - Rate the likelihood you would hire an individual with a disability without a high school diploma.

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Rate the likelihood you would hire an individual with a disability without a high school diploma.	1.00	5.00	2.74	1.26	1.58	39

#	Answer	%	Count
1	Not at all likely	23.08%	9
2	Somewhat unlikely	20.51%	8
3	Neutral	20.51%	8
4	Somewhat likely	30.77%	12
5	Very likely	5.13%	2
	Total	100%	39

Table 17

Importance of Basic Mathematical Concepts

Q16 - Rate the likelihood you would hire an individual that struggles with basic mathematical concepts (i.e. adding, subtracting, multiplying, dividing).

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Rate the likelihood you would hire an individual that struggles with basic mathematical concepts (i.e. adding, subtracting, multiplying, dividing).	1.00	5.00	2.54	1.15	1.33	39

#	Answer	%	Count
1	Not at all likely	20.51%	8
2	Somewhat unlikely	30.77%	12
3	Neutral	30.77%	12
4	Somewhat likely	10.26%	4

5	Very likely	7.69%	3
	Total	100%	39

Table 18

Hiring Workers with Disabilities

Q17 - Are you more or less likely to hire someone that you know has a disability?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Are you more or less likely to hire someone that you know has a disability?	1.00	5.00	3.13	0.61	0.38	38

#	Answer	%	Count
1	Not at all likely	2.63%	1
2	Somewhat unlikely	2.63%	1
3	Neutral	76.32%	29
4	Somewhat likely	15.79%	6
5	Very likely	2.63%	1
	Total	100%	38

Table 19

High School Graduate Math Skills

Q18 - How likely is it for high school graduates to have the math skills necessary for the positions you hire for?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How likely is it for high school graduates to have the math skills necessary for the positions you hire for?	1.00	5.00	3.68	1.05	1.11	38

#	Answer	%	Count
1	Not at all likely	2.63%	1
2	Somewhat unlikely	15.79%	6
3	Neutral	13.16%	5
4	Somewhat likely	47.37%	18
5	Very likely	21.05%	8
	Total	100%	38

Table 20

Trade School Graduate Math Skills

Q19 - How likely is it a trade school graduate has the math skills necessary for the positions you hire for?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How likely is it a trade school graduate has the math skills necessary for the positions you hire for?	1.00	5.00	3.92	0.96	0.91	38

#	Answer	%	Count
1	Not at all likely	2.63%	1
2	Somewhat unlikely	5.26%	2
3	Neutral	18.42%	7
4	Somewhat likely	44.74%	17
5	Very likely	28.95%	11
	Total	100%	38

Table 21

CTE and Employment

Q20 - How well do you feel CTE (career technical education) prepares students for employment?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How well do you feel CTE (career technical education) prepares students for employment?	1.00	5.00	3.97	0.97	0.95	37

#	Answer	%	Count
1	Not at all likely	2.70%	1
2	Somewhat unlikely	2.70%	1
3	Neutral	24.32%	9
4	Somewhat likely	35.14%	13
5	Very likely	35.14%	13
	Total	100%	37

Table 22

Preventions to Employment

Q21 - What would prevent you from hiring an individual with a disability?

What would prevent you from hiring an individual with a disability?
temperament
poor customer service and are unable to do basic math skills
they don't have the correct license to drive truck
Bad work ethic, generally being rude.
Unable to perform the skills required for the job
unable to do the work
if they weren't able to do the job
Can they do the job
Inability to regulate emotions.
Nothing, if they are willing to learn, we hire in many scenarios
physically unable to do the job, since my company does roofing a person needs to be able to physically do the work
unable to complete job responsibilities
If there were no accommodations that would make it possible to do the job without a health or safety risk to the employee or others.
Job fit and ability to do essential functions
If they cant not do the basics of the job without reasonable accommodation
nothing
If they aren’t qualified for the job.
unable to perform tasks required for the job
Qualifications for the field
Nothing.
The safety sensitive environment

If they couldn't do the job even after training
poor math computation
nothing
Unable to complete tasks related to the job
unable to complete the task, unsatisfied customers, anger
Unable to perform the tasks necessary for the job and cannot take feedback/gets upset easily, not dependable
Are unable to perform the necessary tasks for the job.
Being explosive or not being dependable.
Math or safety requirements
Lack of ability to do the job with reasonable accommodations
Physical necessities of the job. Need to be able to lift a certain amount of weight. Need to be able to hear and speak into a phone/radio.
Job Qualifications. OSHA / Safety Requirements. Environmental hazards.
Aggression
I just need someone that can complete the needed tasks

Table 23

Preparing Students for Employment

Q22 - What could schools do better to help prepare students for employment after high school graduation?

What could schools do better to help prepare students for employment after high school graduation?
not limit options to college, but a wide range of jobs are available for students, exposure to different occupations
job experience
provide certificates or put them on career paths
Going through job application/interviews, working on time/money management.

Job shadowing, job experience, create schools that offer certificates that way they stand out from others
common work place responsibilities like showing up on time and communicating time off 2 week notice
teach to real life, not the tv idea of life
More practice at a job site or job shadow
stress the importance of coachability and positive attitude.
More hands on learning of real world issues
basic math skills and not needing a calculator, young kids always on their phone and using a calculator to solve basic problems such as square footage
work ethic
I think schools should teach project management. Its relevant to all careers & would make our workforce much more productive.
Career experiences
Look at what kinds of jobs they are going to be getting and going after those skills (ask employers)
start career expliration in 5th grade - establish interests earlier
Everyday basic skills. Communication and follow up.
hands on experience, career exploration
Interview skills resume writing to grab attention
Life skills
More hands on on actual jobs to get actual knowledge on jobs available in the areas
What is needed sometimes is to do the job then ask why later
more CTE courses, more on the job training
give them "jobs" while they are in school.
Help students with basic math skills, such as giving back change without needing a calculator
basic math skills without use of calculator, mental math
Experience, such as providing internships or work programs

Experience, work-based programs, better reading/math/writing skills
Basic math skills and able to do them quickly, not always relying on a calculator
Basic citizen skills.
Change the curriculum entirely to focus on how to behave in a corporate setting, life skills, financial acumen, and public speaking and presentation
Host more job/career fairs. Establish a work-study program that would operate like an extra-curricular program for students who are less sports/arts focused and more job focused. More one-on-one time with employers, and more access to employment resources.
For the typical IQ student, teach how to create structure and success from obscurity. An electrician can be an employee. An electrician can be a business owner. An electrician can be a teacher. An electrician can be a scientist. An electrician can be unemployed.
Life skills
Mental math. The ability to quickly do your average problem.

Table 24

Skills Needed for Employment

Q23 - In general, what skills do students need to have to be successful in the career field you work in?

In general, what skills do students need to have to be successful in the career field you work in?
people skills, artistic skills, time management/money management skills
people skills and basic math skills
work ethic and license to drive truck
Communication, basic high school knowledge, people skills, understanding/problem solving, teamwork.
Strong math skills, understanding how machines/objects work, critical thinking skills, problem-solving skills
strong work ethic
people skills, communication skills, computer skills
Collaboration, communication, social skills, networking

Friendly, helpful, Basic math (mixing fertilizer, percentages, basic math for making change, taking payment))
Communication, customer service, critical thinking
basic multiplication, physically fit, show up
work ethic
In my field they need to have professionalism, able to work collaboratively, basic project management skills, understanding of complex systems, able to manage large budgets, a sense of servant leadership...
Soft skills
Manufacturing, basics, following rules (to ensure safety) following steps, reading/following directions for set up, basic math, basic computer skills
Communication, logic, math, speech, basic microsfot suite
Good communication. Detailed. Creativity.
people skills, understanding of crops, general science, math skills
A degree in medical imaging
People skills and emotional regulation
Being able to communicate, following instructions
Math, mechanical, class A license
math
people skills, computer skills, math skills
Money skills
reading part numbers, reading a tape measure/caliper, conversions, customer service
continue to learn as new vehicles are made, think critically, problem solve, be efficient, on time
Communication and basic math skills
Knowing how to figure out ratios of water and cement, figuring out square footage, cost and being able to provide estimates.
Measurement and conversation skills.
Communication, aptitude for learning, basic mathematical skills, poise, analytical skills

Multi-tasking, decision making, ability to work both alone and in teams, communications (reading, writing, speaking)
Have a broad understanding of accounting, finance, manufacturing & engineering, physics & chemistry, safety & environmental, and organizational management.
Social skills basic math skills
Fractions, decimals, rulers, and done mentally quickly

Table 25

Time Spent on Training

Q24 - How much time do you spend training new hires to be competent in relevant math skills?

How much time do you spend training new hires to be competent in relevant math skills?
workers set their price and need to know when they need materials order, so it really falls on them to be competent
none due to the math skills that are needed being basic their should be no need to teach these skills
none
n/a
Required to have math skills upon hiring.
none
none
N/a
Very little. A smartphone may be used for conversions and percentages.
Not much, they should be able to use computer programs like Excel for doing daily calculations
none, expected to have them, might help them once, but after that they should know how to do it
none
Most of my colleagues have master's degrees or at least bachelor's degrees, so its mostly just learning new systems instead of math skills.

Very little
1-2 weeks on the job
excel, formulas - expected at time of hire
Very limited. Expected to start with the skills.
1 year
None
None
From 3 to 6 months
None
none, don't hire them if they don't have the skills needed
none
None, they are expected to have these skills when hired
6 months or less
unknown
Under a year
Never measured it before, but have had to train on how to do estimates.
We will tolerate up to 1 year
Minimal, as they are expected to have those skills as a pre-requisite
1-2 Hours
Training / probationary period can last up to 1 year.
3 hours
Not much, if they can’t do it I find someone else

Table 26

Measuring Math Capabilities Prior to Employment

Q25 - Do you have any screening tests? If yes, do any of your screening tests specifically look at a person's math capabilities?

Do you have any screening tests? If yes, do any of your screening tests specifically look at a person's math capabilities?
no, look at portfolio and see how they fit into the atmosphere and if they have the skills needed for the job
no, they are watched and if they don't have people skills or cannot do math they are let go
no
n/a
Yes. Yes.
no
no and no
N/A
No. Only questions during interview
No
no
no
Nope, no screening tests.
No.
No
Yes, not math specific skills.
yes. yes.
No
No
No
This is new and I don't get to hire anyone

yes. yes.
more technical training an testing
No.
no.
no.
Yes. Yes.
No.
Yes. Yes.
N/A
No screening tests
Yes. Yes.
No
No

Appendix C: IRB Decision Letter

Institutional Review Board (IRB)
720 4th Avenue South AS 101, St. Cloud, MN 56301-4498

IRB PROTOCOL DETERMINATION: Exempt

February 23, 2023

To: Elisabeth Mumford
Email: elisabeth.mumford@mnsu.edu

Faculty Mentor/Advisor: Brian Valentini

Project Title: Mathematics and Employment

The Institutional Review Board has reviewed your protocol to conduct research involving human subjects.

Your project has been: **Approved**

Expiration Date: **N/A**

SCSU IRB#: **47035809**

Please read through the following important information concerning IRB projects:

ALL PROJECTS:

- The principal investigator assumes the responsibilities for the protection of participants in this project. Any adverse events must be reported to the IRB as soon as possible (ex. research related injuries, harmful outcomes, significant withdrawal of subject population, etc.).
- The principal investigator must seek approval for any changes to the study (ex. research design, consent process, survey/interview instruments, funding source, etc.).
- The IRB reserves the right to review the research at any time.

ADDITIONAL FOR EXPEDITED AND FULL BOARD REVIEW PROJECTS:

- The principal investigator must submit a Continuing Review/Final Report form in advance of the expiration date indicated on this letter to report conclusion of the research or request an extension.
- Approved consent forms display the official IRB stamp which documents approval and expiration dates. If a renewal is requested and approved, new consent forms will be officially stamped and reflect the new approval and expiration dates.

If we can be of further assistance, feel free to contact the IRB at 320-308-4932 or email ResearchNow@stcloudstate.edu and please reference the SCSU IRB number when corresponding.

Sincerely,

IRB Chair:
William Collis-Prather

Program Director
Applied Clinical Research

IRB Institutional Official:
Dr. Claudia Tomany

Associate Provost for Research
Dean of Graduate Studies