

THE RELATIONSHIP BETWEEN ALTERNATIVE CAREER AND TECHNICAL
EDUCATION (CTE) TEACHER LICENSURE REQUIREMENTS AND CTE TEACHER
SHORTAGE

by

Britton H. Devier

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

Career and technical education (CTE) continues to face an annual shortage of qualified teachers in the profession. This shortage has caused an increase in the use of alternative certification/licensure pathways across the United States. These alternative pathways are highly divergent from state to state. Limited research has investigated CTE teacher shortage and the alternative certification/licensure requirements that contribute. Using archival data, this correlational study looked to determine if CTE alternative certification/licensure requirements can predict CTE teacher shortages. Logistic regression analysis was used to review all 50 states and the District of Columbia and determine if any of the criterion variables predicted CTE teacher shortage. After analysis, it was determined that none of the criterion variables of academic degree, work experience, mandatory testing, and program length was statistically significant in predicting CTE teacher shortage.

***Keywords:* career and technical education (CTE), alternative certification, alternative licensure, career, and technical education (CTE) teacher shortage**

Dedication

This dissertation is dedicated to my loving parents, Dr. David H. and Patty Devier. Your faith and belief in my abilities throughout my life have been unwavering. I am appreciative of your support no matter the endeavor. Thank you for teaching me the value of hard work and dedication. I love you both more than words can express.

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List of Abbreviations

Alternative certification/licensure (AC/L)

American Federation of Teachers (AFT)

Career and Technical Education (CTE)

Educational Testing Service (ETS)

Institutional Review Board (IRB)

National Center for Alternative Certification (NCFAC)

National Commission on Teaching and America's Future (NCTAF)

National Defense Education Act (NDEA)

National Research Center for Career and Technical Education (NRCCTE)

No Child Left Behind (NCLB)

Technology Education (TE)

Teacher Short Areas (TSA)

Vocational Educational for National Defense (VEND)

Vocational Training for War Production Workers (VTWPW)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this study was to determine if there was a relationship between career and technical education (CTE) certification/license requirements and CTE teacher shortages for the school year 2016 - 2017 throughout the United States. Chapter One will discuss the background related to the study and methodology. The problem statement will be presented and discussed. The purpose and significance of this study will also be discussed. Finally, the research questions will be presented, and definitions pertaining to this study will be provided.

Background

As education has shifted to focus on accountability, the demand for quality CTE teachers has increased. In 2002, the No Child Left Behind (NCLB) legislation made an effort to improve student achievement through increased accountability (Fletcher, Gordon, Asunda, & Zirkle, 2015). A highly qualified teacher, as defined by NCLB, has a bachelor's degree and subject knowledge as evidenced by the passage of a standardized test (Fletcher et al., 2015). These requirements became problematic for CTE teachers, specifically for those who are alternatively certified.

More than twenty years after *What Matters Most: Teaching for America's Future*, the nation still faces many of the same challenges (Berry & Shields, 2017). Berry and Shields (2017) indicate that teacher shortages, although varied by subject and region, are becoming a severe problem. Since 2015, media reports of teacher shortages have appeared in nearly every U.S. state (Behrstock-Sherratt, 2016). In *Our Future, Our Teachers*, the U.S. Secretary of Education (2011) identified the enormous challenge to the education system presented by the retirement of 1.6 million teachers over the next decade. Teacher shortages hit CTE particularly hard. In the U.S.

Department of Education's August 2016 Teacher Shortage Areas (TSA) report, 31 states and the District of Columbia reported a shortage in at least one area of CTE. As a remedy, an increased number of alternative certification programs have emerged. In 1982, just eight states offered alternative certification/licensure, a number that increased to include all 50 states by 2008 (National Center for Educational Information, 2003, 2010). Alternative certification/licensure has its roots in vocational education and the Smith-Hughes Act of 1917 (Ruhland & Bremer, 2002), although what is commonly agreed upon as the beginning of alternative certification/licensure came in New Jersey's Alternate Route Program in 1984 (Darling-Hammond, 2001). This Alternate Route Program was a statewide program that gave school administrators the authority to hire college graduates who did not study education.

Career and technical education has existed in various forms for hundreds of years. Beginning long before formal education, parents passed on survival skills to their children (Brewer, 2011; Evans, 1971; Keller, 1948). Dating back as far as the seventh century, vocational education was prevalent in the passing of skills from master to apprentice (Keller, 1948). With the industrial revolution came change to vocational education. The lengthy apprentice model was dropped for the more efficient manual arts training model (Barlow, 1974). Through the 19th century and into the 20th century, vocational education adjusted in scope based on the needs of the nation focusing on skills development (Brewer, 2011). As the 20th century progressed and the new millennium turned, technology became the driving force of vocational education. Skills needed by 21st-century students forced CTE to refocus on general education along with skill development (Association of Career and Technical Education, 2002). Today, demand for CTE in secondary schools continues to increase. More than half of all high school students enroll in at least one CTE course, and 25% to 40% of U.S. students enroll in three or four courses

throughout a course of study (Harris & Wakelyn, 2007). Nearly one-fifth of all credits accumulated by public high school students are in courses categorized as CTE (Asunda, 2011). Throughout the history of CTE, federal legislation has shaped the scope and climate. Funding for vocational education began with the passage of the Smith-Hughes Act in 1917. Since then, the government has continued to support vocational education. In the Carl D. Perkins Act of 2006, the vocational education name was officially changed to the already accepted career and technical education (i.e., CTE).

Today, CTE allows students to earn industry credentials and college credit (Jackson & Hasak, 2014). Johnson and Green (2014) assert that, in the next 15 years, 71% of the skilled labor force is projected to retire. With only 21% of jobs requiring a four-year college degree according to the U.S. Bureau of Labor Statistics (2014), it befits students to take advantage of CTE programs. As our society continues in the information and technology era, CTE will have to adapt and change. The skills and needs of 21st-century jobs require CTE to be in tune with technological and economic changes.

The future success of CTE depends on the CTE profession's ability to recruit and train highly qualified teachers. The nationwide shortage of qualified CTE teachers has made necessary the implementation of alternative CTE certification/licensure pathways. As the demand for CTE teachers grows due to student course demand and teacher retirement, more industry and business professionals will require alternative CTE certification/licensure to fill the void.

Problem Statement

Quality teachers are vital for CTE student and program success. Teacher quality greatly influences student achievement (Ashton & Webb, 1986; Duncan, Cannon, & Kitchel, 2013; Wenglinsky, 2002). Throughout the United States, there are many different pathways toward

CTE teacher certification/licensure. These pathways are in a constant state of change due to various influences. In a study conducted by The National Research Center for Career and Technical Education, there were 105 alternative licensure pathways identified in the 50 U.S. states and the District of Columbia (Zirkle, Martin, & Mccaslin, 2007). These pathways include a myriad of qualifications, mandatory tests, backgrounds, and experiences. The same study identified the need for more research in CTE alternative licensure (Zirkle et al., 2007). According to the U.S. Department of Education's 2016-2017 nationwide listing of teacher shortages, 32 states reported shortages of CTE educators (U.S. Department of Education Office of Postsecondary Education, 2017). As the need for CTE teachers' increases, many states are tempted to lower requirements to fill their teacher shortage. It would appear that the more stringent the CTE teacher certification/licensure, the less likely a tradesperson would consider teaching as a second career. However, little research has been done in this area. The problem is that there are no recent studies that examine the relationship between CTE teacher shortage and certification/licensure requirements.

Purpose Statement

The purpose of this archival, predictive, correlational study was to examine the extent to which CTE certification/licensure requirements can predict CTE teacher shortages for the school year 2016-2017 throughout the United States. The criterion variable is CTE teacher shortage. Teacher shortage is identified using the TSA Nationwide Listing 2016–2017 (U.S. Department of Education Office of Postsecondary Education, 2017) and includes all 50 states and the District of Columbia. The predictor variables are the states' CTE certification/licensure requirements, which include the academic degree needed, work experience, mandated testing, and program length. Alternative certification/licensure is defined as non-traditional routes to enter the CTE

teaching profession (Ruhland & Bremer, 2002). Degree needed is defined as the level of academic degree required for alternative licensure (high school, associates, bachelors, masters, other). Work experience is defined as the numbers of clock hours required for alternative certification/licensure (0-500 hours, 501-3000 hours, 3001 -5000 hours, > 5001 hours). Testing is defined as the mandated standardized exams required to obtain alternative certification/licensure. Program length is defined as the number of semester hours of coursework needed (less than 9, 10-18, 19-30, 31 or more). This research examined alternative certification/licensure issues through a state-by-state analysis.

Significance of the Study

This study is significant to the topic of CTE teacher shortage in relation to CTE certification/licensure requirements. There are few studies (and none recent) that focus on CTE alternative licensure (Zirkle et al., 2007). There is a need for research that looks at certification/licensure requirements. This study will provide insight into CTE teacher shortages and contribute to a deeper understanding of the impacts of alternative certification/licensure requirements. Specifically, academic degree, work experience, mandated testing, and length of the program. Because the study examines all U.S. states and the District of Columbia, the findings of this study have implications for policy and procedures across the country.

The Carl D. Perkins Career and Technical Education Improvement Act of 2006 includes professional development and teacher preparation that relate to this study. Perkins addressed the need to improve the transition of teachers who come from business and industry including with regard to both recruitment and retention. With almost half of teachers leaving the profession within five years, CTE recruitment and retention is critical (Gray & Taie, 2015). Reauthorization of the Perkins Act has passed through the House and is currently in the Senate. The

reauthorization would provide an opportunity to support and expand state and district efforts to address CTE teacher shortages (ACTE Policy Watch, 2017). This research may inspire others to study CTE certification/licensure pathways and CTE teacher shortages.

Research Question

RQ1: Can alternative CTE certification/licensure requirements predict CTE teacher shortages throughout the United States for the school year 2016 - 2017?

Definitions

1. *Career and Technical Education (CTE)* – an educational program that prepares students to be career and college-ready with skills necessary to be successful (ACTE, 2015).
2. *Certification* – nongovernmental agency or association grants special professional recognition to an individual who has met specific predetermined qualifications (Fletcher & Zirkle, 2010).
3. *Licensure* – official recognition by a state governmental agency that an individual meets state requirements and is approved to practice as a professional in that state (Bartlett 2002).
4. *Teacher shortage* – a situation whereby teacher supply falls short of teacher demand (Behrstock-Sherratt, 2016)
5. *Alternative certification* – refers to nontraditional routes to enter the teaching profession. Those routes include occupational competency, professional experience, and completion of a baccalaureate degree in the subject area (Ruhland & Bremer, 2003).
6. *Traditional certification* – a preservice program through a baccalaureate degree including field hours, student teaching, content knowledge and pedagogy (Behrstock-Sherratt, 2016).

7. *Vocational Education* – studies relating to careers and the initial title for CTE studies (Barlow, 1992).
8. *21st century skills* – a combination of core subjects and skills including learning and innovation; information, media, and technology; and life and career (Fletcher & Zirkle, 2010).

CHAPTER TWO: LITERATURE REVIEW

Overview

Chapter Two will provide a history of career and technical education (CTE) that focuses on major curriculum and funding changes. The chapter will present and discuss literature related to teacher shortage and alternative licensure in the United States. The history of CTE, curriculum change, funding, teacher shortage, and alternative licensure are linked topics, and a review of all is essential to the study.

Related Literature

History of Career and Technical Education

For hundreds of years, CTE has existed in numerous forms. Early on, survival skills were passed on from parents to children (Brewer, 2011; Evans, 1971; Keller, 1948). As far back as the seventh century, monks used an apprenticeship model where skills were passed down from a master (Keller, 1948). Until the 16th century, vocational education was mostly informal (Kneller, 1963). During the 16th and 17th centuries, the Puritans, who believed everyone was destined for a specific duty, developed the foundation of CTE with their idea of skill mastery and compulsory education (Kneller, 1963). The English Statute of Artificers recognized the apprenticeship system and set legal descriptions for its use in 1562 (Gordon, 2014). In 1601, the English Poor Law was created to teach impoverished farm children a skilled trade to help their families (Gordon, 2014). According to Gordon (2014), the direction of CTE in the United States was shaped by English Poor Laws.

In the early 17th century came the colonization of America. Brewer, Campbell, and Petty (2000) discuss apprenticeships as the earliest formal training available to the general public. These arrangements called for the master to teach a trade while providing basic needs to the

apprentice (Barlow, 1974; Keller, 1948). According to Barlow (1974), these basic needs included a) food, clothing, and shelter; b) reading and writing instruction; c) religious teaching; d) training in the trade; and e) secrets of the trade. Often people of the lower class entered indentured servitude to learn a trade. Agreements included room, board, and clothing; some spelled out the dissemination of knowledge and secrets of the trade (Gordon, 2014). These early apprenticeships have influenced modern CTE. The current co-op programs offered to many students are modern day apprenticeships. Modern CTE still stressed the teaching of a trade or skill. In 1642, a law was passed in the colonies ensuring that, on top of learning a trade, the apprentice learned the laws and religious views of the colony (Miller, 1993). The interweaving of general education and vocational education is seen in the historical apprenticeship model as carried through to today.

Around the turn of the 19th century, the United States moved rapidly from an agriculturally based society to one based on machines and factories. As this change happened, many people moved from their rural roots to cities to find work (Brewer, 2011; Evans, 1971; Keller, 1948). This period was marked by mass production and machinery replacing the individual craftsman. This era is called the Industrial Revolution. Because of the rapid technological advancements and implementation of new machinery, apprenticeships could no longer provide all the needed training (Barlow, 1974). The lengthy apprenticeship model was dropped for the more efficient manual arts training model (Barlow, 1974). Through the need to provide skilled training came two schools of thought, the practical arts and trade schools (Barlow, 1974). The practice arts movements developed curriculum within the existing school that was skill-based while still being general education (Barlow, 1974). The trade school movement focused on teaching a specific trade and resembles today's vocational programs.

Through the 19th and into the 20th century, vocational education adjusted in scope based on the needs of the nation focusing on skills development (Brewer, 2011).

By early in the 20th century, the quick growth and technological change of the period was causing a change in education. During this time, secondary education was available but not yet mandatory, and college was for the academic elite (Barlow, 1976). During World War I, the government needed trained workers with mechanical skills in addition to soldiers to fight (Thompson, 1973). The challenge, with so many men at war, was to train women to fill the needs of the country rapidly. During the Great Depression, for the first time, vocational education made a difference in workforce preparation for youth and adults (Association of Career and Technical Education, 2002). By World War II, vocational education, having already gained a foothold in our educational system, was built up and extended (Brewer, 2011; Thompson, 1973). During World War II, the federal government created two programs, Vocational Training for War Production Workers (VTWPW) and Vocational Education for National Defense (VEND) (Thompson, 1973). As during World War I, women were again pressed into work in the industries and factories during wartime, and, by April 1943, 741,322 women had enrolled in vocational training (ACTE, 2002). After the war, the federal government increased programming and funding of vocational education to help train returning veterans. By the second half of the 20th century, the U.S. was fully immersed in the space race with Russia. The increase in manufacturing and automation changed the level of preparedness needed in the workforce (Thompson, 1973).

As the 20th century progressed, technology continued to develop at an exponential rate, becoming the force for change in vocational education. Skills needed by 21st century students forced CTE to refocus on general education along with skill development (Association of Career

and Technical Education, 2002). Today, demand for CTE in secondary schools continues to increase. More than half of all high school students enroll in at least one CTE course, and 25% to 40% of U.S. students enroll in three or four courses throughout a course of study (Harris & Wakelyn, 2001). Nearly one-fifth of all credits accumulated by public high school students are in courses categorized as CTE (Asunda, 2011). Johnson and Green (2014) reported that 71% of the skilled trades workforce will retire within the next 15 years. CTE offers students the needed skills and experience to gain employment in areas of shortage. The value of CTE courses is highlighted by Gomes (2015) who affirms “it is time that we recognize the value and importance of focusing on both vocation and academic skills. Students who are mastering these subjects will truly be prepared for college or a vocational path after they graduate from high school” (para. 2). The world economy requires schools to give student high-level training. This training is critical to meet the needs of our technologically advanced jobs and to promote the skills needed for 21st century career success.

CTE Legislation and Funding

Morrill Act.

In 1862, the Morrill Act passed marking the beginning of land-grant colleges. The act provided land to the states to sell. That income was used to develop agriculture and mechanical colleges (Barlow, 1976; Brewer & Achilles, 2008). The Morrill Act was the first national legislation that supported vocational education (Brewer & Achilles, 2008; Calhoun & Finch, 1976).

In 1887, the Hatch Act gave funds to the states to create agricultural experiment stations to provide farmers with the most up-to-date methods (Calhoun & Finch, 1976). This act also looked to give research-driven agricultural data to the nation (Hawkins, Prosser, & Wright,

1966). Funding was later increased by the Adams Act of 1906 (Hawkins et al., 1966). This support was reinforced in 1890 when the Second Morrill Act added funding to support land-grant colleges (Calhoun & Finch, 1976; Hawkins et al., 1966). These acts solidified federal support for higher education and created a shift from classical studies to applied studies that prepared students for life outside the classroom (Lightcap, 2008). A large portion of today's agricultural and technical institutions are still standing because of the funding that originated from the Morrill Acts.

Smith-Hughes Act of 1917.

By the first part of the 20th century, the federal government had realized the importance of vocational education. Addressing concerns about the national graduation rate of 8%, Senator Hoke Smith was appointed to chair a committee to research vocational education issues (Barlow, 1992). From this committee came the Smith-Hughes Act of 1917, which furthered the federal influence of vocational education by adding funding for public secondary schools. The act was initially opposed by the National Education Association and the National Association of Manufacturing but soon passed after a coalition formed (Hillison, 1995).

Through the Smith-Hughes Act, every state had a liaison board that worked with the federal and local school boards (Wonacutt, 2003). Wonacutt (2003) reported that the federal mandate required 50% of a student's time would be in training for a trade, 25% in studying the related subject matter, and 25% in traditional academic classes. The Smith-Hughes Act of 1917, also known as the National Vocational Act of 1917, was one of the first federal aid programs and began with \$1.7 million (Barlow, 1992). The funding was increased yearly in increments up to \$7.2 million by the 1925-1926 school year (Barlow, 1992). Stasz and Bodilly (2004) found that, because of the specific funding in the Smith-Hughes Act, vocational education became separated

from other programs, contributing to today's continued separation. The passage of the Smith-Hughes Act was the beginning of the federal government's involvement in the establishment of high school vocational education (Castellano, Stringfield, & Stone, 2003).

Smith-Hughes extensions.

During the 1920s and 1930s came several extensions of and additions to the Smith-Hughes Act. The Fess-Kenyon Act of 1920 provided funding for vocational rehabilitation of disabled people (Calhoun & Finch, 1976). The George-Reed Act of 1929 added funding for home economics and agricultural programs (Calhoun & Finch, 1976). An extension and reauthorization of the George-Reed Act came in 1934 with the passing of the George-Ellzey Act, which added funding for trade and industry programs (Calhoun & Finch, 1976). These acts worked to extend the reach of vocational education in the U.S. while increasing vocational education offerings. After World War II came the passing of the Servicemen's Readjustment Act of 1944, which later became known as the G. I. Bill. Funding from this bill, which was based on years of service, provided the opportunity for veterans to receive education and training in any desired field (Calhoun & Finch, 1976). Still in effect today, many have taken advantage of the G.I. Bill benefits.

National Defense Education Act.

In 1958, President Dwight D. Eisenhower signed the National Defense Education Act (NDEA) in response to the Soviet Union's launch of Sputnik I (Flattau, Bracken, Van Atta, del la Cruz, Sullivan, 2006). The threat to the nation's security increased the support for the study of science, mathematics, foreign language, and technical education. The NDEA complemented existing federal education programs and emphasized programs that would strengthen the U.S. educational system by routing people into the teaching profession (Flattau et al., 2006). In

addition to providing the much-needed occupational training of the time, NDEA provided low-interest student loans for higher education. The availability of these loans helped to cultivate the number of educated people in the nation.

Perkins era.

Research in the 1960s showed that students did not value a high school diploma. Educational trends of the era abandoned the thought of attending college as a means of career ascension and guided many students to take vocational and nonacademic classes (Meeder & Stevens, 2005). Addressing this trend was the passage of the Vocational Education Act of 1963, which replaced the Smith-Hughes Act. Added in the Vocational Education Act was language to address the education to special groups including handicapped, disadvantaged, and women (Wolfe, 1978). This legislation was the milestone that set the stage for the authorization of the Carl D. Perkins Vocational and Technical Education Act in 1984. Stasz and Bodilly (2004) reported that the 1984 act added emphasis on improving vocational education programs for special populations and developing modernized quality programs. The passage of the Carl D. Perkins Vocational and Applied Technology Education Act (Perkins II) in 1990 focused on providing an academic foundation and training students for a highly skilled workforce (Meeder & Stevens, 2005). Castellano, Stringfield, & Stone (2003) point out that Perkins II was the first CTE legislation that addressed the changing economic and education landscape. Perkins II integrated vocational and academic study with work-related experiences (Castellano et al., 2003). Congress passed the reauthorization of the 1990 act in 1998 with Perkins III, the Perkins Vocational and Technical Education Act. The act's focus was in bridging secondary and postsecondary vocational education and funding accountability (Skinner & Apling, 2006; U.S.

Department of Education, 2011. Stressed in the 1998 reauthorization was the importance of graduation and the improvement of public school vocational education.

In 2006, the Perkins Act was reauthorized again as the Carl D. Perkins Career and Technical Education Improvement Act of 2006. The act's passage marked the official name change of vocational education to CTE. The legislation provided funding for innovation in technical education while keeping the focus on academic and technical skill attainment. Plank, DeLuca, and Estacion (2005) concluded:

Recent federal legislation...present[s] a vision of CTE that involves not only the development of practical skills needed in the workplace but also an integration of CTE and academic subjects...[and is leading to] an erasure of the stigma often attached to vocational education (p. 1).

On July 31, 2018, President Trump signed the Strengthening Career and Technical Education for the 21st Century Act into law. This bill reauthorizes the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins) and will be referred to as Perkins V. The reauthorization provides an opportunity to support and expand state and district efforts to address CTE teacher shortages (ACTE Policy Watch, 2017). In a report from Advance CTE (2018) the reauthorization is described as:

Dedicated to increasing learner access to high-quality Career Technical Education (CTE) programs of study. With a focus on systems alignment and program improvement, Perkins is critical to ensuring that programs are prepared to meet the ever-changing needs of learners and employers. Perkins reflects the 100-year federal commitment to CTE by providing federal support for CTE programs and focuses on improving the academic and

technical achievement of CTE students, strengthening the connections between secondary and postsecondary education and improving accountability (p. 1).

Perkins V maintains the current legislative levels federal to state funding allocations. The reauthorization allows for funding to be spent on career exploration programs at the middle school level and on all students, including those not in CTE. To receive full funding, states must have a plan to support, recruit, and retain CTE teachers, faculty, and administrators. The plan must include professional development that provides the knowledge and skills needed to work with and improve instruction for special populations (Advance CTE, 2018). Perkins V updates and expands coverage of special populations to include homeless individuals, foster students and those who have aged out of foster care, and students with an active duty parent. Similarly, Perkins V increases funding for students in state correctional systems and increases the amount states may set aside to focus on rural areas, areas with high concentrations of CTE programs, or areas with performance caps. The reauthorization of Perkins solidifies the lasting impact and continued involvement the federal government has in CTE.

CTE Teacher Shortage

As education has shifted focus to accountability, the demand for quality CTE teachers has increased. In 2002, the NCLB legislation made an effort to improve student achievement through increased accountability (Fletcher et al., 2015). A highly qualified teacher, as defined by NCLB, has a bachelor's degree and subject knowledge as evidenced by the passage of a standardized test (Fletcher et al., 2015). These requirements become problematic for CTE, specifically for those who are alternatively certified.

More than 20 years after *What Matters Most: Teaching for America's Future*, the nation still faces many of the same challenges (Berry & Shields, 2017). Berry and Shields (2017)

indicate the teacher shortages of today are as becoming a serious problem. Since 2015, media reports of teacher shortages have appeared in nearly every U.S. state (Behrstock-Sherratt, 2016). In *Our Future, Our Teachers* (U.S. Department of Education, 2011), the U.S. Secretary of Education identified the enormous challenge to the education system as 1.6 million teachers would retire over the next decade. In the past 15 years, teacher attrition rates have grown by 50%, and teacher turnover has risen to nearly 17% across the country according to the National Commission on Teaching and America's Future (NCTAF) (Barnes, Crowe, & Schaffer, 2007). Teacher turnover follows a U-shaped curve, with younger teachers and retiring teachers leaving at very high rates (Ingersoll, 2001). Ingersoll (2001) detailed that, early in the 1980s, studies were reporting the coming teacher shortage due to increased student enrollment and the aging of the teaching workforce. The U.S. Department of Education's 2016-2017 TSA report listed the existence of teacher shortages in each of the 50 states and territories, with both cities and rural areas being heavily impacted. Career and technical education has been hit particularly hard by teacher shortages. In the 2016 TSA report, 31 states and the District of Columbia reported a shortage in at least one area of CTE. Despite the shortage, traditional preservice CTE teacher preparation programs have decreased (ACTE, 2017). The most substantial teacher shortages are aligned with the US Bureau of Statistics fastest growing careers. Information technology comprises 5 of the 20 fastest growing careers and health services 7 of 20 fastest growing. In a survey, 81% reported a shortage in manufacturing, 73% information technology, and 71% of health sciences (ACTE, 2015). Additionally, there is growth in CTE-related fields within the hospitality industry (U.S. Department of Labor Statistics, 2014). According to Barron, P., Maxwell, G., Broadbridge, A., & Ogden, S. (2007), there is a discrepancy between the demand

for hospitality workers and worker supply along with a shortage of CTE teachers to train workers.

Across the country, states have continually documented CTE teacher shortages. Michigan recently passed legislation reducing requirements for CTE teachers to attract more teachers. The Virginia State Department of Education has cited CTE teacher shortage as critical since 2003. Throughout the country, reports of skilled worker shortages are in the headlines. Kane (2009) noted that CTE teacher shortage has a negative impact on future economic growth.

Most states have actively engaged in addressing the critical CTE teacher shortage. Unique programs have been designed and vary by state and the regional needs. New York State, for example, has been active in addressing the CTE teacher shortage in a variety of ways since the 1980s. Texas and Minnesota are among states that have authorized college loan repayment incentives in an effort to recruit teachers. Most states are utilizing alternative certification programs that work to recruit career changers as a way to gain high-quality teachers (Reese, 2010). Governments officials have taken notice of the critical CTE teacher shortage as well.

Senators recently introduced a bipartisan bill, the Creating Quality Technical Education Act, to add funding to support prospective CTE educators (ACTE Policy Watch, 2018). The bill targets midcareer professionals in related technical fields, recent college grads, veterans, and currently licensed teachers with a desire to transition to CTE. This bill will add to the already robust alternative certification programming adopted as a remedy to teacher shortage throughout the country. Officials in Minnesota established the Minnesota Teacher Shortage Student Loan Repayment Program is to assist with student loan repayment in teacher shortage areas. The program addresses licensure field, regional and high demand licensure areas within the state. In Ohio and Michigan, schools are partnering with community colleges to offer CTE courses

(Advance CTE, 2017). These partnerships allow students to receive technical training for high school and college credit. The CTE programs in many states include work-based internship opportunities that allow students to receive on-the-job training. In schools across the country, unique strategies are being employed to manage CTE teacher shortage and the wave of retirements anticipated in the coming years.

Alternative Teacher Certification/Licensure

Across the United States, traditional teacher education programs are mostly comparable. These comparisons do not appear between alternative licensure programs. Alternative licensure is the process for licensure used by public educators who do not hold an undergraduate degree in education from a teacher preparation program (Ruhland & Bremer, 2002). To fill in-demand teacher shortage positions, schools have had to look at routes other than traditional teacher education (Ingersoll, 2003). Licensing agencies across the United States commonly define any licensure path that does not follow traditional teacher education preparation as alternative. This vague definition accounts for the broad variety of pathways from state to state. Requirements range from little or no classroom experience to master's level coursework in pedagogy; alternative licensure often requires coursework even for individuals with undergraduate degrees in the subject to be taught (Buhland & Bremer, 2002). Not unlike traditional teacher education licensure, the alternative licensure requirements differ by state and agency (Constantine et al., 2009). Preservice classroom experience is the chief difference between traditional and alternative licensure. Many alternative licensure preservice teachers gain instructional experience through fieldwork or as part of a full-time teaching position (Birkeland & Peske, 2004). Unlike their traditionally licensed counterparts, alternatively licensed teachers often are hired into full-time teaching positions and build classroom experience on the job (Constantine et al., 2009).

Emerging to address the growing teacher shortages, alternative teacher certification developed in the early 1980s. Teacher retirement, new teacher attrition, student enrollment growth, and modest teaching salaries are some factors that contribute to teacher shortage (Aragon, 2016). To meet these shortage demands expediently, alternative certification pathways were created. Rosenberg and Sindelar (2005) noted years of shortages coupled with the limited output from higher education teacher preparation programs spawned the increase of alternative programs to attract promising individuals from varying professions.

Alternative certification/licensure has its roots in vocational education and the Smith-Hughes Act of 1917 (Ruhland & Bremer, 2002). New Jersey is commonly credited with the first alternative certification program with the 1984 creation of the Provisional Teacher Program. This program became known as the alternative round establishing the first program in the country that provided a pathway to teaching other than through traditional teacher preparation (Klagholz, 2004). This program granted school administrators the authority to hire college graduates who did not study education. Since their inception, the number of alternative certification pathways has dramatically increased. In 1982, just eight states offered alternative certification/licensure; by 2008, this number rose to include all 50 states (National Center for Educational Information, 2003, 2010). The National Center of Education Statistics reported in 2005 that approximately 56% of nontraditional teachers enter the teaching field less than five years after college graduation. Between 1985 and 2009, an estimated 430,000 people were certified to teach through alternative routes (Feistritzer, 2009). By 2015, over 63,000 candidates were enrolled in programs providing alternative pathways to certification (U.S. Department of Education, 2011). That high percentage indicates the growing impact of alternative teacher certification across the United States.

These alternative teacher certification routes gained momentum and attention for numerous reasons including accessibility to the teaching workforce for nontraditional candidates, attracting teachers to underserved geographical areas, recruiting teachers for challenging-to-fill content areas such as math and science, and attracting high potential individuals who might otherwise pursue different careers (Darling-Hammond & Cobb, 1996; Feistritzer & Chester, 1998; Turley & Nakai, 2000).

Every state offers alternative certification in one form or another. The programs vary significantly by state. The variation makes it difficult to compare; what one state classifies as an alternative might look like a traditional program in another state. Nevertheless, commonality does exist across most alternative certification programs. Generically, alternative certification programs seek to provide a fast track into the teaching profession while still giving quality preparation. Alternative pathways look to expand and diversify the potential teacher pool. Typically, the programs are designed to recruit teachers in areas of critical shortages and fill hard-to-staff regions and schools. The programs also look to recruit specific subject areas by targeting midcareer professionals looking to transition into the teaching profession.

Woods (2016) defines alternative programs as being for individuals who have earned a bachelor's degree and wish to bypass the time and expense of completing a traditional teaching degree or undertaking a graduate program. Alternative certification can be offered through colleges, universities, nonprofit organizations, for-profit organizations, or school districts (Woods, 2016). Many alternative routes look like and have similar requirements as traditional routes. The difference comes with the focus on a career change and adding classroom skills. Woods (2016) reports that, while completing the required coursework, alternative pathway

participants often begin working in the classroom from the beginning rather than in the final semesters, as in traditional pathways.

According to Bartlett (2002), licensure involves an official recognition by a state agency that a person meets state-mandated requirements. Certification recognizes the possession of qualifications beyond just basic licensing requirements, with said certification being granted by a nongovernmental agency or association. What has evolved in most states is a symbiotic relationship between certification-granting agencies (e.g., colleges and universities) and state government agencies (e.g., State Department of Education). One cannot get licensed to teach without certification, and one cannot get certified except through a certification-granting agency's approved method or institution. Some have referred to this situation as a de facto monopoly on education and certification (Heinen & Scribner; 2007; Hess, Rotherham, & Walsh, 2004).

Across states, alternative routes to teacher certification pathways have numerous variations. The 50 states and the District of Columbia reported 122 alternative routes to teacher certification pathways in 2016. Each alternative teacher certification has its standards, but each path has comparable established guidelines. Roth and Swail (2000) summarized:

Despite the differences, most authorities agree that teacher candidates should:

1. Have at least a bachelor's degree; some states require a fifth year or master's degree;
2. Complete an approved, accredited education program;
3. Have a major or minor in education (for elementary education);
4. Have a major in the subject area in which they plan to teach (for middle or high school teaching);
5. Have a strong liberal arts foundation;

6. Pass either a state test, the widely used PRAXIS exam, or another exam (p. 9).

With the growth in popularity of alternative certification, a substantial number of adults who meet the requirements are selecting alternative routes for certification. To ensure high-quality teachers while still meeting demand, some alternative pathways are becoming more stringent.

The Education Commission of the States suggests that the following features are essential to successful alternative programs: (a) strong partnerships between preparation programs and school districts, (b) superior participant screening and selection processes, (c) strong supervision and mentoring, (d) curricula that include coursework in the classroom basics and teaching methods, and (e) field experiences and coursework prior to full-time teaching (p. 175).

According to Suell and Piotrowski (2007), although alternative education programs may be different in structure and content, the majority of programs mandate some form of training, coursework, mentoring, and exams. Supporters of alternative pathways argue that the deregulation of teacher licensure will eliminate teacher shortages and increase teacher quality (Behrstock-Sherratt, 2016).

Many states offer certification pathways for CTE teachers coming from industry. The work experience of the industry professional is used to waive some educational requirements of traditional routes. Alternative pathways typically still require preservice teaching training through professional development or coursework. This helps to ensure classroom effectiveness through gained instructional and pedagogical skills in addition to industry skills (Advance CTE, 2017). States vary on when instruction training occurs. According to Advance CTE (2017), some states allow training to occur simultaneously with teaching experience in the classroom while others require applicants to receive training preservice. In Alabama, the CTE Teacher

Certification Program supports teachers who have been licensed through alternative routes. During the first year of service, the teacher receives 196 hours of training that covers pedagogy and classroom management and provides mentorship from skilled veteran teachers (Advance CTE, 2017). Completing the 196 hours and meeting other minimum Alabama requirements can qualify individuals for a five-year Bachelor's Equivalent Technical Education license. In Arizona, the Department of Education has worked to develop alternative certification through a partnership with the Arizona Association for Career and Technical Education. The partnership produced a 15-course skilled development program known as the Premier Program Series (Advance CTE, 2017). The series, which provides high-quality coaching and tutorial practices, has helped to enhance the standard and effectiveness of trade specialists receiving various certification. Not all states need induction and mentorship programs for new teachers, and in many states, the responsibility to produce such coaching generally lies with native districts and faculty boards (Advance CTE, 2017). These different approaches to and requirements for alternative licensure are all devised to meet the demand for CTE teachers in areas of critical need and to provide high-quality pre-service teacher training.

Work Experience

The Thomas B Fordham Foundation released a report that criticized teacher education requirements (Kwiatkowski, 1999). The report stated that outstanding teacher candidates are often discouraged by licensure requirements that require extra time and money and that “the best and the brightest of young Americans have other career options and will pursue them if the costs of becoming a teacher are too high” (Kwiatkowski, 1999, p. 7). Many educational leaders feel alternative pathways entice academically competent individuals who would not otherwise enter the profession into teaching (Barnes et al., 2007). Alternatively, licensed teachers tend to be

older, have academic degrees in fields other than education, and have experiences in other occupations (Feistritz & Chester, 1998). Individuals who seek alternative teacher licensure have valuable skills, come from minority groups, are more mature, and often are male (Stoddart & Floden, 1995). Many CTE teachers are hired primarily for their years of experience and specialization in their profession. In South Dakota, prospective teachers with an associate's degree and at least 4,000 hours of related work experience can obtain a two-year license; additionally, holding a nationally recognized industry credential can qualify individuals for a CTE license (Advance CTE, 2017). According to Advance CTE (2017), South Dakota alternatively licensed CTE teachers join a mentorship program, receive professional development, and are involved in professional learning communities.

In effect, then, vocational and technical education has always had a nontraditional or alternative approach to prepare and certify its teachers (Lynch, 1996). Demonstration and verification of occupational competence and experience are proof of the teacher's mastery of the subject matter to be taught (Lynch, 1998). Teachers in trade and industrial education and health fields were typically certified based on their occupational experience and were required to complete a minimum number of course hours in pedagogy (Ruhland & Bremer, 2002). Many vocational teachers are not subject to the same teacher licensure and teacher preparation requirements as a traditional academic teacher through the history of CTE federal funding (Lynch, 1996). Allen (2003) reviewed 92 studies conducted on teacher preparation for the Education Commission of the States and found little evidence that pedagogy training contributed significantly to effective teaching particularly in subject-specific courses.

Academic Degree

Some states allow teachers to gain licensure in public schools with only a high school diploma or its equivalent and extensive work experience in their respective fields (Lynch, 1996). Teacher certification requirements vary across the United States, as do license types. Nationally, there are professional licenses, provisional licenses, supplemental licenses, alternative certifications, and other licenses that bear similar names (Esch & Shields, 2002). No two states have the same requirements for teacher licensure. Generally, a standard teaching certificate asserts the following: (a) that the teacher graduated from a state-approved undergraduate or graduate educational program consisting of 18-40 education credits; (b) that the teacher completed 8-18 weeks of student teaching; and (c) that the teacher took and passed an exam covering teaching knowledge, subject matter knowledge, and/or basic skills (Darling-Hammond, 2002). In situations in which teacher candidates have not met traditional teaching certification requirements, states can opt to issue temporary, emergency, or provisional licenses to potential teachers.

Teacher Testing

Until 1998, teacher licensure examinations were not mandated by all states (Stotsky, 2007). When the Higher Education Act was reauthorized in 1998, a component of Title II was the requirement for each state to provide a teacher licensure examination (Van Namen, 2013). Currently, teacher certification in most states requires two academic proficiencies. The first examination, typically required for admission to the teacher education program, addresses essential reading, writing, and math skills. The second tests content knowledge for specific subject areas and grade levels and is given as part of the state licensure requirements (Van Namen, 2013). Teacher preparation programs vary with each state with regard to when

candidates are required to pass the examinations (Stotsky, 2007). Many examinations exist from state to state to measure specific grade-level and content knowledge. Some states develop their own assessments; however, many use the Educational Testing Service's (ETS) Praxis series. States are required each year to report pass rates on licensure examinations for each teacher preparation program (Stotsky, 2007). Teacher licensure candidates can generally take the prescribed examinations as many times as needed to earn a passing score (Boyd, Goldhaber, Lankford, & Wyckoff, 2009; Stotsky, 2007).

Teacher licensure candidates who cannot earn a passing score on the examinations will not be granted teacher licensure and will be unable to become teaching professionals. Pass or fail scores are reported to test-takers; those candidates who do not earn a passing score have to retake the licensure examination until they pass to receive teacher licensure (Stotsky, 2007). Since the passage of NCLB, much attention has been given to identifying if preservice teachers have the knowledge and skills to become professional educators. Licensure examinations have become the most common measurement of teacher credentialing across the U.S. (Van Namen, 2013).

The Praxis, the most used licensure examination series, was developed by ETS to measure the knowledge and skill needed to enter teaching (Van Namen, 2013). The Praxis is also used as a filter to exclude those prospective educators who lack the required knowledge and skill and would be inadequate educators (Boyd et al., 2007; Goldhaber, 2007). Stotsky (2007) states that teacher licensure/certification is to "provide some measure of quality control and consumer protection at the individual level" (p. 3) and to guard those who will be educated. Preservice teacher licensure examinations are not designed to measure achievement, intelligence, or ability. Licensure candidates must meet the set score to pass the examination regardless of the examination and testing service (Van Namen, 2013). States using ETS and National Evaluation

System (NES) examinations have a range of different cutoff scores (Boyd et al., 2007; Stotsky, 2007). Those states who use the American Board for Certification Teacher Excellence (ABCTE) are required to follow the preestablished cutoff score (Van Namen, 2013).

Most states have some mandated testing requirement for alternative teacher licensure. Most common is the ETS Praxis series. To test basic skills and gain entry into the alternative education program many states utilize Praxis I. Subject area is tested in the appropriate areas and level using Praxis II. These tests are the same state-mandated ETS Praxis series tests that their traditionally licensed colleagues are required to pass before becoming licensed.

Program Length

Originally, alternative certification programs were developed as a short-term fix for teacher shortages (Stoddart & Floden, 1995). As alternative certification became more popular, it increasingly focused on content area mastery and on-the-job training, which, contrasts with traditional programs that stress pedagogical knowledge and preservice classroom training (Stoddart & Floden, 1995). Now a mainstay of educational preparation, Stoddart and Floden (1995) suggest that alternative licensure programs are not intended to replace traditional university-based teacher education programs. They write, “The choice between a traditional program and an alternate route is not a choice between some professional preparation and no preparation” (Stoddart & Floden, pp. 7-8). The traditional and alternative teacher preparation programs differ on instructional timing, context, and the acquired mix of professional knowledge and skill (Stoddart & Floden, 1995). States are able to have both programs through legislated agreements, which detail program implementation (Ludlow & Wienke, 1994). Wilson, Floden, and Ferrini-Mundi (2001) looked at the characteristics of high-quality alternative certification programs and found that such programs were good at recruiting diverse teachers who go on to

teach in urban settings. Kwiatkowski (1999) asserted that alternative programs have four goals: (1) increase applicants in high-demand STEM areas, (2) increase the number of participants of under-represented teachers, (3) increase staffing levels of hard-to-staff urban schools, and (4) decrease the need for emergency credentialing to counter teacher shortages (p. 216).

Alternative teacher certification programs vary in length of program, delivery mode, and candidate population (Rosenberg & Sindelar, 2005). Nearly half of alternative teacher certification programs are administered by a college or university (Feistritzer, 2009). Six percent of programs are administered by community colleges in partnership with school districts, regional service centers, and school administration providing 25% of alternative programs (Feistritzer et al., 2009). State agencies administer about 6%; various consortia, 4%; and “other” groups and organizations about 14%. The “other” category includes mostly collaborations and a handful of private companies and online providers (Feistritzer et al., 2009).

Typically requiring a reduced number of courses, alternative certification pathways often include a rigorous summer program. Generally, alternative certification students must accrue a set number of observation hours before they enter the classroom. According to Walsh and Jacobs (2007), about a third of alternative programs require new teachers to complete the equivalent of a master’s degree (30 hours), with many others requiring nearly as much coursework. Some programs only require a few weeks of preparation before teachers can enter the classroom (Nadler & Peterson, 2009).

According to Title II Higher Education Act (2015), states reported 499,800 individuals enrolled in teacher programs during 2012-2013. Eighty-nine percent (447,116) were enrolled in traditional teacher preparation programs, while 11% (52,684) of teaching candidates were enrolled in alternative preparation programs.

It is a challenge to compare alternative programs due to the variety in their structure by state and region (Boyd et al., 2007; Nadler & Peterson, 2009). In 2014, states reported a total of 673 alternative teacher preparation providers offering 8,075 unique programs; these programs accounted for 30% of the 26,589 teacher preparation programs across the country. The five states that reported the highest number of individuals enrolled in teacher programs were New York, Arizona, Texas, Pennsylvania, and Ohio.

Summary

Career and technical education has changed significantly since the days of manual training and the practical arts. The continued support and funding has created CTE pathways that engage many students and increase high school graduation rates and post-secondary success (National Center for Educational Information, 2010). Smith-Hughes laid that foundation and Carl D. Perkins now plays a crucial role in accountability and funding for CTE programs. Career and technical education gives students 21st-century skills and career-specific course training needed to gain industry credentials upon graduation.

In a report prepared for the U.S. Department of Education on teacher preparation research (Wilson et al., 2001), the most commonly cited reasons for instituting alternative certification programs include the national teacher shortage, a need to attract nontraditional teacher candidates, a desire to increase ethnic diversity in the teaching pool, and a need for staff at urban and rural schools (Wilson et al., 2001). At this time, no state has abandoned its traditional teacher certification programs. According to the National Center for Alternative Certification (2012), New Jersey, California, and Texas were pioneers in alternative teacher certification, and 40% of new hires in New Jersey and one-third of new hires in Texas and California come through alternative licensure routes (NCFAC, 2012). With the demand for highly qualified teachers far

greater than the supply, the increase of alternative certification pathways is critical to CTE's continued success. The ability for experienced professionals to gain alternative teacher certification is invaluable to CTE students who have a passion for their chosen skill.

CHAPTER THREE: METHODS

Overview

The purpose of this predictive correlational study was to examine the relationship between CTE certification/license requirements and CTE teacher shortages for the school year 2016-2017 throughout the United States. Archival data from each of the 50 U.S. states and the District of Columbia was used. Chapter Three includes information about the design of the study, instrumentation, participants, the setting of the study, procedures used to collect the data, and the research questions. The analysis and data collection procedures are also addressed.

Design

In this study, a predictive correlational design was used to predict CTE teacher shortage based on CTE certification/licensure requirements using archival data from all 50 U.S. states and the District of Columbia. The predictor variables included academic degree needed, work experience, mandatory testing, and program length. Correlational research designs analyze the relationships between multiple variables individually and in combination (Gall, Gall, & Borg, 2007). The predictive correlational design was used to determine to what extent a criterion behavior pattern can be predicted (Gall et al., 2007). The design was appropriate for this study because it sought to determine CTE teacher shortage based on academic degree, work experience, mandated testing, and program length.

The first predictor variable was the academic degree requirement for alternative CTE certification/licensure for each state. This variable was nominal and was recorded using the data collection sheet. The variable was coded as “0,” “1,” “2,” “3” and “4” for high school diploma, associate’s degree, bachelor’s degree, master’s degree, and other, respectively.

The second predictor variable was the work experience requirement for alternative CTE certification/licensure in each state. The work experience requirement is the amount of time a person works in their profession and specialization. This variable was nominal and was recorded using the data collection sheet. The variable was coded as “0”, ”1”, ”2” and ”3” for 0-500 hours, 501-3000 hours, 3001-5000 hours, and more than 5001 hours, respectively.

The third predictor variable was mandatory testing required for alternative CTE certification/licensure in each state. These tests are the state-mandated licensure exams that candidates are required to pass. Many states use the ETS Praxis series test. This variable is dichotomous (required or not required) and was recorded based on the data collection sheet. This variable was coded as “0”, testing not required and “1”, testing required.

The fourth predictor variable was program length. This is nominal and was determined based on data collection sheet for each state. Program length is the number of credits required for the alternative license. Typically, alternative programs require a reduced number of courses. Many states require the equivalent of a master’s degree (30 hours) with some states requiring much more or less coursework. This variable was nominal and was recorded using the data collection sheet. The variable was coded as “0”, “1”, “2”, and “3” for fewer than 9 credit hours, 10-18 credit hours, 19-30 credit hours, and more than 31 credit hours, respectively.

Research Question

RQ1: Can alternative CTE certification/licensure requirements predict CTE teacher shortages for the school year 2016-2017 throughout the United States?

Null Hypothesis

H₀1: There is no statistically significant relationship between the criterion variable (CTE teacher shortage) and the combination of predictor variables comprised of alternative CTE

certification/licensure requirements (academic degree, work experience, mandatory testing, program length or aggregate of factors) for the school year 2016-2017 throughout the United States.

Participants and Setting

Archival data from all 50 states and the District of Columbia were used in this study. Territories of the U.S. were not included. Archival data used for this study came from various sources including the TSA Nationwide Listing for 2016-2017 and each state's department of education or certification/licensure agency. All 50 states and the District of Columbia have at least one alternative pathway for alternative certification/licensure. Many states have multiple options. In total, there are more than 100 alternative certification/licensure pathway options throughout the U.S. Within these options, there are many variables including academic degree, work experience, mandatory testing, and program length.

Among the 50 states and the District of Columbia, 32 have identified a teacher shortage in CTE. Teacher shortage data was drawn from the U.S. Department of Education's TSA list for 2016-2017. Requirements for alternative certification/licensure was examined through each state's department of education or appropriate awarding agency. Technology Education (TE) shortage was included in this study because many states TE certification/licensure is granted under CTE.

Archival data used for this study came from the TSA Nationwide Listing for 2016-2017, a study conducted by the U.S. Department of Education Office of Postsecondary Education. The TSA for the school year 2016-2017 is the most recent in a series of reports on teacher shortage conducted by the U.S. Department of Education Office of Postsecondary Education. The TSA examines teacher shortage areas by state. See Appendix D for the 50 states' shortage and non-

shortage areas. Reporting of teacher shortage areas for each state is essential for federal funding and required by law to be identified. The TSA, although not an employment directory, is a resource for teaching professionals searching for potential job opportunities. States found to have a CTE teacher shortage were assigned a dummy code of “1” on the data collection sheet. States that did not have a CTE teacher shortage as identified in TSA were assigned a dummy code of “0” on the data collection sheet.

For this study, alternative certification/licensure requirements were examined for all 50 states and the District of Columbia using archival data used from each state’s Department of Education or certification/licensure agency. The study looked at each state’s alternative certification/licensure requirements for the academic degree, work experience, mandatory testing, and program length. These requirements were chosen for their frequency among states and likelihood as a predictor. See Appendix D for a list of requirements for each state.

Instrumentation

This study examined the relationship between CTE teacher shortage and CTE certification/licensure requirements. Data was collected from two sources. The first source was each state’s alternative CTE teacher certification/licensure requirements used to measure the predictor variables (academic degree, work experience, mandatory testing, and program length). This data was obtained by an exhaustive search of each state’s Department of Education or certification/licensure agency website (see Appendix D state list). The study used a data collection sheet for each state. The collection sheet can be found in Figure 1.

Data Collection Sheet	
State:	

State Website:					
CTE Supervisor:		Phone:			Email:
Pathway:					
State CTE Shortage:	Yes (1)	No (0)			
Academic Degree Requirement:	HS (0)	Associate (1)	Bachelors (2)	Masters (3)	Other (4)
Work Experience:	0-500 hrs (0)	501-3000 hrs (1)	3001 -5000 hrs (2)	>5001 hrs (3)	
Mandatory Testing:	Required (1)	Not Required (0)			
Program Length:	< 9 credits (0)	10-18 credits (1)	19-30 credits (2)	>31 credits (3)	

Figure 1. Data Collection Sheet.

The data collection sheet was utilized to record information in an organized manner. The data collection sheet was adapted from the 2007 Study of State Certification/Licensure Requirements for Secondary CTE Teachers (Zirkle et al., 2007). The 2007 Study of State Certification/Licensure Requirements for Secondary CTE Teachers was conducted under a \$2.4 million dollar grant funded by the U.S. Department of Education Office of Vocational and Adult Education to the National Research Center for Career and Technical Education; the study examined CTE certification/licensure pathways across the 50 states and the District of Columbia (Zirkle et al., 2007). Historically, many CTE areas have had two pathways: a traditional, degree-awarding teacher preparation program and an alternative pathway based primarily on work experience; both pathways often include exams and field experience. The 2007 Study of State

Certification/Licensure Requirements for Secondary CTE Teachers study was done “for the purposes of comparison, potential state certification/licensure updates, program revision, and perhaps policy changes” and the study “examined the state-by-state requirements for all CTE fields in both pathways” (Zirkle et al., 2007, p. 1). Zirkle et al. (2007) looked at requirements for CTE teacher certification/licensure including education requirements (academic and technical preparation), work experience, degree requirements, teacher preparation program completion, and entry and exit tests (such as the Praxis assessments). The 2007 study had implications for both teacher preparation policy and research highlighting the Carl D. Perkins Career and Technical Education Improvement Act of 2006, the need for recruitment and retention of CTE teachers, and the integration of applied and academic learning into CTE curriculum (Zirkle et al., 2007). The second data source was the 2016-2017 TSA Nationwide Listing (U.S. Department of Education Office of Postsecondary Education, 2017), a U.S. Department of Education nationwide report required by federal educational funding regulations. This listing provided information to measure the criterion variable as either CTE teacher shortage or no CTE teacher shortage.

Procedures

Before conducting this study, the researcher obtained approval from the Institutional Review Board (IRB) at Liberty University (see Appendix C for the approval letter). Then, alternative CTE teacher certification/licensure requirements data were collected through an exhaustive search of states’ Department of Education or certification/licensure agency websites (see Appendix D). The researcher searched and read each website for related information on CTE alternative certification/licensure requirements. Relevant information found on the websites was stored digitally. As data was obtained, the researcher entered it on the data collection sheet

under appropriate categories, including academic degree, work experience, testing, and program length (see Appendix A for the data collection sheet). Each state had an individual data collection sheet.

The researcher compiled data for the first predictor variable, which categorized the academic degree requirements for alternative CTE certification/licensure for each state. This variable was nominal and was found through the state's Department of Education or certification/licensure agency website. The variable was assigned dummy codes of "0," "1," "2," "3" and "4" for high school diploma, associate's degree, bachelor's degree, master's degree, and other, respectively.

The researcher collected data for the second predictor variable, which measured the work experience requirement for alternative CTE certification/licensure in each state. This variable was nominal and was found through the states' Department of Education or certification/licensure agency website. The variable was assigned a dummy code on the data collection sheet of "0", "1", "2", or "3", representing 0-500 hours, 501-3000 hours, 3001-5000 hours, or more than 5001 hours, respectively.

Data for the third predictor variable, testing required for alternative CTE certification/licensure, was collected by the researcher for each state. This variable is dichotomous (required or not required) and was found through the states' Department of Education or certification/licensure agency website. This variable was assigned a dummy code of "0" for not required and "1" for required on the data collection sheet.

The researcher compiled data for the fourth predictor variable, program length. This is nominal and was determined based on data collection sheet for each state. This variable was nominal and was found through the states' Department of Education or certification/licensure

agency website. The variable was assigned dummy codes on the data collection sheet of “0”, “1”, “2”, and “3” for fewer than 9 credit hours, 10-18 credit hours, 19-30 credit hours, and more than 31 credit hours, respectively.

The criterion variable, CTE teacher shortage, was defined dichotomously as either “CTE teacher shortage” or “no CTE teacher shortage” and coded with “0” for no CTE teacher shortage and “1” for CTE teacher shortage. Teacher shortage area calculations for this study are based on unduplicated full-time equivalent (FTE) teaching positions in each state as found in TSA. Shortage area FTEs are unfilled teaching positions, positions filled by emergency certification, and positions filled by certified teachers not teaching in their licensed subject area. The data needed for CTE teacher shortage was obtained using the TSA Nationwide Listing for 2016-2017. Each state was extensively reviewed for reported shortages in CTE and TE. Certification/licensure for TE falls under CTE in many states, which made its inclusion vital. If the state reported a teacher shortage in the area of CTE or TE, then the researcher entered a dummy variable of 0 = not shortage and 1 = shortage of data collection sheet for each state. The researcher found 31 states and the District of Columbia had a teacher shortage listed for the 2016-2017.

Data Analysis

Descriptive statistics for each predictor variable and the criterion variable were calculated. Included in the descriptive statistics was a frequency count for each category. Logistic regression analysis was used to test the null hypothesis. Gall et al. (2007) state that logistic regression is used for “determining the correlation between a dichotomous criterion variable and a set of predictor variables” (p. 354). Because the criterion variable, CTE teacher shortage, was dichotomous, the logistic regression analysis was appropriate.

The data analysis examined if the predictor variables (academic degree requirement, work experience requirement, mandatory testing, and program length) can determine a proclivity toward state CTE teacher shortage. The strength of the model was measured using Cox and Snell's and Nagelkerke's statistics. A Wald ratio was reported for the logistic regression model at the 95% confidence interval. Logistic regression requires two assumptions be met. They are that each cell must have a frequency count of at least five and that the criterion variable should have a 50/50 split. Odds ratios were calculated to determine the chance each predictor variable had of predicting CTE teacher shortage.

CHAPTER FOUR: FINDINGS

Overview

This chapter will discuss descriptive statistics, data screening procedures, and logistic regression analysis assumptions. The results for the null hypothesis will be presented, including the logistic regression results and the Wald's statistic for each predictor variable of academic degree needed, work experience required, mandated testing, and program length.

Research Question

RQ1: Can alternative CTE certification/licensure requirements predict CTE teacher shortages for the school year 2016-2017 throughout the United States?

Null Hypothesis

H₀1: There is no statistically significant relationship between the criterion variable (CTE teacher shortage) and the combination of predictor variables for alternative CTE certification/licensure requirements (academic degree, work experience, mandatory testing, and program length) for the school year 2016-2017 throughout the United States.

Descriptive Statistics

Data for the criterion variable, Career and Technical Education (CTE) teacher shortage was analyzed and the results can be viewed in Table 1. Data for all 50 states and the District of Columbia was included in the sample. The information sheets for each state and the District of Columbia, including contact information, researched pathway, researcher comments, and data collected, can be viewed in Appendix D. There were 32 states with a CTE teacher shortage and 19 states with no CTE teacher shortage for the 2016-2017 school year. There were 29 states requiring a high school diploma, eight states requiring an associate's degree, four requiring a bachelor's degree, no states requiring a master's degree, and 10 requiring "other" in the sample.

There were seven states requiring fewer than 500 hours of work experience, five states with 501-3000 hours, 12 states requiring 3001-5000 hours, and 28 states that required more than 5001 hours of work experience. There were 32 states that required mandatory testing, and 19 states that did not require testing. There were 20 states with fewer than 9 program hours required, 19 states with 10-18 hours, seven states with 19-30 hours, and five states that required more than 31 program hours.

In the CTE teacher shortage group, there were 32 states included in the sample. Within the CTE teacher shortage group, there were 19 states requiring high school diploma, four states requiring an associate's degree, two states requiring a bachelor's degree, no states requiring a master's degree, and seven states requiring "other". The "other" category includes states that did not specify a high school diploma or GED requirement. There were five states requiring less than 500 hours of work experience, no states requiring 501-3000 hours, eight states requiring 3001-5000 hours, and 19 states requiring 5001 or more hours of work experiences. There were 20 states requiring testing, and 12 states that do not have mandatory testing. There were 13 states requiring 9 or fewer program hours, 12 states that required 10-18 program hours, three states require 19-30 program hours, and four states require 31 or more program hours.

In the no CTE teacher shortage group, there were 19 states included in the sample. Within the no CTE teacher shortage group, there were 10 states requiring a high school diploma, four states requiring an associate's degree, two states requiring a bachelor's degree, no states requiring a master's degree, and three states requiring "other". The category "other" includes states that did not specify a high school diploma or GED requirement. There were two states requiring fewer than 500 hours of work experience, four states requiring 501-3000 hours, four states requiring 3001-5000 hours, and nine states requiring more than 5001 hours of work experience. There were 12 states requiring testing, and seven states that did not require testing.

There were seven states requiring fewer than 9 program hours, seven states requiring 10-18 program hours, four states requiring 19-30 program hours, and one state requiring 31 or more program hours.

Table 1

Frequencies for Predictor Variables for CTE Teacher Shortage

Predictor Variable	Shortage (<i>n</i> = 32)	No Shortage (<i>n</i> = 19)
Academic degree		
Other	7	3
High School	19	10
Associates	4	4
Bachelors	2	2
Masters	0	0
Work Experience		
0-500 hours	5	2
501-3000 hours	0	4
3001-5000 hours	8	4
>5001 hours	19	9
Mandatory Testing		
Not required	12	7
Required	20	12
Program length		
<9 hours	13	7
10-18 hours	12	7
19-30 hours	3	4
>31 hours	4	1

Results

Data Screening

The researcher conducted data screening on each of the predictor variables (academic degree, work experience, mandatory testing, program length) by sorting each variable and examining for inconsistencies. The researcher did not identify any data errors resulting in a sample size of 51.

Assumptions

A binary logistic regression has four assumptions (Warner, 2008). First, the criterion variable must be dichotomous; in this study, CTE teacher shortage is the criterion variable, which is dichotomous with the two options being CTE teacher shortage or no CTE teacher shortage. Second, predictor variables must be free of multicollinearity. Each of the predictor variables (academic degree, work experience, mandatory testing, and program length) are categorical; thus multicollinearity could not be determined, making this assumption not applicable to the study. Third, according to Warner (2008), the logistic regression model must be specified to include all relevant variables and no extraneous variables. The researcher chose the predictor variables of academic degree, work experience, mandatory testing and program length after an extensive literature review. Based on the research literature review, the selected predictor variables were determined to be relevant, and no relevant variables were added to the model. The fourth assumption is that outcome variable categories are exhaustive and mutually exclusive (Warner, 2008). Each state either had a CTE teacher shortage or no CTE teacher shortage; no state was both. Because each state had either a CTE teacher shortage or no CTE teacher shortage, it was impossible for a state to be considered in both. This study met all the required assumptions as stated by Warner (2008).

Also noted by Warner (2008), binary logistic regressions containing expected frequencies of less than five do not perform well. It should be noted that, in this study, there were 15 groups with less than the recommended frequency of five. These categories included the academic degree requirement categories of associate's degree, bachelor's degree, master's degree, and other for no CTE teacher shortage. For work experience, the groups with less five frequencies included 501-3000 for CTE shortage and, for no CTE teacher shortage, 0-500 hours and 3001-5000. Under program length, two categories contained less than five frequencies;

these were 19-30 hours and >31 hours for both CTE shortage and no CTE teacher shortage groups. Additional recommendations were taken from Vittinghoff and McCulloch (2006) who report that groups with low frequencies are acceptable provided that the model is stable; they recommend that frequency count assumptions for predictor variables can be relaxed in a logistic regression analysis. For this study, the model was found to be stable, and the low-frequency categories remained in the model.

Results for Null Hypothesis

A binary logistic regression analysis was used to test the relationship between the predictor variables (academic degree, work experience, mandatory testing, and program length) and the criterion variable (CTE teacher shortage) at a 95% confidence level. All variables were dummy coded. Each state and the District of Columbia were coded as “0” for no CTE teacher shortage and “1” for CTE teacher shortage. An academic degree was coded as “0,” “1,” “2,” “3,” and “4,” for high school diploma, associate’s degree, bachelor’s degree, master’s degree, and “other”, respectively. Several states made no mention of a high school diploma, GED, or degree requirement and were, thus, categorized as “other” for this study. Work experience was coded as “0,” “1,” “2”, and “3,” for 0-500 hours, 501-3000 hours, 3001-5000 hours, and >5001 hours, respectively. Mandatory testing was coded as “0” for required and “1” for not required. Program length was coded as “0,” “1,” “2”, and “3,” for 9 hours or fewer, 10-18 hours, 19-30 hours, and 31 hours or more, respectively.

The results of the binary logistic regression were not statistically significant, $\chi^2(8) = 14.04, p = .61$. The model had a medium effect size according to Cox and Snell’s ($R^2 = .029$) and Nagelkerke’s ($R^2 = .039$). There was no statistically significant predictive relationship between CTE teacher shortage (CTE teacher shortage or no CTE teacher shortage) for each state and the

predictor variables (academic degree, work experience, mandatory testing, program length).

Thus, the researcher failed to reject the null hypothesis.

The researcher further investigated each predictor variable. For the variable of academic degree required, the Wald ratio was not statistically significant, $\chi^2(1) = .57, p = .45$. This result indicated that the academic degree required was not a statistically significant predictor of teacher shortage. The researcher also investigated the predictor variable of work experience required. For the variable of work experience required, the Wald ratio was not statistically significant, $\chi^2(1) = .94, p = .33$. This result indicated that work experience required was not a statistical predictor of teacher shortage. The researcher also examined mandatory testing. For the variable mandatory testing, the Wald ratio was not statistically significant, $\chi^2(1) = .16, p = .69$. This result indicates that mandatory testing was not a statistical predictor of teacher shortage. Finally, the researcher investigated program length. For the variable of program length, the Wald ratio was not statistically significant, $\chi^2(1) = .01, p = .91$. This result indicates that program length was not a statistical predictor of teacher shortage. The odds ratios for each of the predictor variables were analyzed. The odds ratios for academic degree, work experience, mandatory testing, and program length were 1.18, 1.32, 1.30, and 1.04 respectively. All the odds ratios are near a 50/50 split and were not statistically significant.

Table 2

Summary of Logistic Regression Analysis Predicting State CTE Teacher Shortage

Predictor variable	β	SE	OR	Wald statistic	p	df
Academic degree	.17	.22	1.18	.57	.45	1
Work experience	.28	.29	1.32	.94	.33	1
Mandatory testing	.27	.67	1.30	.16	.69	1

Program length	.04	.32	1.04	.01	.91	1
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Summary

Chapter Four presented an overview of the data collected, the statistical analysis conducted, and the procedures followed. Data used in the study was state CTE teacher shortage and the academic degree, work experience, mandatory, testing and program length of each state's alternative licensure requirements. The results of the binary logistic regression analysis were reported along with descriptive statistics. The statistical analysis found that the predictor variables of academic degree required, work experience required, mandatory testing, and program length were not statistically significant predictors of state CTE teacher shortage, and the researcher failed to reject the null hypothesis. In Chapter Five, these statistical findings will be discussed along with their relationship to previous research; the implications of these results will also be discussed.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of this archival, predictive correlational study was to examine the relationship of academic degree requirements, work experience requirements, mandatory testing, and program length to the CTE teacher shortage in all 50 states and the District of Columbia. Chapter Five will discuss the results of the study and its implications, including considering related research. Additionally, the limitations of the study and recommendations for future research will be addressed.

Discussion

Career and technical education is a vital part of American education and the American economy. Numerous studies have shown the rigorous academics of CTE combined with industry-based technical knowledge result in higher academic achievement and better career outcomes for a growing number of students (Wilkin & Nwoke, 2011). Despite the success of CTE, many programs face the severe challenge of attracting qualified CTE teachers.

To address this concern, alternative certification programs were developed in the 1980s to encourage people to enter the education profession (Murnane & Steele, 2007). The National Research Center for Career and Technical Education reported that several factors contribute to the shortage including increased student enrollment, traditional CTE teacher education program closures, and teacher retention concerns (Zirkle et al., 2007). Woods (2016) identifies alternative teacher certification as one way to alleviate critical CTE teacher shortages.

Alternative licensure is not without its opponents. Previous research indicates that some educators feel that alternatively licensed teachers do not have the required understanding of pedagogical theories and practices that they would have obtained in a traditional teacher education program (Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005). Since the

inception of alternative certification routes, there has been some concern over the rigor and quality standards for alternative certification routes compared to traditional routes. Research has continually shown no statistically significant difference in academic achievement between traditionally certified and alternatively certified teachers (Constantine et al., 2010). This level of achievement for alternative certification teachers has been helped by the efforts of many states that have ensured high CTE teacher standards (Constantine et al., 2010). The existence of a CTE teacher shortage is supported by studies that show teacher shortages have been of critical concern for U.S. education policymakers for decades (Murnane & Steele, 2007). The shortage has led to a dramatic increase in the use of alternative teaching licensures. Additionally, Asunda (2011) reviewed CTE teacher preparation literature from 2001-2011 finding that studies revealed very little being done to update CTE teacher preparation on a continuous basis.

In response to the shortage, the Education Office of Secondary Education conducted a survey (i.e., the TSA National Listing) to collect information regarding CTE teacher shortages for the 2016-2017 school year. The Code of Federal Regulations and the U.S. Department of Education define teacher shortage areas as “an area of specific grade, subject matter or discipline classification, or a geographic area in which the Secretary determines that there is an inadequate supply of elementary or secondary school teachers.” (CFR 34 CFR 682.210(q)(8)(vii)). The TSA Nationwide Listing is a reference document published each year with the intention to:

1. Notify the nation that States and schools may potentially hire academic administrators, licensed teachers, and other educators and school faculty of specific disciplines/subject areas, grade levels, and/or geographic regions.
2. Serve as a useful resource for recent graduates of Schools of Education and trained, experienced teaching professionals aspiring to serve school districts with shortages about potential opportunity areas in each State’s and territory’s Pre-Kindergarten through Grade 12 classrooms.
3. Serve as a useful resource in the process of advising Federal student financial aid recipients of the potential to reduce, defer, or discharge student loan repayments by

teaching in certain areas. (U.S. Department of Education Office of Postsecondary Education, 2016, p. 15)

The TSA Nationwide Listing was not intended to be a job list or employment directory. Many variables that affect teacher shortage are not addressed in the annual TSA Nationwide List. The list was comprised of data reported by each state's Chief State School Officer or state representative.

To better understand the teacher shortage, this study tested the following null hypothesis:

H₀1: There is no statistically significant relationship between the criterion variable (CTE teacher shortage) and the combination of predictor variables for alternative CTE certification/licensure requirements (academic degree, work experience, mandatory testing, and program length) for the school year 2016-2017 throughout the United States.

The criterion variable was CTE teacher shortage for each state and the District of Columbia. The predictor variables were academic degree, work experience, mandatory testing, and program length. Academic degree was defined as the level of degree completion required for alternative licensure for each state. The other category was used for states that had no mention of a degree requirement for alternative licensure. Work experience was defined as the number of hours required for alternative CTE licensure for each state. Mandatory testing was defined as the states' requirement of a test or industry credential before gaining an alternative CTE teacher license. Program length was defined as the number of college credit hours, if any, required by each state to qualify for alternative CTE licensure.

Upon testing the null hypothesis, the researcher found no statistically significant predictive relationship among academic degree, work experience, mandatory testing, and program length on CTE teacher shortage for all 50 states and the District of Columbia. The null

hypothesis failed to be rejected. To better understand the issue, the researcher discusses each predictor variable below.

Academic Degree and CTE Teacher Shortage

In this study, academic degree was not found to be a statistically significant predictor of CTE teacher shortage. One finding of this study was that 29 states require a high school diploma, while 10 additional states require only a GED or make no mention of an academic degree requirement. Research has found evidence of this shift away from needing a bachelor's degree for initial certification, as many CTE fields do not require a bachelor's degree in the field of work (Bazile & Walter, 2009). Feistritz (2009) indicated that most teachers entering teaching through an alternative pathway have at least a bachelor's degree; however, supporting the finding of this study, Walter and Gray (2002) indicated that alternatively certified CTE teachers are less likely to hold a bachelor's degree and are further removed from college. In a 2009 National Center for Education Information (NCEI) survey, 47% of teachers who entered the profession through an alternative pathway would not have become a teacher if an alternative route did not exist. This reinforces the Johnson and Lie (2004) study that showed a significant incentive of alternative certification pathways for prospective teachers was the ability to bypass traditional coursework prerequisite and begin teaching quickly.

Work Experience and CTE Teacher Shortage

Research done for the National Assessment of Vocational Education showed a positive relationship between occupational experience and teacher effectiveness for beginning teachers (Lynch, 1996). When provided with professional learning opportunities, having teachers in CTE who have work experience has been shown to have a positive effect on student achievement and can help to connect classroom learning to students' career paths (Constantine et al., 2010). A

minimum of two years of related work experience was found by Walter (1984) to correlate with the attainment of tenure for CTE teachers. Contradictory to more recent studies, Walter (1984) did not find work experience to have a positive relationship with student performance; his research did indicate that work experience correlated with students' view of teacher credibility. Historically, it is useful to recall that work experience is not intended to improve instruction but rather to ensure that the teacher is a content expert.

States continue to revamp their alternative licensure pathways by leaning profoundly on industry credentials and work experience to relieve the strain of CTE teacher shortage. Michigan and Minnesota recently overhauled their licensing procedures to allow individuals without college degrees and extensive work experience to get alternative CTE licensure with no other training required (ACTE, 2017). Although required work experience was shown not to be a statistically significant predictor of CTE teacher shortage, this study found that 40 states require more than 3001 hours of work experience to attain an alternative CTE license, reinforcing the shift in CTE teacher preparation towards work experience.

Mandatory Testing and CTE Teacher Shortage

In this study, mandatory testing was required in 32 states, 20 of which had CTE teacher shortages. The most apparent reason for states requiring preservice teacher testing is its positive relationship with teacher effectiveness. Shuls and Trivitt (2015) showed a positive correlation between teacher licensure exam performance and teacher efficacy and noted that alternatively certified teachers scored even higher than traditionally certified teachers. Because CTE is highly content driven, many experts tend to devalue the importance of pedagogical skill and argue for expertise in subject matter (Ballu & Podgurksy, 2000). In contrast, Darling-Hammond (2002) stressed the importance of solid teacher grounding in human development and pedagogical skill.

In a Teach for America study, Darling-Hammond et al.'s (2005) indicates that preservice teacher testing can be a barrier for some candidates and that success on these tests does not change teacher ability to close achievement gaps.

Program Length and CTE Teacher Shortage

Previous research suggests that CTE teachers often hold degrees and industry credentials. A survey by the American Federation of Teachers (AFT) found CTE teachers to be largely college educated. Of the survey respondents, nearly 50% of CTE teachers possess a bachelor's degree in their field, and almost 60% possess at least one industry license or credential (AFT, 2014). Jacques and Potemski (2014) reported that states that require a bachelor's degree for CTE teacher certification see programs suffer due to teacher shortages. The alternative CTE teacher certification trend across the U.S. seems to be the loosening of requirements and a move away from formal teacher preparation programs.

Developed initially to fill emergency teacher needs, alternative pathways are becoming the norm for CTE teachers to enter the profession. About 75% of CTE teacher use an alternative route to teacher certification and have little teacher preparation coursework (Bazile & Walter, 2009). The limited rigor of alternative CTE certification pathways can leave CTE teachers ill prepared to integrate their content knowledge into courses. The debate on the need for pedagogy and human development training continues to be a hot topic. Hoepfl (2001) suggested that multiyear follow-up studies should be completed to get a clearer picture of the effectiveness of alternative programs. Recruiting and retaining a quality CTE teacher workforce requires policymakers to balance the competing concerns of the profession. Program requirements can shape who enters the CTE teaching profession, how well prepared these teachers are, and how long they remain in the profession. Research suggests that nearly twice as many CTE teachers

enter through alternative certification as other teacher fields, and CTE teacher have little or no instructional training (Feistritz, 2009; NRCCTE, 2011). Because of the emphasis of content for CTE teacher's alternative certification, program length is not critical. This study showed that a shorter program does not have an impact on teacher shortage.

Conclusion

The results of this study indicate that, despite the increased use of alternative routes to CTE teacher certification and the loosening of state policy requirements, efforts to combat the CTE teacher shortage are failing. The study was able to identify four variables for alternative CTE certification/licensure that do not predict CTE teacher shortage; academic degree required, work experience required, mandatory testing, and program length. There remains a CTE teacher shortage in 31 states and the District of Columbia. Studies have documented numerous issues with CTE, including teacher preparation program closures, teacher recruitment and retention, and the certification/licensure requirements (Bartlett, 2012). These issues encourage increased attempts across the United States to change CTE teacher certification and licensure requirements to remedy the shortage.

According to Woods (2016), teacher shortage can be addressed in two ways: by recruiting new teachers to the profession and by retaining teachers already in the classroom. These factors are of growing importance as student enrollments continue to climb, and competition for quality teacher talent continues. Despite the overall increase in teacher salaries across the country over the last decade, teacher salaries do not compete with the average wages of similarly educated people in the workforce (Aragon, 2016). Officials have begun to realize the importance of quality teacher recruitment and the existence of competition amongst jobs. In 2016, the State of the State addresses by 16 different governors' mentioned proposals to ensure

high-quality teachers through recruitment and better compensation (Aragon, 2016). Many states have begun reform efforts to implement base salary, performance pay, or diversified pay. Raue and Gray (2015) found that teachers who earn less than \$40,000 are 17% more likely to leave the profession within five years as those who make more than \$40,000. By comparison, a 2014 study of Michigan skilled trades wages found a median income of more than \$45,000 with more experienced workers receiving six-figure earnings (Jamieson, 2014). Recruitment and finances are only one side of the shortage dilemma.

Data from the Department of Education shows that interest in teaching is down 5% since 2010, and enrollment in all teacher preparation programs is down from 719,081 in 2008 to only 465,536 in 2014 (DiCarlo, 2015). Also of concern is the loss of teachers who are already in the classroom. McCandless and Sauer (2010) reported that many alternatively certified instructors feel that they lack the administrative support to succeed in the classroom. Research continues to show that teacher retention can be drastically improved with mentorship and induction programs. The increase in teachers being alternatively certified adds to the need for beginning teacher support. Currently, 20% of teachers in U.S. classrooms are in their first three years in the profession (Woods, 2016). With 94% of high school students earning at least one CTE credit, the need for quality CTE teachers will continue to rise (Association for Career and Technical Education [ACTE], 2017). As the CTE profession faces the challenges of providing high-quality teachers, new and innovative approaches will need to be explored to meet the demand. The Advance CTE (n.d.) deputy executive director stated in 2017 “There’s no one answer, although alternative certification is increasingly a strategy state are using, it’s insufficient in addressing the overall teacher shortage issue” (p. 3). In short, when classrooms are left without a teacher, the rules quickly change to fill the void.

Implications

This study adds to the existing body of knowledge of CTE teacher shortage and alternative certification/licensure by eliminating four variables that could contribute to CTE teacher shortage. The researcher predicted that the stricter the requirements for CTE alternative licensure, the more likely a state would be to have CTE teacher shortage. However, the study showed no predictive power for any of the variables examined. The research showed that states had loosened their requirements for alternative CTE licensure in an attempt to address the CTE teacher shortage. Still, this appears to be an effort that has not worked, as 32 states reported a CTE teacher shortage in 2016-2017. Alternative licensure allows many individuals to enter the profession. The researcher hopes that this study will lead policymakers and CTE professionals to have a better understanding of how to address CTE teacher shortages.

The researcher believes that much of the issue of CTE teacher shortage lies in the lack of interest in CTE pathways and the widening skills gap in our society. College, the most expensive route to employment, continues to be the primary path promoted to K-12 students. Meanwhile, high paying jobs sit unfilled, and the skills gap widens. The need for business, healthcare, and industry professionals is as high as ever. In efforts to recruit quality employees, many professions are increasing financial incentives. This is in direct competition with the field of CTE, as teacher shortages continue to be an annual issue. For CTE to attract quality teachers, educators and policy makers must first place value on the careers that CTE offers. The cycle of CTE teacher shortage starts with a limited interest in CTE careers.

Limitations

The study was limited in that it included only one alternative certification pathway from each state. The researcher chose the alternative certification pathway that was specific to CTE or

the least rigorous path if CTE was not specifically spelled out. In its 2007 study, the National Research Center for Career and Technical Education found 105 different alternative certification pathways across the 50 states and the District of Columbia (Zirkle et al., 2007). Since this study only included one alternative certification pathway from each state, it is possible that the predictor variables chosen by the researcher could affect the results.

Not all states had a clear indication of the academic degree required. The “other” category for academic degree was used when researcher did not find a specific requirement for that state. The “other” category was also used when that state indicated its academic requirements to be high school equivalency or GED. The lack of clear answers to this category could have affected the academic degree predictor variable in this study.

Recommendations for Future Research

The nationwide shortage of CTE teachers has been of concern in some areas of the country for decades. This study focused on one CTE alternative licensure pathway for each of the 50 states and the District of Columbia to explore potential predictors of CTE teacher shortage. Many factors contribute to CTE teacher shortage, none of which are the academic degree required, the work experience required, the existence of mandatory testing, or program length as identified by this study. Some studies could delve deeper into the CTE teacher shortage issue. The researcher suggests the following areas for further research:

1. A study that includes all the alternative pathways for each state. In 2007, there were 105 alternative pathways identified by the National Research Center for Career and Technical Education (Zirkle et al., 2007). The new study could address changes and trends in alternative pathways since 2007.

2. Research using qualitative methodology to address why business and industry professionals are choosing not to enter the CTE teacher profession. Qualitative design allows the researchers to look deeper at a question through personal experiences of participants.

3. A study to describe and define the best practices in alternative CTE teacher pathways to be used as a model for consistency across the U.S.

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Appendix A: Data Collection Sheet

State: _____

Pathway: _____

CTE Supervisor: _____

Phone: _____

Email: _____

State CTE Shortage: _____ Website: _____

No	Yes
0 _____	1 _____

Academic Degree Requirement:

High School	Associates	Bachelors	Masters	Other
0 _____	1 _____	2 _____	3 _____	4 _____

Work Experience:

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0 _____	1 _____	2 _____	3 _____

Mandatory Testing:

Required	Not Required
0 _____	1 _____

Program Length:

<u>< 9 credits</u>	10-18 credits	19-30 credits	>31 credits
0 _____	1 _____	2 _____	3 _____

Additional comments:

Appendix B: Variable Codes*SPSS Variable Codes*

Variable	Code
Academic degree	
Other	0
High School	1
Associates	2
Bachelors	3
Masters	4
Work Experience	
0-500 hours	0
501-3000 hours	1
3001-5000 hours	2
>5001 hours	3
Mandatory Testing	
No	0
Yes	1
Program Length	
<9 hours	0
10-18 hours	1
19-30 hours	2
>31 hours	3

Appendix C: IRB Approval**LIBERTY UNIVERSITY.**
INSTITUTIONAL REVIEW BOARD

December 10, 2018

Britton Devier

IRB Application 3612: The Relationship Between Alternative Career and Technical Education (CTE) Teacher Licensure Requirements and CTE Teacher Shortage

Dear Britton Devier,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research

The Graduate School

LIBERTY
UNIVERSITY.

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Appendix D: State Data

Alabama

Pathway: Bachelor's equivalent technical education license

CTE Supervisor: Callie Wells

Phone: 334-694-4900

Email: cwells@alsde.edu

Website: www.alsde.edu

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
-------------	-----------	-----------	---------	-------

0: X	1:	2:	3:	4:
------	----	----	----	----

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
-------------	----------------	------------------	-------------

0:	1:	2:	3: X
----	----	----	------

Mandatory Testing

Required	Not Required
----------	--------------

0: X	1:
------	----

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
-------------	---------------	---------------	-------------

0:	1:	2:	3: X
----	----	----	------

Additional comments

- 45 hours state level training
- 7 years work experience with HS diploma

Alaska

Pathway: Type M limited certificate

CTE Supervisor: Deborah Riddle

Phone: 907-465-2892

Email: Deborah.riddle@alaska.gov

Website: www.education.alaska.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 4 or more years work experience
- No mention of HS diploma requirement

Arizona

Pathway: Provisional CTE K-12 certification – Business/ Industry professional

CTE Supervisor: Cathie Raymond

Phone: 602-364-2211

Email: cathie.raymond@azed.gov

Website: www.azed.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

- 6000 hours work experience or bachelor's degree
- 15 hours college required for those applying with the 6000 hours work experience
- No mention of HS diploma requirement

Arkansas

Pathway: CTE provisional permit

CTE Supervisor: Angela Kremers

Phone: 501-683-1705

Email: angela.kremers@arkansas.gov

Website: www.arkansased.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- 4 years work experience with HS diploma
- HS diploma required

California

Pathway: Business and Industry partnership teacher

CTE Supervisor: Tom Adams

Phone: 916-319-0900

Email: tadams@cde.co.gov

Website: www.ctc.ca.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: X 2: 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 3 years' work experience minimum
- Minimum of 1000 hours for a year's credit

Colorado

Pathway: Initial CTE

CTE Supervisor: Sara Heath

Phone: 720-858-2399

Email: sarah.heath@cccs.edu

Website: www.cde.stat.co.us

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1: X	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 4,000 hours required
- Associates degree with 18 hours in content area

Connecticut

Pathway: Alternative Route to Certification – Vocational Education

CTE Supervisor: Harold Macken

Phone: 860-713-6779

Email: Harold.macken@ct.gov

Website: www.portal.ct.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 3 year's work experience required

Delaware

Pathway: Skilled and Technical Sciences license

CTE Supervisor: Luke Rhine

Phone: 302-735-4015

Email: luke.rhine@doe.k12.de.us

Website: www.doe.k12.de.us

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: X 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 6 years work experience

Florida

Pathway: Temporary certification

CTE Supervisor: Rod Duckworth

Phone: 850-245-9463

Email: rod.duckworth@fldoe.org

Website: www.fldoe.org

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2: X	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0: X	1:	2:	3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 6 years work experience in content area
- Schools district requests CTE certification
- Full license requires bachelor's

Georgia

Pathway: Teaching specialist – Career and Technical Education

CTE Supervisor: Barbara Wall

Phone: 404-657-8304

Email: bwall@doe.k12.ga.us

Website: www.gapsc.com

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1: X	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- HS diploma for non-renewable license
- Associates degree for renewable license
- Each area has specific requirements

Hawaii

Pathway: Limited CTE

CTE Supervisor: Bernadette Howard

Phone: 808-956-4791

Email: mbhoward@hawaii.edu

Website: www.hawaiipublicschools.org

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: X 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 3 years' work experience required

Idaho

Pathway: Content specialist

CTE Supervisor: Dwight Johnson

Phone: 208-429-5501

Email: dwight.johnson@cte.idaho.gov

Website: www.sde.idaho.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

- 6 year's (12,000 hours) work experience required
- must be 22 year's old to apply for license

Illinois

Pathway: Provisional vocational certification

CTE Supervisor: Marci Johnson

Phone: 217-524-4832

Email: marjohn@isbe.net

Website: www.isbe.net

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1: X	2:	3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 6 semester hours required for renewal
- 2000 hours work experience

Indiana

Pathway: Career specialist permit

CTE Supervisor: Stefany Deckard

Phone: 317-234-0210

Email: stdeckard1@doe.in.gov

Website: www.doe.in.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- 10,000 hours of work experience required

Iowa

Pathway: CTE Authorization

CTE Supervisor: Pradeep Kotamraju

Phone: 515-281-4716

Email: Pradeep.kotamraju@iowa.gov

Website: www.boee.iowa.org

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: 3: X

Additional comments

- 6,000 hours work experience
- 30 hours required to renew license

Kansas

Pathway: CTE specialized certification

CTE Supervisor: Connie Beene

Phone: 785-430-4240

Email: cbeene@ksbor.org

Website: www.ksde.org

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- Must hold an industry credential in field
- 5 year's work experience
- No mention of HS diploma requirement

Kentucky

Pathway: Occupational based CTE certificaion

CTE Supervisor: David Horseman

Phone: 502-564-4286

Email: David.horseman@education.ky.gov

Website: www.education.ky.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- 64 hours to renew initial license
- 4 year's of work experience

Louisiana

Pathway: Career and Technical- Trade and Industry Education

CTE Supervisor: Patricia Felder

Phone: 225-922-2809

Email: patriciafelder@lctcs.edu

Website: www.teachlouisiana.net

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 4 years work experience (7,680 hours) required
- New instructor workshop
- 15 credits and industry credential

Maine

Pathway: CTE endorsement

CTE Supervisor: Dwight Littlefield

Phone: 207-624-6721

Email: Dwight.a.littlefield@maine.gov

Website: www.maine.gov/doi

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1:	2:	3: X

Additional comments

- 6,000 hours of paid teaching employment to renew
- 6,000 hours of work experience

Maryland

Pathway: Conditional certificaion

CTE Supervisor: Lynne Gilli

Phone: 410-767-0100

Email: lynne.gilli@maryland.gov

Website: www.marylandpublicschools.org

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

- 2 years work experience
- Industry credential

Massachusetts

Pathway: Vocational technical license

CTE Supervisor: Keith Westrich

Phone: 781-338-3000

Email: kwestrich@doe.mass.edu

Website: www.doe.mass.edu

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 5 years work experience
- Program dependent on CTE area

Michigan

Pathway: Professional CTE certification

CTE Supervisor: Brian Pyles

Phone: 517-335-5224

Email: pylesb@michigan.gov

Website: www.michigan.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- 4,000 hours work experience required
- 6 semester hours of course work to renew

Minnesota

Pathway: Tier 4

CTE Supervisor: Jeralyn Jargo

Phone: 651-201-1650

Email: jeralyn.jargo@minnstate.edu

Website: education.mn.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: 2: X 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: X 1: 2: 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- Schools can request a variance for high need areas

Mississippi

Pathway: CTE non-education degree – 3 year

CTE Supervisor: Thomas Wallace

Phone: 601-359-3974

Email: twallace@mdek12.org

Website: www.mdek12.org

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1: X	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

- 2 years of work experience
- Enrollment into vocational instructor program (VIP)

Missouri

Pathway: CTE temporary certification

CTE Supervisor: Blaine Henningsen

Phone: 573-751-2660

Email: blaine.henningsen@dese.mo.gov

Website: www.dese.mo.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- No mention of HS diploma requirement
- 6,000 hours of work experience
- Must be employed by a school district

Montana

Pathway: Class 4 CTE license

CTE Supervisor: Jacque Treaster

Phone: 406-444-7915

Email: jtreaster@montana.edu

Website: www.opi.mt.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- 10,000 hours of work experience

Nebraska

Pathway: Career education permit

CTE Supervisor: Katie Graham

Phone: 402-471-3104

Email: katie.graham@nebraska.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: 2: 3: 4: X

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: X 1: 2: 3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- No mention of HS diploma requirement
- 5 years work experience or pass state test or apprenticeship
- Unique state with requirements

Nevada

Pathway: Secondary CTE certification

CTE Supervisor: Kristine Nelson

Phone: 775-687-7283

Email: knelson@doe.nv.gov

Website: www.doe.nv.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: 2: X 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: X 1: 2: 3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: X 3:

Additional comments

- No work experience requirement

New Hampshire

Pathway: Alternative 4 certification

CTE Supervisor: Heather Gage

Phone: 603.271.5992

Email: heather.gage@doe.nh.gov

Website: www.education.nh.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments

- 4,000 hours work experience required

New Jersey

Pathway: CTE CE

CTE Supervisor: Jane Griesinger

Phone: 609-777-2170

Email: jane.griesinger @doe.state.nj.us

Website: www.nj.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1:	2: X	3:

Additional comments

- 4 years of work experience (4 years)
- 24 hours of course work
- No HS degree requirement mentioned

New Mexico

Pathway: Secondary Vocational Education

CTE Supervisor: Elaine Perea

Phone: 505-27-6542

Email: elaine.perea@state.nm.us

Website: www.webnew.ped.state.nm.us

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

- 5 years of work experience required

New York

Pathway: Transitional A certification

CTE Supervisor: vacant

Phone: 518-474-3862

Email:

Website: www.nysed.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: X 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

North Carolina

Pathway: Lateral entry

CTE Supervisor: Trey Michael

Phone: 919-807-3883

Email: trey.michael.dpi.nc.gov

Website: www.dpi.state.nc.us

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2: X	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2: X	3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

North Dakota

Pathway: Alternative CTE

CTE Supervisor: Wayde Side

Phone: 701-328-3180

Email: wasick@nd.gov

Website: www.nd.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- Content areas vary on requirements

Ohio

Pathway: CTE 37

CTE Supervisor: Emily Passias

Phone: 614-644-5690

Email: emily.passias@education.ohio.gov

Website: www.education.ohio.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: X 3:

Additional comments

- 5 years of work experience required

Oklahoma

Pathway: Alternative placement CTE

CTE Supervisor: Macie Mach

Phone: 405-743-5430

Email: marcie.mack@careertech.ok.gov

Website: okcareertech.org

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: 1: X 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: X 1: 2: 3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

Oregon

Pathway: Restricted CTE

CTE Supervisor: Laura Foley

Phone: 503-947-5669

Email: laura.foley@state.or.us

Website: www.oregon.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1: X	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1: X	2:	3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

Pennsylvania

Pathway: Vocational Instructor

CTE Supervisor: Lee Burket

Phone: 717-787-5530

Email: lburket@pa.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

Rhode Island

Pathway: Preliminary CTE

CTE Supervisor: Nicole Smith

Phone: 401-222-8481

Email: Nicole.smith@ride.ri.gov

Website: www.ride.ri.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

South Carolina

Pathway: CATE

CTE Supervisor: Angel Malone

Phone: 803-734-8412

Email: amalone@ed.sc.gov

Website: www.ed.sc.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

South Dakota

Pathway: Alternative CTE – CTE specialist permit

CTE Supervisor: Laura Scheibe

Phone: 605-773-3134

Email: laura.scheibe@state.sd.us

Website: www.doe.sd.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: X 2: 3:

Additional comments

Tennessee

Pathway: CTE occupational license

CTE Supervisor: Casey Haugner Wrenn

Phone: 615-532-6260

Email: casey.haugner@tn.gov

Website: www.tn.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: X 3:

Additional comments

Texas

Pathway: CTE certification

CTE Supervisor: Heather Justice

Phone: 512-463-9734

Email: heather.justice@tea.texax.gov

Website: www.tea.texas.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: 3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: X 3:

Additional comments

Utah

Pathway: Alternative route to licensure

CTE Supervisor: Thalea Lanhurst

Phone: 801-538-7889

Email: thalea.longhurst@schools.utah.gov

Website: www.schools.utah.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1:	2: X	3:

Additional comments

Vermont

Pathway: Apprentice license

CTE Supervisor: Jay Ramsey

Phone: 802-479-1343

Email: jay.ramsey@vermont.gov

Website: www.education.vermont.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: X 1: 2: 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: 3: X

Additional comments

Virginia

Pathway: Industry credential certification

CTE Supervisor: George Willcox

Phone: 804-225-2052

Email: george.willcox@doe.virginia.gov

Website: www.doe.virginia.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0: X	1:	2:	3:

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0: X	1:	2:	3:

Additional comments

- Industry credential required
- No mention of HS diploma requirement

Washington

Pathway: Initial CTE

CTE Supervisor: Eleni Papadakis

Phone: 360-709-4600

Email: eleni.papadakis@wtb.wa.gov

Website: www.pesb.wa.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: 1: X

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1: X	2:	3:

Additional comments

- 6,000 hours of work experience
- No mention of HS diploma required

West Virginia

Pathway: CTE endorsement

CTE Supervisor: Kathy Jo D'Antoni

Phone: 304-558-2346

Email: kdantoni@k12.wv.us

Website: www.wvde.state.wv.us

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0: X	1:	2:	3:	4:

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1:	2:	3: X

Additional comments

Wisconsin

Pathway: Trade specialist permit

CTE Supervisor: Colleen McCabe

Phone: 608-266-9399

Email: colleen.mccabe@wtcsystem.edu

Website: www.dpi.wi.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School	Associate	Bachelors	Masters	Other
0:	1:	2:	3:	4: X

Work Experience

0-500 hours	501-3000 hours	3001 -5000 hours	>5001 hours
0:	1:	2:	3: X

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits	10-18 credits	19-30 credits	>31 credits
0:	1:	2:	3: X

Additional comments

- 3 years work experience required
- Approved apprenticeship program

Wyoming

Pathway: Trade and technical permit

CTE Supervisor: John Bole

Phone: 307-777-6132

Email: john.bole@wyo.gov

Website: www.edu.wyoming.gov

State CTE Shortage

No Yes

0: X 1:

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: X 2: 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: 1: 2: X 3:

Additional comments

- 2 years of work experience required

District of Columbia

Pathway: Technical and Industry occupational license

CTE Supervisor: Rich Kincaid

Phone: 202-442-4008

Email: richard.kincaid@dc.gov

Website: www.osse.dc.gov

State CTE Shortage

No Yes

0: 1: X

Academic Degree Requirement

High School Associate Bachelors Masters Other

0: X 1: 2: 3: 4:

Work Experience

0-500 hours 501-3000 hours 3001 -5000 hours >5001 hours

0: 1: 2: X 3:

Mandatory Testing

Required Not Required

0: X 1:

Program Length

< 9 credits 10-18 credits 19-30 credits >31 credits

0: X 1: 2: 3:

Additional comments