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Teacher Shortage and Alternative Licensure Solutions for Technical Educators

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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 all 50 states and the District of Columbia. These alternative pathways are highly divergent from state to state. Limited research has investigated the alternative certification/licensure requirements that may contribute to CTE teacher shortage. This predictive correlational study looked to determine if CTE alternative certification/licensure requirements could predict CTE teacher shortages. It was found that CTE alternative certification/licensure requirements were not a good predictor of CTE teacher shortage.

Keywords: Career and Technical Education (CTE), alternative certification, alternative licensure, career and technical education (CTE) teacher shortage

INTRODUCTION

Although varied by subject area and region, teacher shortages continue to be a problem across the country. Since 2015, media reports of teacher shortages have been recognized in nearly every U.S. state (Behrstock-Sherratt, 2016). Teacher shortages hit career and technical education (CTE) particularly hard. In the U.S. Department of Education's 2017 Teacher Shortage Areas (TSA) report, 31 states and the District of Columbia reported a shortage in at least one area of CTE. The 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 their studies (Harris & Wakelyn, 2007). Nearly one-fifth of all credits accumulated by public high school students are in courses categorized as CTE (Asunda, 2011). As a remedy to the CTE teacher shortage, alternative certification programs have emerged. In 1982, only eight states offered alternative certification/licensure, a number that increased to include all 50 states by 2008 (National Center for Educational Information, 2003, 2010).

This study aimed to provide insight into CTE teacher shortages and contribute a deeper understanding of the impacts of alternative

certification/licensure requirements. Additionally, the study adds to the body of knowledge of CTE teacher shortage and alternative certification/licensure by eliminating four variables that could contribute to CTE teacher shortage: academic degree, work experience, mandated testing, and length of the program. There were a few studies (and none recent) that focused on CTE alternative licensure (e.g., Zirkle, Martin, & Mccaslin, 2007). There is a need for research that considers certification/licensure requirements. Because this study examines all U.S. states and the District of Columbia, its findings have implications for policy and procedures across the country.

PROBLEM STATEMENT

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 et al., 2007). These pathways include myriad 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 have lowered requirements in an attempt to fill their teacher shortage. It would appear the more stringent the CTE teacher certification/licensure, the less likely a potentially qualified person would consider teaching. However, little research has been done in this area.

LITERATURE REVIEW

Teacher Shortage

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 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 the 20 fastest growing careers. In a survey, 81% reported a shortage in manufacturing, 73% information technology, and 71% of health sciences (Advance CTE, 2017).

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 hurts 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 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 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). Government 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 mid-career 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 shortages throughout the country.

Alternative Teacher Certification/Licensure

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). Licensure agencies across the United States commonly define any licensure path that does not follow traditional teacher education preparation as an 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 (Ruhland & Bremer, 2002). Not unlike traditional teacher education licensure, the alternative licensure requirements differ by state and agency (Constantine et al., 2009). The 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).

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 2017. 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).

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 (Feistritzer & 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). Demonstration and verification of occupational competence and experience are proof of the teacher’s mastery of the subject matter to be taught (Lynch, 1998). This means that many CTE teachers are hired primarily for their years of experience and specialization in their profession.

Academic Degree

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.

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 (Stotsky, 2007). Stotsky (2007) stated 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.

Most states have some mandated testing requirements for alternative teacher licensure. The most common is the ETS Praxis series. To test basic skills and gain entry into the alternative education program many states utilize the 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

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) suggested that alternative licensure programs are not intended to replace traditional university-based teacher education programs. The traditional and alternative teacher preparation programs differ in instructional timing, context, and the acquired mix of professional knowledge and skill (Stoddart & Floden, 1995). 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). According to the U.S. Department of Education (2017), 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 utilizing alternative programs.

METHODS

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 the 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 the 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.

Instrumentation and Data Sources

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. The study used a data collection sheet for each state. The collection sheet can be found in Figure 1, on page 52.

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 examined CTE certification/licensure pathways across the 50 states and the District of Columbia (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 a CTE teacher shortage or no CTE teacher shortage.

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) stated that logistic regression is used for "determining the

DATA COLLECTION SHEET					
State:					
State Website:					
CTE Supervisor:			Phone:	Email:	
Pathway:					
State CTE Shortage:	Yes (1)	No (0)			
Academic Degree Requirement:	HS Degree (0)	Associate Degree (1)	Bachelor Degree (2)	Master Degree (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

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 to 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. Descriptive statistics can be viewed in Table 1, on page 53.

RESULTS

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. The results 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.

Each predictor variable was further investigated (see Table 2). 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. 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. 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, for the variable of program length, the Wald ratio was not statistically significant,

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
Associate's	4	4
Bachelor's	2	2
Master's	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

$\chi^2(1) = .01, p = .91$. 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.

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.

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. To better understand, each predictor variable is discussed below.

Table 2. Summary of Logistic Regression Analysis Predicting State CTE Teacher Shortage

Predictor variable	β	<i>SE</i>	OR	Wald statistic	<i>p</i>	<i>df</i>
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

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, whereas 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, because many CTE fields do not require a bachelor's degree in the field of work (Bazile & Walter, 2009). Feistritzer (2009) indicated that most teachers who enter 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 National Center for Education Information (NCEI, 2010) 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 Liu (2004) study that showed a significant incentive of alternative certification pathways for prospective teachers was the ability to bypass traditional coursework prerequisites 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., 2009). 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 (Advance CTE, 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 the subject matter (Ballu & Podgursky, 2000). Darling-Hammond (2002) indicated that preservice teacher testing can be a barrier for some candidates and that success on these tests does not change a teacher's 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 teachers 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 teachers have little or no instructional training (Feistritzer, 2009). Because of the emphasis of content for CTE teachers' alternative certification, program length is not critical. This study showed that a shorter program does not have an impact on the 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 qualified and talented teachers continues. Despite the overall increase in teacher salaries across the country during 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 (Advance CTE, 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 (2017) deputy executive director stated "There's no one answer, although alternative certification is increasingly a strategy states 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.

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 following areas are recommended 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. The 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 United States.

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