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Career and Technical Education (CTE) and High School Student Success in Tennessee

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Career and Technical Education (CTE) and High School Student Success in Tennessee

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by

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ABSTRACT

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The purpose of this quantitative study was to examine the relationship between participation in CTE programs and students' graduation rates and rates of CTE students' entrance into postsecondary education or employment after graduation. Possible differences between students' enrollment in urban and rural school districts and their graduation, participation, and secondary placement rates were also considered. Publicly available data on high school students in the state of Tennessee were analyzed to compare the graduation rates of CTE participants with the graduation rates of non-CTE participants in the state as a whole and in nine selected urban school districts and nine selected rural school districts for the school years 2009-2010, 2010-2011, and 2011-2012.

Research cited in this study indicated that CTE participation could increase students' graduation rates. Some research also indicated that rural students were more likely to complete CTE concentrations than urban students and that other differences might exist in the CTE experiences of urban and rural students. Six research questions were created and their null hypotheses tested with a series of *z*-tests.

Analysis of publicly available data for the selected school systems and for the state as a whole found slightly higher rates of graduation among CTE concentrators than among non-

concentrators and higher rates of CTE participation among rural than urban high school students, but these differences were not statistically significant. Differences between urban and rural schools systems' graduation rates and their rates of postsecondary placement of CTE concentrators in education, the military, or employment were also found to be statistically insignificant.

DEDICATION

This study is dedicated to my family, who have inspired my career in education and made it possible. My mother, Janis Miller, gave me a love of learning from the earliest days of my life and supported me, often despite myself, throughout my days as a student. My late father, Jerry Ellis Sayers, told me from the age of five that I would earn a doctoral degree one day, and without that expectation to meet, I might never have done so. I met my dear wife, Robin Smith Sayers, while we pursued our Master of Education degrees, and she has helped me along every step of the way in my career as an educator, including through my doctoral studies, despite the time my research took away from our life together. My sons, Landon Owen David Sayers and Bowie Crockett Sayers III, have made me strive to be a better man in every way, including in my career and my life-long learning, so that I may be a good example to them. My gratitude to all of them, and to many other friends and family who have helped me along the way and who made the way worthwhile, cannot ever be fully expressed, but for all they have done, I dedicate this study to them.

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I also wish to acknowledge my colleagues at Science Hill High School, many of whom were my teachers when I was a student there but whom I am now privileged to call my friends. I especially appreciate the advice and support of Dr. Charles R. Griffith and Dr. David Burgin, whose sympathy for the challenges of writing a dissertation helped keep me at my work. Many of my former teachers inspired me to join them in this career, but I may owe the most in that regard to Mr. Bill Stanton, now retired from Science Hill and enjoying work as a tour guide in Charleston, South Carolina. His assigned class presentations forced me to overcome my shyness and to discover that I could hold the attention of a high school history class and enjoy doing so even at the age of 16.

I must also acknowledge my students, who have made my career choice a deeply satisfying one, and who have been patient with my slow grading habits during some of the more intense periods of my doctoral studies. My student teachers, Ms. Brandi McCloud, Mr. John Thacker, Mr. John Livaditis, and Ms. Ashley Holt all made it a pleasure to be their mentor. Their capable instruction at the front of my classroom allowed me time at my desk in the back to pursue my work for East Tennessee State University and other aspects of my continuing education.

I owe a great debt to all my friends and family. I have dedicated this dissertation to my immediate family, my parents, wife, and children, but my extended family have also been very encouraging in this, and in all my endeavors. My uncle, Mr. Alan Sayers, offered me valuable advice and guidance following my father's death. Without his help in those years I would probably not enjoy the life I have today or have had the wisdom to complete my formal

education in the way that I finally have with this degree. My friend Mr. Thomas Jefferson DeWitt helped me find a place on the Rocky Mount Museum Board of Trustees, which has been an enjoyable experience in educational leadership and also helped me fulfill my residency requirements. Mr. Paul DeWitt and his wife Amanda put me up in their home during the semester before I came to East Tennessee State University and had begun my doctoral work at Lincoln Memorial University's Knoxville campus, making a good start to my studies possible.

Finally, but also foremost, I owe everything I have acknowledged before and, indeed, all that I have in this life and after it to God. That includes the completion of this course of study, over which many prayers were said over the past four years.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Educational leaders in the 21st century are accountable to the staff they lead, the students they teach, the parents of those students, their communities at large, and to a system of laws governing students' educational achievement. For many educators and students, the pressure to achieve academic success can lead to disillusionment and disengagement with the process of education, reducing the chances of educational success, whether that is measured by attendance rates, graduation rates, or students' preparation for postsecondary education or employment (Fowler, 2009). Research by Plank, DeLuca, and Estacion (2005) has indicated that for some students, involvement in Career Technical Education (CTE) can hold students' interest in their education, encourage them to graduate on time, and better prepare them for gainful employment or further study following high school graduation by giving them practical training that they can see a use for while they are learning it and which they can find a use for in a career when their training is complete. This study employed publicly available data from public schools in the state of Tennessee to examine relationships between students' CTE participation and their success as measured by graduation rates, and also to compare rates of CTE participation, overall rates of graduation, and postsecondary placement rates between urban and rural students in Tennessee.

Statement of the Problem

It has long been the mission of educators to prepare students for future academic work and to serve as productive citizens in their adult lives, in large part by preparing them to enter the

workforce with the potential to pursue a satisfying career (Ozman & Craver, 2008). For professional public educators of the 21st century this mission has been emphasized by the creation of new and rigorous standards through the No Child Left Behind Act's renewal of the Elementary and Secondary Education Act of 1965 and through other national and state-level laws that require high graduation rates and track student attendance and success in various ways (Tennessee Department of Education, 2010). Furthermore, many prospective employers have reported having difficulty finding workers who have many of the basic skills, let alone the more advanced ones, necessary for working in skilled trades (Society for Human Resource Management, 2013) and even in more high-tech fields (Bray, Painter, & Rosin, 2011). The Tennessee Promise program supported by Governor Bill Haslam of Tennessee to increase funding for students enrolling in two-year technical certification programs after high school has highlighted the importance that many leaders now place on Career Technical Education (Baker, 2014a). This plan has been controversial because the leaders of some four-year institutions of higher education have expressed concern that it will take financial support away from four-year institutions and reduce their attendance levels (Baker, 2014b). However, in its first year approximately 56,000 of 65,000 12^{th} grade students in Tennessee applied for funding through Tennessee Promise (Collins, 2014), and Senator Lamar Alexander and President Barack Obama have both expressed the view that it could become a model for the entire country ("Zero Tuition," 2015).

Both to conform to the letter of the law and to fulfill the spirit of their educational mission to prepare students for their future careers, school leaders must be diligent and creative in encouraging the student involvement that promotes student retention and success as measured both by test scores and graduation rates and in preparing students for meaningful careers

following their graduation (Wilkin & Nwoke, 2011). Career Technical Education programs are one way in which educational leaders try to do this. Research by Loveless (2011) and Shadden (2011) has indicated that involvement in CTE classes can increase student success in Tennessee. Other research (Aliaga, Kotamraju, & Dickinson, 2011; Aliaga, Kotamraju, & Stone, 2012) analyzing schools throughout the country produced similar findings both for students who followed a CTE curriculum and for students following a primarily academic curriculum who experimented with one or a few CTE classes.

Purpose of Study

The purpose of this quantitative study was to examine the relationships between the independent variables of participation in CTE programs and enrollment in rural and urban school districts and the dependent variable of students' graduation rates. The relationships between the independent variable of enrollment in rural or urban school districts and the dependent variables of CTE participation rates, graduation rates, and rates of CTE students' entrance into postsecondary education or employment upon graduation were also considered. Publicly available data on high school students in the state of Tennessee were analyzed to compare the graduation rates of CTE concentrators with the graduation rates of students who were not classified as CTE concentrators in the state as a whole and in 18 selected school districts. Nine of those school districts were urban districts and nine were rural. Three school districts of each type were selected randomly from each of the three Grand Divisions of the state of Tennessee. Publicly available data were also analyzed to investigate possible differences between the effects of CTE programs in urban and rural areas through comparison of urban and rural CTE participation rates, overall graduation rates, and CTE concentrators' postsecondary placement

rates in nine selected urban and nine selected rural school districts. This methodology was primarily based on the work of Loveless (2011), but also on work by Shadden (2011); Aliaga et al. (2011); and Aliaga et al. (2012).

Research Questions

The following research questions were approached in this study to determine if there was a significant difference between the graduation rates of CTE concentrators and nonconcentrators and between rural and urban school districts' CTE participation rates, graduation rates, and postsecondary placement rates. Because postsecondary placement is called *secondary placement* in the Tennessee Department of Education's official terminology for reporting placement rates, the term secondary placement was used in that sense in the research questions and in the discussion of the data collection process and the data analysis employed in this study.

1. Is there a significant difference in the overall CTE graduation rate and the overall non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012?
2. Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?
3. Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

4. Is there a significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?
5. Is there a significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?
6. Is there a significant difference in the rate of high school CTE graduates in the selected urban school districts who are secondarily placed and the rate of high school CTE graduates in the selected rural school districts who are secondarily placed for the collective school years 2009-2010, 2010-2011, and 2011-2012?

Significance of the Study

Although there has been an increasing recognition of the need for high school graduates to be career-ready and more emphasis is being placed on Career Technical Education at the college level, quantitative research that focuses on the relationship between CTE participation and student graduation rates and postsecondary placements rates, especially in the state of Tennessee, is limited. Research on the relationship between CTE participation and student success in Tennessee by Loveless (2011) and Shadden (2011) concluded with calls for further research. While most of their analyses returned significant results and their overall conclusion was that CTE participation does contribute to student success, not all of their tests yielded significant results. Their samples were also limited to school districts in East Tennessee, excluding Middle and West Tennessee, where the experiences of students may be different. Furthermore, their research only encompassed the school years 2007-2008 and 2008-2009, but

data for more recent school years are now publicly available for consideration. Therefore, an expansion of their work seemed appropriate. Neither study considered possible differences between urban and rural school districts' CTE participation rates and student success rates, yet it seemed that could be an important consideration in a state with several very populous urban areas but also many sparsely populated rural counties. Research by Jacobson and Mokher (2014) has indicated that rural and urban students may have different experiences with CTE, particularly a higher rate of CTE program completion among rural students, although Jordan, Kostandini, and Mykerezi (2012) found no significant difference between urban and rural dropout rates. It is also possible that in some urban areas the stigma against CTE participation described by Aliaga et al. (2012) leads to reduced participation in CTE programs in urban areas. That is an important gap in existing research that needs to be filled. Considering the emphasis placed on college-readiness and career-readiness by Tennessee's First to the Top educational reform plan's student performance goals (Tennessee Department of Education, 2014b), further research on the relationship between participation in CTE programs and students' graduation rates and rates of postsecondary success was warranted.

Definitions of Terms

This study used the following definitions of terminology in aspects of career technical education, Tennessee public school accountability requirements, placement in careers or education following high school graduation, and delineations of geographical regions. Unless otherwise stated, this study used the Tennessee Department of Education's definitions for categories of public school demographics and the U.S. Census Bureau's definitions of population centers.

1. Career Technical Education (CTE): Educational courses designed to prepare students for a wide range of careers and additional educational opportunities. These careers may require differing levels of education, including industry-recognized credentials, postsecondary certificates, and two- and four-year degrees (Association for Career and Technical Education). The Tennessee Department of Education recognizes sixteen different career clusters within the state standards for CTE classes (Tennessee Department of Education Division of Career and Technical Education, 2013b).
2. CTE Concentrators: Secondary students who have earned three or more CTE credits during the school year (Tennessee Department of Education Division of Career and Technical Education, 2013a). This definition is similar to Aliaga et al.'s (2011) definition of CTE concentrators as high school graduates who took three credits in the same CTE concentration area before graduating. Unless specifically stated otherwise, this study used the Tennessee Department of Education's definition of CTE Concentrators.
3. CTE Graduation Rate: The reported rate of high school graduation for students who were classified as CTE concentrators (Tennessee Department of Education Division of Career and Technical Education, 2013a).
4. CTE Participants: Secondary students who have earned one or more CTE credits during the school year, including CTE Concentrators (Tennessee Department of Education Division of Career and Technical Education, 2013a).
5. CTE Participation Rate: The percentage of students in grades 9-12 in a school system classified as CTE participants during a given school year according to the Tennessee

Department of Education Report Card's comparison of CTE enrollment and total student enrollment.

6. Graduate on Time: A public school student is considered who receives a regular diploma within four years of enrolling in high school (Tennessee Department of Education, 2010).
7. Grand Divisions of Tennessee: Three geographical, historical, cultural, and legal regions within Tennessee, defined by state law as the Eastern Division, Middle Division, and Western Division (Hargett, 2013). A list of the counties in each Grand Division is provided in Appendix A.
8. Non-CTE Graduation Rate: The graduation rate of students who were not CTE concentrators.
9. Urbanized Area: For the purposes of the 2010 U.S. Census, a delineated geographical area with a densely settled core and contiguous populated areas with at least 50,000 residents (Department of Commerce, 2011). Tennessee had twelve urbanized areas at the time of the 2010 Census (Department of Commerce, 2012). A list of these urbanized areas and the school districts associated with them is provided in Appendix B.
10. Urban Cluster: For the purposes of the 2010 U.S. Census, a delineated geographical area with a densely settled core and contiguous populated areas with at least 2,500 but fewer than 50,000 residents (Department of Commerce, 2011). Tennessee had 79 urban clusters at the time of the 2010 Census (Department of Commerce, 2012). A list of these urbanized areas and the school districts associated with them is provided in Appendix B.
11. Rural: For the purposes of the 2010 U.S. Census, any area not included in an urbanized area or an urban cluster (Department of Commerce, 2011). Thus, it must be an area with

fewer than 2,500 residents and no large population concentrations immediately nearby; otherwise it would become part of that urbanized area or urban cluster. A list of school districts in rural areas is provided in Appendix D.

12. Secondary Placement: The percentage of CTE concentrators who entered into postsecondary education or advanced training, began military service, or were employed in the second quarter following the academic year in which they graduated from secondary education. The reported secondary placement rate for a given school year was based on the count of the previous school year's CTE cohort concentrators who graduated and who were successfully contacted by school administrators. (Tennessee Department of Education Division of Career and Technical Education, 2013a).

Limitations and Delimitations

This study investigated one research question with a sample of all public high school students in the state of Tennessee from the three consecutive school years 2009-2010, 2010-2011, and 2011-2012. All other research questions investigated by this study were limited to a sample of high school seniors who were enrolled in eighteen selected school systems in the state of Tennessee. Results based on this sample may not necessarily be suitable for making generalizations about other school systems in Tennessee or school systems outside of Tennessee. Furthermore, data on secondary placement were based on information reported by school officials based on their own efforts to gather data on their graduates following graduation, and are only available for CTE concentrators. Their sample populations may not have been selected with sufficient rigor or their results collected consistently, so they cannot be considered to provide as reliable a sample population for this study as the graduation rates and other data

collected from the Tennessee Department of Education's Report Card on each school district's performance for the selected school years. Also, while the Tennessee Department of Education reports the rate of CTE participation and the rate of CTE concentration, CTE graduation rates and secondary placement rates only included students who were CTE concentrators (Tennessee Department of Education Division of Career and Technical Education, 2013a). This made it impossible for this study to consider the experiences other than rates of CTE participation of students taking only one or two CTE courses whom Aliaga et al. (2011) described as *CTE experimenters* and considered worthy of further study. It also made it difficult to analyze the graduation rate of non-CTE concentrators, because the number of non-CTE concentrators and their graduation rate were not directly reported. However, as described in Chapter 3, that information was approximated through consideration of the total number of students who graduated from public high schools in the selected districts and the overall graduation rate of each cohort as reported by the Tennessee Department of Education. The fact that the non-CTE graduation rates considered in the first three research questions were approximations rather than officially reported figures poses a limitation on the validity of comparisons involving the graduation rates of non-CTE concentrators. Finally, some home-schooled students (Wright, 2012) and some private schools (Tennessee State Board of Education, 2014b) are not required to take all the state-mandated tests or to report all the same data that public schools do, so the exclusion of their data may have placed a limit on a complete comparison of the relationship between CTE participation and the other variables considered in this study.

Overview of the Study

Chapter 1 contained a general introduction to the study, as well as a specific statement of the problem, statement of purpose, research questions, significance of the study, definitions of terms, and the limitations of the study. Chapter 2 included a review of literature relevant to the history of CTE and its significance as a contributor to students' success following their completion of secondary education. Chapter 3 described the research methodology, including research questions and hypotheses, the selection of the population, and the procedures for collecting and analyzing data. Chapter 4 offered a discussion of the results of the analysis conducted for each research question. Chapter 5 provided a summary of the study, conclusions, and recommendations for further research.

CHAPTER 2

REVIEW OF RELATED LITERATURE

In the 21st century, accountability is one of the most prominent features of public school leadership (Feng, Figlio, & Sass, 2010). In the half-century since the passage of the Elementary and Secondary Education Act (ESEA) of 1965, provision of federal funding contingent upon state and local school systems' compliance with federal guidelines has obligated schools to provide equal opportunities for students from a wide range of socio-economic backgrounds, but has also created a complex and sometimes contradictory collection of regulations that can pose a challenge for school leaders to implement (Fowler, 2009). However, accountability requirements created by ESEA and the most recent acts reauthorizing it have also placed public educators under a great deal of pressure to meet goals that many find challenging, and have even driven some teachers away from schools that were under intense scrutiny (Feng et al., 2010) and led to high turnover among principals in some areas (Hill & Banta, 2008; Loeb & Cunha, 2007). This is in large part because the pressure to meet goals that can seem impossible has been demoralizing to some professionals while failure to make adequate progress towards these goals can result in sanctions for individual schools and entire school systems, including the possible loss of jobs for school administrators and faculty (Stipek, 2013).

Although most of the goals set by ESEA are academic in nature, a number of educational and business leaders have proposed that student engagement, and thus student success in their academic and professional careers, could be improved through a better system of vocational training or Career Technical Education (CTE) (Cohen & Besharov, 2002). This is not a new idea: apprenticeships that trained young workers for skilled trades are one of the oldest forms of

education (Innes, 1995) and the United States government has actively encouraged vocational education since the passage of the Smith-Hughes Act of 1917 (Calhoun & Finch, 1982). However, the increased emphasis on student graduation rates and the decline in unskilled trades in the United States have led to a new interest in CTE as a possible factor in promoting student success (Jacoby, 2013). This literature review presents a history of the legal framework behind current standards of accountability for public schools, a history of CTE in the United States, a review of recent research on the challenges facing schools, the challenges facing employers, the relationship between participation in CTE and student success in school and following graduation, and current trends in CTE.

A Brief History of School Accountability

The first law mandating a form of school accountability in what is now the United States was passed in the colonial period. The Massachusetts Education Law of 1642 ordered town leaders to determine if parents of minor children and the master craftsmen training apprentices were providing the young people under their care a proper education, and to fine those who were not. In 1837, Massachusetts became the first state in the United States to create a state board of education (Webb, 2006). Under the leadership of Horace Mann, this board of education collected data from student examinations in order to compare the quality of schools in the state (Fowler, 2009). In the early 20th century, the scientific management theories of efficiency experts such as Frederick Winslow Taylor were applied to education by some reformers at the local and state level. Efforts were made to quantitatively measure the abilities of students, although this was seen as a tool for educators to assess their students rather than a way for boards of education to hold teachers accountable, at least for the moment. Not until the Cold War did

teachers and school administrators come under scrutiny by the federal government, and that was a consequence of a climate of fear. The United States government began to direct the curriculum of mathematics, science, and foreign language courses in the public schools through the National Defense Education Act of 1958 in response to the launch of the Soviet satellite *Sputnik*. This increased involvement in public education was accomplished primarily through financial incentives, as government purchasing power affected textbook publishers and government funding of math, science, and foreign language departments in public schools increased their influence within their schools (Webb, 2006). This use of federal funding to shape education became an even more important feature of public education in the United States in the decades to come.

The power to offer funding to programs that national political leaders wished to support and to withdraw it from those they did not became much more pronounced with the passage of the Elementary and Secondary Education Act (ESEA) in 1965. This was the first time the United States government had authorized spending to support academic education in elementary and secondary schools on a large scale. The most significant part of this act, at least in its early years, was Title I, which accounted for 80% of the funds budgeted for the ESEA's programs. Conceived as part of Lyndon Johnson's War on Poverty, Title I continues to channel money to the economically disadvantaged in an effort to reduce the educational inequality between American socio-economic groups (Elmore & Rothman, 1999). However, because much of this support comes in the forms of grants awarded to schools, the possibility of losing that grant funding has compelled school leaders to be accommodating of the expectations of the United States Department of Education. Furthermore, because ESEA must be reauthorized on a regular basis, it has been expanded repeatedly. President George H. W. Bush worked with a council of

state governors to promote the adoption of national standards starting in 1989. President Bill Clinton used the 1994 reauthorization of ESEA to further promote nationwide standards and testing, in part through the Goals 2000 bill that was passed alongside the ESEA reauthorization. The most significant change since the passage of the original ESEA came under the presidency of George W. Bush, in the No Child Left Behind Act (NCLB) which reauthorized the ESEA again in 2002. Unlike earlier ESEA-related regulations, this one required states to develop and assess standards in several areas. Schools that failed to show improvement in the assessed areas would have their names published and face the possible loss of ESEA funding, and teachers and administrators working in those schools could possibly lose their jobs (Fowler, 2009).

National scrutiny and legal requirements for public schools have only increased since then. President Barack Obama's Race to the Top initiative has allowed some states to relax some of the requirements created by NCLB if they created new ones that were similarly rigorous. Tennessee's First to the Top plan allowed Tennessee to obtain this relaxation and become one of the first two states to earn federal funding under the Race to the Top plan. While the new regulations have increased the level of accountability, they are too new for a consensus to exist on whether or not they are effective. They are viewed as a major challenge by many professional educators, however (Camera, 2014).

A Brief History of Career Technical Education

Providing education in order to train a student in a skilled craft or trade is one of the oldest forms of education, and has been regulated since the Middle Ages, or earlier. For centuries apprenticeships were regulated by the guilds to which the masters training the apprentices belonged, but in an early instance of national-level educational regulation the 1563

Statute of Artificers placed the system of training apprentices and recognizing them as masters of their crafts under national control, even mandating seven years of training (Innes, 1995). In the English colonies in America, and especially following the independence of the United States, the customs and laws of formal apprenticeships to craft guilds declined until the point that such guilds had nearly vanished by the early 19th century (Johnson, 1978).

As technology and social groups changed, however, the methods of organizing workers' training had to change, too. Among the driving forces behind this in the United States during the late 19th and early 20th centuries were the increased division of labor and the deskilling of labor in factories through the development of the assembly line and theories of scientific management. Another important social change that affected workers' training was the increase in immigration from Eastern Europe in the late 19th century, bringing a wave of so-called *New Immigrants* whose culture seemed more alien and who had fewer technical skills than some earlier waves of immigrants, particularly the German immigrants of the 1840s and 1850s. The common school movement of the 19th century arose in large part to assimilate a new urban working class into what was then considered typical American culture and to prepare them for factory work. Although this was primarily aimed at making immigrants into good workers, rural American moving to the growing cities in search of jobs, African-Americans seeking a way to escape their dependence on white landlords, and Native Americans being encouraged or forced to leave their native lands also found their way into a growing education system geared towards providing them the skills they needed to work in a factory such as literacy, numeracy, and conforming to a schedule dominated by clocks and bells (Webb, 2006).

The financial benefits and social limits of industrial education was a contentious issue among African-American leaders at the beginning of the 20th century. Booker T. Washington,

the founder of the Tuskegee Institute, a predominantly vocational school for African-Americans in Alabama, promoted instruction in skilled trades for African-Americans living just a generation after the end of slavery. He argued that earning a good living through honest labor in a skilled trade offered a person an escape from farming on Southern plantations, but was also worthwhile "not alone for financial value, but for labor's own sake and for the independence and self-reliance which the ability to do something which the world wants done brings" (quoted by West, 2006, p. 193). To help his school meet national standards and to give his students practical experience, Washington hired professionals in the fields that were taught at Tuskegee whenever possible (Weiss, 2012). On the other hand W.E.B. DuBois, a founder of the NAACP, argued that industrial education was insufficient to making good citizens of its students, insisting "that the object of all true education is not to make men carpenters, but to make carpenters men" (quoted by Shaw, 2013, p. 213). While DuBois believed that vocational education was valuable, he thought that Washington and other educational leaders who considered it the primary means by which African-Americans might improve their status were too willing to diminish the opportunities and personal value of African-Americans by insisting they pursue trades rather than higher education (Shaw, 2013). Their philosophical debate between training students in skilled trades and promoting the pursuit of higher academic education presaged a debate that would last throughout the 20th century, and afterwards.

The growth of public education designed for making good workers was directed by local leaders, sometimes on the advice of experts, until the early 20th century. In 1917, under pressure from an organization led by business interests and concerned about American preparedness for a possible war with Germany, Congress passed the Smith-Hughes Act, providing federal funds for the training and salaries of teachers in the fields of agriculture, industrial trades, and home

economics (Webb, 2006). By defining vocational training, by funding it, and by requiring states to submit annual plans for how they would use the funds granted them, the Smith-Hughes Act made vocational training a very early example of the federal government using the power of public spending to provide support for and gain oversight of a sector of public education. It, and subsequent federal legislation, also shaped how vocational education would be provided (Calhoun & Finch, 1982).

One method of offering vocational education that developed in the 20th century was the two-year junior college or community college. These junior colleges began with multiple functions. They were meant to offer some academic education beyond that provided by local high schools but less than that provided by four-year colleges, in some cases as preparation for study at such a college and in other cases for fields in which some education was needed but a four-year degree was not viewed as necessary. Many teacher training programs began as two-year courses of this type; other two-year courses served as pre-business or pre-law training. In course of time, such programs of study became four-year degrees offered by universities. Junior colleges were also meant to offer vocational training for skilled trades between the level of the unskilled assembly line worker and the college-educated professional. In many ways, the two approaches seemed similar, but as two-year courses of study such as teacher training, pre-law training, and pre-business training became four-year degrees offered by universities, junior colleges became more focused on vocational training while still providing academic classes as a way to feed students into four-year colleges. The focus on vocational education that the Smith-Hughes Act promoted was emphasized in the 1920s and 1930s by the American Association of Junior Colleges, whose leaders felt they could best serve their students by focusing on terminal certificates and degrees in vocational training. However, federal policies and social changes in

the decades to come would promote both academic and technical courses in two-year colleges, which some felt created a lack of focus in those schools that made it hard for them to excel in either area, but especially in academic preparation (Cohen & Brawer, 2003).

The Servicemen's Readjustment Act, or G.I. Bill, passed in 1944 offered generous financial assistance to veterans attending college, which led to a massive increase in college enrollment in the decades after the Second World War, as veterans and then the children of the veterans' Baby Boom attended college. As many students without a family history of college attendance began to enroll in college, many found two-year institutions a helpful way to enter an academic environment that most public schools of the time had not prepared them for. This promoted the academic feeder aspect of junior colleges, maintaining demand for academic coursework at what increasingly came to be called community colleges (Cohen & Brawer, 2003). However, this status as feeder schools, often with open enrollment not limited by students' test scores or high school academic performance, meant that community colleges were increasingly seen as options only for students without the academic preparation or even the academic ability necessary for success at a four-year university. This contributed to a growing stigma attached to community colleges in the public's perception of them (Deil-Amen & Rosenbaum, 2002). Furthermore, federal laws promoting vocational education, such as the Vocational Education Act of 1963 and succeeding laws reauthorizing and expanding it, have made CTE classes the main source of federal funding for most two-year colleges, and thus their main focus in many places, even as they maintained parallel academic curricula (Cohen & Brawer, 2003).

The influence of the federal government over vocational education was expanded through a series of laws leading up to the Vocational Education Act of 1963, one of Lyndon Johnson's

first steps in waging war on poverty (Webb, 2006). In addition to providing funding for two-year vocational colleges, the Vocational Education Act was amended in 1968 and again in 1976 to give the federal government more authority over state boards of education in their implementation of vocational training, including the power to evaluate their compliance with national standards. They also expanded oversight of postsecondary vocational education (Calhoun & Finch, 1982). This power was expanded further with the Perkins Acts.

The Carl D. Perkins Vocational Education Act of 1984 recognized the value of vocational education and offered funding meant to increase access to vocational training, especially for students with special needs or from disadvantaged backgrounds. In 1990, the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, or Perkins II, was passed to expand the original Perkins Act. In 1994, the School-to-Work Opportunities Act (STWOA) was passed to promote cooperation between schools and businesses to ease the transition from school to work and coordinate schools educational planning with employers' needs. The act was reauthorized again in 1998. In this form, known as Perkins III, it offered even more funding and in some ways greater flexibility in the use of that funding but also required more government oversight of states' vocational training programs. The Carl D. Perkins Career and Technical Education Improvement Act of 2006, or Perkins IV, redefined vocational education as Career Technical Education, or CTE, which has since become the preferred term. It remains the main source of funding for CTE in the United States, although its level of funding has not been increased since 2002, and when inflation is taken into account, it actually provided a lower value of financial support at the time of its extension in 2013 than it did when it was reauthorized in 2006. Despite this, it continues to play an important role in supporting and defining CTE in American public education (Gordon, 2014).

Even as the federal government expanded funding for CTE and increased its oversight of it, CTE enrollment was declining and public perceptions of CTE were changing for the worse. As college attendance became more common in the decades after the Second World War, many high schools began to focus on preparing their students for college while treating CTE programs as a second class track or even a dumping ground for students they did not feel were suited for college. In some cases this tracking was based on academic performance and in others on social class (Cohen & Besharov, 2002). Some educational philosophers on the political left influenced by the counterculture in the 1960s and 1970s even criticized CTE programs for acting as a mirror rather than a corrective to existing society and reinforcing social trends that led to a loss of dignity for many citizens by entrenching existing socioeconomic distinctions (Button & Provenzo, 1983). These criticisms contributed to a decline in CTE enrollment in those decades that has not abated (Foster, 1997).

The perception that CTE was a part of the educational system where less academically capable students were shunted away from core classes began to reinforce itself, as some CTE teachers began to assign less work and less rigorous work. At the same time CTE programs struggled to attract and retain qualified and motivated teachers as talented students began to avoid CTE classes due to a perception that they were of lower quality and status (Cohen & Besharov, 2002). A doctoral dissertation by Haney (2002) reported that in the Florida school district where he conducted surveys, one of the main reasons for a local decline in student interest in CTE was a perception that CTE teachers were of lower quality, although the number of academic credits required for graduation also limited the amount of time available for CTE. Likewise, many parents have come to expect their children to attend four-year academic colleges, and therefore have discouraged their children from taking CTE classes, let alone

dedicating their education to vocational training (Cohen & Besharov, 2002). In fact, simply changing the name of this form of education from vocational training to CTE was done partly to remove the stigma that attached to what was perceived as an inferior or outdated form of education (Wang, 2010). This perception was reinforced by in the 1980s by changing educational policies in the United States and by fears of economic changes based overseas.

In the 1970s and 1980s, the growth of Japan as an economic power worried many Americans. According to some polls in the 1980s, for a brief period some Americans even viewed Japan as a greater threat to the United States than that posed by the Soviet Union (Kasubuchi, 2002). This fear was based on Japan's rapid economic development, particularly in automobile manufacturing, as well as Japanese investors' high-profile purchases of Rockefeller Center and the film studios of Universal Studios and Columbia Pictures (Hook, Gilson, Hughes, & Dobson, 2005). A decline in manufacturing jobs in the United States due to competition from lower-paid workers overseas, although not quite as severe as was often perceived, led many Americans to question whether manufacturing jobs would be a meaningful source of employment in the future (Ezrati, 2004). Furthermore, studies at the time of the Japanese education system demonstrated a focus on language and mathematical skills as well as on teaching cooperation, methods which some American business leaders felt American schools should emulate (Ito, 1996). This culture of cooperation was also manifest in a culture of company loyalty, in which employees loyally served their companies, but corporate leaders also protected their employees, with job security almost completely guaranteed and salaries and promotion based primarily on the length of workers' service with the company. American businesses demonstrated a rapid decrease in their loyalty to their workers and the possibility of staying in one job for life became less realistic for many Americans, contributing to a sense of

insecurity, particularly in the manufacturing fields that were once an important part of CTE. Where possible in American companies, secure and skilled but expensive unionized labor was being replaced, if at all, by cheaper, minimally qualified hourly workers, further expanding what Lincoln and Doerr (2012) described as a loyalty gap. This sense that American companies were falling behind their international competitors and that American students were not prepared to compete with their foreign peers was one of several things that put political pressure on schools to increase their academic standards (Cavanagh, 2012).

The reduction in respect and support for CTE accelerated in the 1980s following the publication of *A Nation at Risk* in 1983. That report led to the creation of more demanding academic criteria for American students, but in high schools the increased requirements for graduation left students less time for CTE and contributed to three decades of declining rates of CTE enrollment (Bridgeland, Litow, Mason-Elder, & Suh, 2012; Camp & Heath-Camp, 2007). Although the average number of credits earned in CTE have declined, some areas have declined more than others, and a few have even increased, partly in response to job needs and partly due to perceptions of them as more prestigious than others. Between 1990 and 2009, the percentage of high school graduates nationwide who had taken any CTE classes declined slightly from 88% to 85%, while the average number of CTE credits earned by high school graduates declined from 4.2 to 3.6. However, the decline was even more distinct in CTE courses related to construction, transportation, engineering, computers, manufacturing, and business, while the average credits earned in classes related to communications, health care, public services, and culinary services increased (Institute of Educational Sciences, 2013).

Challenges Facing Schools

When the Elementary and Secondary Education Act (ESEA) of 1965 was reauthorized by the No Child Left Behind Act (NCLB) which was signed into law in January, 2002, the states had three years to create their own curriculum standards, graduation requirements, and the rate of graduation that they would require of schools across the state as well as the instruments by which they would assess schools' adequate yearly progress in meeting these requirements (Boehner, 2004). After over a decade of adjustment to the rules created under this act and subsequent legislation, high school students in Tennessee are required to take standardized tests in mathematics, biology, language arts, and social studies, in addition to fulfilling requirements to earn a certain number of credits, including some in specific subject areas. Schools are also required to show a graduation rate of 90%, and a student is only considered to have graduated if he or she does so within four years of beginning high school (Tennessee Department of Education, 2010). Other states have adopted other, often more stringent standards. In Tennessee and many other states, these new requirements are being further modified by the adoption of Common Core State Standards, although it is possible that some states that have announced plans to implement the Common Core State Standards may abandon them because of the political controversy surrounding them (Bidwell, 2014). Because the immediate negative consequences of a low graduation rate are applied to schools rather than to students, it is incumbent on school leaders to keep their graduation rates high both for the good of their students and for the good of the staffs of the schools they lead.

According to a series of papers presented at a meeting of the American Youth Policy Forum (Brand, 2008), one serious problem in secondary education has been a lack of student engagement in school, which contributes to the dropout rate. This lack of engagement has been

inspired in large part by some students' sense that their studies tend not to offer skills with practical applications. Several of the papers proposed addressing this through an improvement of CTE programs and by connecting academic learning with technical education. One suggestion for making such connections involved showing students in carpentry classes how the Pythagorean Theorem they were taught in math class is used by carpenters and builders to make accurate right angles and square corners. Another problem in many of CTE programs described by the presenters was that they were not aligned well with postsecondary training programs or with local employment needs, so that even students who were engaged in CTE might not have been able to use their technical education in the job market upon graduation. The presenters proposed that identifying students who would benefit from CTE programs, offering them more guidance in choosing the best programs in high school and in finding the best postsecondary training and careers, and coordinating high school CTE programs with postsecondary programs and the needs of employers would all help to make American high school students more engaged in their high school education and more productive and involved in their communities after graduation. Although such advocacy of CTE programs is common in the literature, there are a few dissenting voices that question the positive effects of CTE programs, as described below.

Despite the general approbation that CTE programs receive from educational and business leaders who may not be directly connected with the high schools, community colleges, and other institutions that offer CTE classes, there are a few researchers, such as Bae, Gray, and Yeager (2007), who have identified possible problems with participation in CTE. They have contended that the stigma that CTE classes still have in many high school and other educational settings has resulted in CTE participants developing a lower self-esteem and experiencing greater disengagement from their academic community. This in turn may have ultimately made them

less successful than other students their age who were not considered vocational students. By comparing performance differences on eleventh grade math and reading tests between CTE and non-CTE students with similar proficiency scores on eight grade tests and by comparing eleventh grade math test scores with eighth grade math proficiency and high school math class enrollment using two different cohorts of students from two CTE high schools in Pennsylvania, Bae et al. found no significant difference between CTE and non-CTE students in their reading test scores and actually found that CTE students performed worse than non-CTE students on their math tests. When other factors, such as the number of college preparatory classes different students had taken were controlled for, though, even that difference vanished.

Although the findings of one research study of two high school cohorts are hardly definitive, they did suggest that CTE programs may not be the panacea that they have lately come to be presented as. Furthermore, a larger study of public high schools in Florida (Jacobson & Mokher, 2014) also found no evidence that CTE improved students' graduation rates in high school once other factors were controlled for, although it did find that CTE in college or other postsecondary education did increase rates of graduation and income levels for students who earned a certificate or degree in CTE. Jacobson and Mokher also found that there were differences at the high school level between rural and urban school systems in that rural students were more likely to complete CTE concentrations than urban students, although once other factors were controlled for, that did not translate into wider levels of student success at the high school level. On the other hand, some researchers, such as Aliaga et al. (2011) have suggested that many studies on the effects of CTE programs are incomplete because they may have left out many students who took a small number of CTE classes and benefited from them,

but who were not considered to be CTE students for statistical purposes because they took only a few CTE classes.

Another problem for schools where educational leaders want to promote CTE is that there is a shortage of qualified CTE teachers in many areas. In part this is due to the negative perception of CTE that still exists among many people, which has discouraged talented people from seeking certifications to teach CTE classes (Wang, 2010). Likewise, the declining respect accorded to CTE classes and their frequent use (or perceived use) as a dumping ground for non-academic students has demoralized some experienced CTE teachers, some of whom hare even chosen to retire early to escape careers that are no longer as satisfying as they once were (Tucker, 2012). Furthermore, many CTE teacher education programs have been eliminated across the country, which has meant that there have been fewer new teachers being trained than there have been experienced CTE teachers retiring. One possible solution to this shortage is the creation of alternative methods of teacher certification, and all 50 states and the District of Columbia have some form of alternative licensure, although that has not yet alleviated the CTE teacher shortage. If expanded CTE programs are one way to address some of the challenges facing schools, finding a sufficient number of talented CTE teachers is yet another one of the challenges that schools must overcome (Conneely & Uy, 2009).

Challenges Facing Employers

Not only do school leaders need to ensure a high graduation rate, but they also need to improve students' preparation for the job market. A recent survey by the Society for Human Resource Management (2013) found that employers hiring or considering hiring 2013 college graduates found a number of deficiencies in their preparation for the workplace. The lack of

necessary skills was the second leading reason overall why employers chose not to hire 2013 college graduates. Fully 20% of employers surveyed reported a lack of skills as the primary reason they had not hired any recent college graduates; the only more common reason not to hire recent graduates was that many of the companies surveyed simply did not have any openings at the time. Even 20% of those employers who stated that the graduating class of 2013 had advantages over earlier college graduates reported that one of their advantages was merely that they were less likely to be overqualified than other applicants. The most significant problems were a lack of basic reading and writing skills (49% of employers reported a lack of these skills) and poor mathematical skills (18% of employers reported deficiencies in this area). Worse, those numbers were only drawn from the responses of employers who had hired or actively planned to hire 2013 graduates; the responses of employers who had not and did not plan to hire any recent graduates were not even tabulated in those percentages. Among the hardest positions to fill were those requiring technical training, such as jobs for engineers, technicians, and practitioners of skilled trades such as electricians, carpenters, machinists, mechanics, welders, and plumbers. If those are the perceptions of recent college graduates, it seems likely that similar problems might be found among applicants who have just graduated from high school.

A series of interviews of recent high school graduates, business leaders, and college instructors conducted in 2004 by Peter D. Hart Research Associates revealed that many high school graduates and their potential employers felt that the graduates were not sufficiently prepared for college or employment. Of the students interviewed for the study, only 61% of college students and 60% of high school graduates who went directly into the workforce felt prepared by high school for college or a career. Their perceived lack of preparation was not only in academic skills, but also in work habits necessary for success in their studies or workplace.

Employers who were surveyed estimated that 39% of high school graduates were completely unprepared for the expectations of entry-level jobs, while 45% were unprepared to advance beyond entry-level positions. 28% percent of interviewed employers were not satisfied or even partly satisfied with the preparation that high schools were providing for their students. College instructors were even less satisfied, with only 18% considering the majority of their students to be well prepared by high school for college. 80% of non-college students and 82% of college students claimed that they would have worked harder and achieved more in high school if there had been higher standards there, and supported raising standards in high schools. While the study's recommendations focused on improving academic standards, 97% of non-college students reported that high schools should offer more opportunities for real-world learning and make coursework more relevant.

A similar lack of properly-prepared workers has been reported ("Behind the Scenes," 2014), in the state of Georgia, whose leaders hope to develop a film industry in the state. Although Georgia offers generous tax credits to film production companies that make movies in the state, some filmmakers have been reluctant to film in the state, or have undertaken film production there only to later change their minds due to the difficulty of hiring workers capable of building sets, doing electrical work, or running sound systems. This shortage is a problem for other industries in Georgia, too, as recently only one new worker has been trained in a skilled trade for ever four who have retired. Georgia's leaders have responded, in part, by increasing funding for trade schools and technical colleges, particularly focusing on the training needed for industries that they want to promote, including filmmaking. Some of those schools have also begun collaborating with industry leaders to design specialist courses, and the head of one Atlanta-based film production company has announced plans to offer his own summer courses to

teach students how to work on a film set in hopes of filling the gap he has seen in the local workforce. This is one of many attempts to align the work of educators with the needs of employers.

According to a report by the McGraw-Hill Research Foundation (Bray et al., 2011), business leaders at a conference of Wisconsin educators also reported a large and growing skills gap between the kind of highly trained employees modern businesses needed and those that were actually graduating from public high schools, technical colleges, and universities. In discussions between leaders in business and education, both groups also agreed that a typical bachelor's degree in the liberal arts and even some scientific fields no longer guaranteed, or even necessarily provided the opportunity to pursue, a good career in the 21st century. In fact, due to a shortage of workers with the technical skills needed by employers in countries with developed economies, a worker with the requisite technical skills could command a starting salary higher than those available to the typical college graduate with a B.A. Although this financial incentive particularly applied to forms of technical education that result in a college degree, such as a degree in engineering, it could also apply to many technical fields that require college-level skills, but not a college degree. Despite this, many high school, technical school, and even university graduates were considered ill-prepared to enter such fields, even if they had a certificate or diploma suggesting they should have had the expertise necessary for technical employment. The report quoted an earlier statement by the CEO of Caterpillar, Doug Oberhelman, that his company had "to retrain every person we hire" (Bray et al., 2011, p. 7). He described this problem among recent graduates as acute and claimed that it existed because "the education system... has failed them" (p. 7). On the other hand, some educators at the conference complained that business leaders often did not communicate their needs, especially at the local

level, to educators, making it hard to match educational programs to the employment needs to the current business climate. Bray et al. concluded, after considering the points of view of business leaders, educators, and government officials, that business leaders, educators, and government agencies needed to collaborate better in order to create meaningful CTE programs that could meet the existing needs of employers which would, in turn, help meet the future career of the students they taught.

A report by the Institute for Higher Education Leadership & Policy (2011) also described an investigation of CTE programs in community colleges in California, focusing on patterns of student enrollment and progress in four high-wage career pathways with jobs in high demand: information technology, engineering technology, engineering, and nursing. Although the report described the value of those programs and the difficulty employers have had in filling all the positions they had in those fields, it also revealed serious problems with CTE programs in California at the time of the study. One major barrier to success was, once again, a lack of necessary math skills among high school graduates. Other problems faced in California included poor coordination between and among high schools, community colleges, four-year colleges, and employers in the state, poor coordination and unclear standards and expectations within many community college CTE programs, and a badly-integrated system of data storage an analysis, making problems hard to spot or analyze and solutions difficult to implement. As noted above, many of these complaints are not unique to California, particularly the criticism that CTE programs do not actually prepare students for the workforce because they are not well coordinated with local employers and their needs. In general, the investigators reported that CTE programs were considered to be important, but often given little support or meaningful oversight. In California, at least, this report's highly critical findings led to the publication of a series of

more in-depth reports about the failings, successes, and recommendations for improvement of the state's CTE programs.

In 2012 and 2013, the Institute for Higher Education Leadership and Policy published a series of four articles to follow up on the findings of their 2011 study to examine CTE programs in the state of California's public school and college system in greater depth and to recommend ways to improve the weaknesses their earlier work revealed. Part I (2012a) discussed the importance of CTE training in preparing students to enter the workforce, and California's weakness in that area. Although this report focused primarily on the role of two-year community colleges in providing that type of CTE training, although the authors did mention the importance of coordinating high school and college CTE programs. Part II (2012b) of the series identified various problems with the existing CTE programs in California, among which was a lack of coordination between the course offerings in many CTE programs and the actual needs of the workforce. Part III (2012c) was primarily a description of other states' community college and junior college CTE programs organized in categories that matched what the authors viewed as California's main areas of concern: determining what degrees and certificates to offer (focusing on the most important ones rather than spreading resources too thin by offering a wide but shallow range of classes), creating consistent, state-wide proficiency standards, coordinating high school, college, and career pathways, measuring the success of CTE programs, and paying for them. Tennessee was among the states praised for excelling in several of the areas in which California was weak, mainly due to the good management of the Tennessee Technology Centers. The Tennessee Technology Centers were described as being particularly good at selecting appropriate degree and certificate programs, providing those programs in a consistently structured way, holding CTE programs accountable for their work, and in funding CTE well.

Part IV (2013) of the series concluded by recommending better integration of CTE into the core curricula of colleges, elementary schools, and secondary schools, partly by offering counseling in CTE classes to help students gain more exposure to and have more guidance in CTE programs. It also recommended working more with businesses to help focus CTE programs on the labor needs of the community, so that graduates of CTE courses would be able to use their skills to get jobs. Although many of the recommendations were presented in ways that are specifically applicable to California's laws and practices, the overall findings that CTE programs could be very helpful to students, but often were not due to poor organization and marginalization within the field of public education, and the general recommendations for improving CTE programs, could be applicable anywhere.

Other states have also studied problems in high schools and recommended increased involvement in CTE programs as one way to address some of these concerns. The Michigan Department of Education published a white paper in 2009 "to help secondary school administrators, teachers, and parents coordinate the programmatic requirements of Career and Technical Education (CTE) with those that govern the rights of students in Special Education programs and those with a 504 plan" (Office of Career and Technical Education, 2009, p. 1). The report recognized the value of CTE programs in retaining the interest of students receiving special education services and in helping to prepare them for an adult career that would not require the kind of college education or large amount of esoteric academic knowledge that many of them would be unlikely to attain. According to the report, a good CTE program could help such students find employment after graduation and enjoy a productive adult life. The authors of the paper also recognized that many special education teachers and other teachers, administrators, and parents do not understand the requirements of CTE programs, which often

results in special education students being placed in CTE classes for which they are not suited. To help both special education students and those who care for them, the report tried to bridge that gap in understanding. In doing so, it explained many of the laws that govern both CTE and special education programs, and showed some of the ways it is difficult to reconcile the requirements of both programs. It also suggested ways to bridge that gap despite the difficulties, primarily based on developing a better understanding of what CTE programs provide and of individual students' needs and abilities. Like many other writers on the subject, the authors of this report also recommended better coordination of CTE programs with the needs of local employers. These were only a few of the many suggestions in the existing literature for using CTE to improve student success during and after their formal education.

Career Technical Education as a Contributor to Student Success

The preponderance of recent research on CTE suggests that it can be an important contributor to student success, both in terms of graduation rates and as preparation for gainful employment in fields that are often understaffed. Although the majority of American teenagers completes high school or earns a GED or other graduation equivalency certificate, the fact remains that around 5% of American high school students never do so, and many more only do so after a period of time in which they drop out of education, only to return later. A report published by the National Research Center for Career and Technical Education largely attributed this to a process of gradual disengagement from school that involves a period of frustration with academic education, declining self-esteem, a lack of support for struggling students, and the absence of a high personal or family value placed upon education (Plank et al., 2005). The authors postulated that for students whose learning styles were not suited to traditional academic

settings, the more hands-on and practical approach of most CTE classes could engage students who do not normally succeed in academic classes primarily based on lectures or on reading.

Using data from the National Longitudinal Survey of Youth 1997 to examine the association between ratio of students' CTE classes to academic classes and their likelihood of dropping out of high school, Plank et al. (2005) concluded that CTE enrollment can play a significant role in reducing dropout rates. The most significant benefits were found for students who entered ninth grade below the age of fifteen, and those students experienced the greatest benefits if they took approximately one CTE class for every two academic classes. The study also revealed other factors that tended to increase dropout rates, including the fact that students who were older than other students in the same grade were more likely to drop out than their peers who were in the same age group as their classmates. To counteract this, Plank et al. encouraged administrators to inculcate an inclusive school culture that values graduation in hopes of overcoming the stigma older students may feel if they perceive that they are being left behind by their peers and begin to feel a desire to move on with their lives. This is also important because, as the Society for Human Resource Management has pointed out (2013), it can be very hard in today's technologically advanced society for someone without either academic or technical skills to find gainful employment in adult life.

That concern is not unique. Although Mohr (2008) stated that "for those who do not attend college after high school, there are many opportunities in CTE that can provide good employment offering a competitive salary, benefits and job security" (p. 34) in careers such as construction, he also noted that in many places, employers have found it difficult to hire qualified workers. Using carpentry, the largest field of employment in the construction industry, as an example, he reported that many prospective carpenters were at a distinct disadvantage

because they lacked basic mathematical skills vital to that profession. He therefore recommended both stronger CTE programs in high schools and a better integration of CTE programs and basic academic classes, particularly those math classes that improve basic numeracy and the ability to use fractions, work with angles, and calculate area. He echoed the example suggested by Brand (2008) of students learning how carpenters could use the Pythagorean theorem in their work. Mohr proposed that by solving concrete problems such as taking measurements and reading blueprints as part of math classes, math classes for CTE students could be both more engaging and more useful.

Other studies have also suggested that CTE programs can improve student retention and graduation rates. The High Schools that Work program created by the Southern Regional Education Board has collected data about student assessment scores, grades, and student and teacher responses to surveys. Two studies (Kaufman, Bradby, & Teitelbaum, 2000; Wonacott, 2002) of data collected for the school years between 1996 and 1998 indicated increases in student test scores in schools using the High Schools that Work curriculum and methodology. Both studies attributed part of this success to the creation of educational plans for individual students overseen by the students, their parents, and designated school officials. Kaufman et al. also attributed some of this improvement to the practice of whole school reform, particularly mixing CTE and academic curricula for all students, which at the time of their study was a departure from the practice of many schools. Part of the rationale for this was that, with appropriate guidance, students with a preference for CTE would still be held to high academic standards and could learn academic material in a way that was integrated with practical applications through CTE courses, while students inclined to more academic pursuits would still gain some pragmatic experience in CTE. The concept that academic students could benefit from

some CTE was presented by later researchers, too, such as that of Aliaga et al. (2011) and Aliaga et al. (2012). A more recent study of High Schools that Work has also indicated that the mixture of high academic expectations with a coordinated academic and practical curriculum are the main contributors to the success of schools using the practices of High Schools that Work (Young & Cline, 2008). The High Schools that Work program has recently been expanded through the Technology Centers that Work program to help students and teachers, particularly those involved in home schooling, to collaborate with technology centers to promote career and college readiness, to share technology center resources with schools and home schooled students who might not otherwise have access to CTE, and to integrate CTE and academic study (Southern Regional Education Board, 2009).

Another study of the effects of CTE programs on student success was undertaken as part of a doctoral dissertation at East Tennessee State University by Loveless (2011). This dissertation presented the results of research on the effect of participation in CTE programs on students in eight school districts in East Tennessee, based on an analysis of publicly available data from the 2007-2008 and 2008-2009 school years. In it Loveless compared CTE graduates in those districts with the state baseline for postgraduation placement in college or careers; the CTE graduation rate with the overall graduation rate for those eight districts; male and female CTE students' graduation rates; the CTE graduation rates in those eight districts with the state baseline; and the CTE graduation rates in those eight districts with the overall graduation rate for all students in Tennessee. The data were analyzed using a series of chi-square tests. For the most part, the data from the 2007-2008 school year indicated that CTE participation tended to have a statistically significant positive effect on students, but most of the data from 2008-2009 were statistically inconclusive. However, in both school years, the graduation rate of CTE

students in the eight districts studied was higher than expected based on overall state-level data, suggesting that taking part in CTE programs was valuable for those students. Because the results of this study were promising, but only encompassed eight school districts over the course of two school years, it was deemed worthy of continuation and expansion to see if its findings could be replicated across a larger area and span of time. The methodology employed by Loveless was simple and straightforward, and informed the methods used in this study.

Another dissertation completed in 2011 by Shadden described similar challenges facing educators and students in Tennessee. The challenge of making adequate yearly progress makes improving graduation rates important to school leaders while students who drop out of high school face significantly lower levels of income over the course of their lives. Through independent sample *t* tests and one-sample *t* tests, Shadden analyzed publicly available data on the Tennessee Report Card for the school years 2007-2008 and 2008-2009, and found that in most cases there was a significant difference in graduation rates of CTE concentrators and of non-concentrators for the student body as a whole and for students within certain subgroups, which in his study were sorted by student gender. In the cases in which there was a statistically significant difference, CTE concentrators had higher graduation rates than non-concentrators. Shadden's methodology also informed the methods used in this study.

In a paper presented at the annual meeting of the Association for Career and Technical Education Research in 2011, Aliaga et al. not only argued that participation in CTE has a positive effect on students' lives, education, and careers after high school, but that total student participation in CTE classes is often inadequately reported because students who only take one or two CTE classes in a particular field of CTE are often not considered CTE students. Aliaga et al., however, described such students as *experimenters*, and considered them an important part

of any CTE program. Part of their importance stemmed from the fact that such students may account for up to 84% of students with some exposure to CTE. Their preliminary research indicated that such experimenters did tend to pursue the fields in which they experimented in high school into college and their later careers. In fact, because they were not tracked into a particular CTE concentration, they could tailor their CTE experiences to their expected needs. This did mean that such students needed guidance at least as much as traditional CTE students, whom other papers (Brand, 2008) had already indicated needed more concrete and practical guidance than they often got, but it also meant that they were an important part of CTE programs who must be considered alongside the more traditional CTE students.

When studying the effects of CTE on student success, identifying CTE students is one of the first steps in designing a research plan. The work of Aliaga et al. (2012), which was related to the research underlying the 2011 presentation by Aliaga et al., used the same terminology as that presentation, describing students who took a small number of CTE classes as experimenters while contending that such students were also a vital part of CTE programs and that they benefitted from their participation in them. Their study described a typology that allows researchers to explore and analyze the CTE credit-taking experience of all high school students, not just those traditionally considered CTE. This typology was based on data from the Education Longitudinal Study of 2002, collected by the National Center for Education Statistics (NCES) of the U.S. Department of Education, which included both quantitative data and information from qualitative interviews with students participating in CTE classes. Using this data, students were sorted into eight different categories based on the number and type of CTE credits they had earned. Most of these categories were made up of students who fall outside traditional definitions of CTE or vocational students. This study found that almost all high school students,

including those from high-income families not normally considered typical CTE students, take at least some CTE classes. It also found that taking part in CTE classes did not necessarily correlate with low academic grades, despite the stereotype described in some conflicting research such as that by Bae et al. (2007). Finally Aliaga et al. (2012) indicated that while many students can benefit from CTE courses, participation in CTE did have a particularly strong effect on improving student retention and graduation rates among students who had a strong concentration in CTE programs. The typology and methodology of this study were sound enough and explained clearly enough that they could inform other research in the effect of CTE programs on student success. Indeed, they suited this study particularly well, as the State of Tennessee's definitions of *CTE concentrators* as students who take three or more CTE credits in one school year and *CTE participants* as students who take at least one CTE credit in one school year are quite similar to the distinctions made by Aliaga et al. (2012).

The Future of Career Technical Education

Although CTE has suffered from stigmatization in an educational system that has focused on preparing students for admission to four-year colleges (Deil-Amen & Rosenbaum, 2002) and Perkins Act funding currently provides a lower value of financial support at the time of its extension in 2013 than it did when it was reauthorized in 2006 when inflation is taken into account (Gordon, 2014), the lack of political support that CTE programs have suffered may be changing. In 2012, the North Carolina state legislature's Legislative Research Commission authorized a special committee to review the effectiveness of CTE programs in North Carolina's schools, particularly regarding their success in preparing high school students for the job market. The committee recommended (Legislative Research Commission, 2013) making it easier for

professionals in desirable fields to obtain licenses to teach CTE class in high schools to correct a deficiency in the number of CTE teachers employed in the state. Like California's Institute for Higher Education Leadership & Policy (2012b; 2013), Michigan's Office of Career and Technical Education (2009), and others (Bray et al., 2011), the North Carolina Legislative Research Commission (2013) also recommended better coordination between educators and business leaders to prepare students for the needs of the existing workforce. What this report added to that widely-offered recommendation was to improve the recognition and respect accorded to CTE within the state's high school educational system by recognizing student completion of CTE coursework through special endorsements on high school diplomas that would reward students for their accomplishments and indicate their job skills to prospective employers. In recognition of the importance of CTE, one of the committee members, Aaron Fleming, was later even hired away from his position as director of CTE for Lee County Schools to serve as an advisor to the speaker of the North Carolina House of Representatives (Trogdon, 2015). The committee's proposal was signed into law in 2013 in North Carolina, as were similar recommendations in Florida, Texas, and Wisconsin (Association for Career and Technical Education, 2014).

In Tennessee, where the Tennessee Diploma Project has raised requirements for students to graduate with a standard diploma, one of the new requirements is concentration in an elective area through earning at least three credits in one of five elective focus areas. One of those five elective focus areas is CTE (Tennessee State Board of Education, 2014a). Furthermore, students pursuing an elective focus in CTE must concentrate at least three of their CTE credits in one of 16 career clusters in order to better align student preparation with the needs of the work force and the expectations of postsecondary education (Southern Regional Education Board, 2014).

While these plans in Tennessee, North Carolina, and other states primarily offer recognition and respect to CTE, other state and national leaders have proposed offering new forms of funding as well.

A number of leaders in local and state governments and even at the national level have begun to express interest in increasing participation in CTE at the level of the two-year community or technical college. With this increased political interest comes a concomitant promise of increased funding. When Bill Haslam was mayor of Knoxville, Tennessee, he was impressed by a privately funded initiative called Knox Achieves, which offered local students tuition combined with mentoring at Pellissippi State University, a community college in Knox County. College enrollment numbers increased, and college graduation rates in Knox County improved 11.5% between 2009 and 2014. Under the name tnAchieves, the program has spread to other counties across the state, and students who have participated in it have maintained a higher retention rate than the state average (Tamburin, 2015). As governor of Tennessee, Haslam promoted the publicly-funded Tennessee Promise plan to use funds from the Tennessee Education Lottery Scholarship to offer scholarships covering two years of full tuition to Tennessee high school graduates enrolling in two-year community or technical colleges starting in the 2015-2016 school year. Haslam's stated goal is have 55% of Tennessee's residents earn a professional certificate or post-secondary degree by the year 2025 (Baker, 2014a). This plan has gotten attention outside the state of Tennessee, as well.

In January, 2015, President Barack Obama announced plans to offer funding to make the first two years of community college free for qualified applicants. These plans were partly inspired by Tennessee Promise, as well as by other local and state efforts to promote enrollment in technical training programs and two-year colleges ("Zero Tuition," 2015), such as the Chicago

STAR Scholarships which offer outstanding graduates of Chicago's public schools full tuition to community college ("Hard Work Rewarded," 2015). While these scholarships would not be only for students pursuing a certificate or degree in CTE, they would be among the beneficiaries of funding for students pursuing occupational training (Davis & Lewin, 2015).

There has been some criticism of both state and federal offers of scholarships, however. Lamar Alexander, a senator from Tennessee, has expressed support for state level plans such as Tennessee Promise, but has claimed to be concerned that a federally-supported plan might be too intrusive or too inflexible, and would prefer that such initiatives be left up to the states (Davis & Lewin, 2015). Leaders of some four-year institutions of higher education have worried that increasing funding for two-year institutions might reduce financial support for four-year institutions and reduce their attendance levels (Baker, 2014b). Another possible effect of Obama's plan is that since it provides aid to students by matching state aid to students at a three-to-one rate states may reduce direct funding to community colleges and increase direct aid to students. This may result in some colleges raising fees either to make up the shortfall in public funding or to take advantage of the additional tuition money that would become available, making it even harder to afford college for those who are not eligible for the program ("Zero Tuition," 2015). Others have criticized Tennessee Promise for only offering to pay tuition not covered by other sources of funding, so that it might not actually provide much additional financial assistance to students from lower socioeconomic backgrounds who would already be eligible for Pell grants or other need-based funding (Davis & Lewin, 2015). Most of these critics, however, have focused on details of the plans' funding and implementation, however, and not on the basic concept of promoting CTE training, suggesting that the value of CTE is widely-recognized, even if the best way to provide it remains a topic for debate.

Chapter Summary

Career Technical Education has a long history in the realm of public education in the United States, but one that has often been marked by controversy over which vocations educators should be preparing students for, or even whether they should be training students for a professional at all or if they should be preparing them for higher academic education. Today, educational leaders face a great deal of pressure from a complex set of laws holding them accountable for the success of their students. Students face the prospect of a job market in which it can be difficult to find gainful employment and which some report feeling unprepared to succeed in. Employers see many applicants without the job skills that they need. A solution to these challenges facing schools, students, and employers may be linked in CTE.

Many researchers have suggested that CTE programs that engage students and that are connected with the needs of modern business realities can improve student success by keeping them involved in school, helping them to graduate from high school on time, and preparing them for some form of postsecondary placement in the job market, military, or college. Even students who do not pursue CTE professionally may benefit from some exposure to it over the course of their education. However, a few researchers have indicated that CTE has a stigma that may actually hurt students who participate in it, while other studies have suggested that CTE may not have a significant positive or negative correlation with student success. Such critics are in the minority, however, and have not dissuaded political leaders from expressing support for CTE programs and in some places providing financial backing for CTE as well. The CTE elective focus area in Tennessee high schools and the Tennessee Promise program for Tennessee's college students are examples of this political support for CTE in action, and may even inspire new forms of support for CTE in other states or even nationwide in the future.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter described the methodology used in this study, including the research design and research questions. It then described the population and the sample selection process. The population consisted of all public high school students in the state of Tennessee eligible to graduate in the school years 2009-2010, 2010-2011, and 2011-2012. Samples were selected to consider CTE concentration in the state as a whole and in nine selected urban and nine selected rural school districts to investigate differences in graduation rates between CTE concentrators and nonconcentrators and differences in urban and rural CTE participation rates, graduation rates, and secondary placement of CTE graduates This was followed by a description of the data collection process. The primary source of data was the Tennessee Department of Education's publicly available school report card. The chapter concluded with a discussion of the analysis of the data using *z*-tests.

The purpose of this quantitative study was to examine the relationships between the independent variables of participation in CTE programs and enrollment in rural and urban school districts and the dependent variable of students' graduation rates. The relationships between the independent variable of enrollment in rural or urban school districts and the dependent variables of CTE participation rates, graduation rates, and rates of CTE students' entrance into postsecondary education or employment upon graduation were also considered. Publicly available data on high school students in the state of Tennessee were analyzed to compare the graduation rates of CTE concentrators with the graduation rates of non-CTE concentrators in the state as a whole and in 18 selected school districts. Nine of those school districts were urban

districts and nine were rural. Three school districts of each type were selected randomly from each of the three Grand Divisions of the state of Tennessee. Publicly available data were also analyzed to investigate possible differences between the effects of CTE programs in urban and rural areas through comparison of urban and rural CTE participation rates, overall graduation rates, and CTE concentrators' secondary placement rates in nine selected urban and nine selected rural school districts. This methodology was primarily based on the work of Loveless (2011), but also on research by Shadden (2011), Aliaga et al. (2011), and Aliaga et al. (2012).

Most of the data analyzed are directly available on the Tennessee Department of Education's web site. However, the total number of students eligible to graduate in a given school year is not provided on the state report card, nor is the number or the graduation rate of non-CTE concentrators. To be able to compare the non-CTE concentrators' graduation rates with those of CTE concentrators, it was necessary to approximate the total number of students eligible to graduate in each school year and the number of non-CTE concentrators eligible to graduate. That made it possible to approximate a non-CTE graduation rate for the selected school districts. The data used to approximate this were collected from the annual statistical reports of the Tennessee Department of Education (2014a). These annual statistical reports included the number of graduates in the state as a whole and in every public school system in Tennessee since the 1998-1999 school year, and the reports from the 2009-2010, 2010-2011, and 2011-2012 school years were used in this analysis (Huffman, 2011; 2012; Webb, 2010). To approximate the number of students eligible to graduate from high schools in the state as a whole and in each selected school district, the number of students who did graduate from high school in those areas was divided by the reported graduation rate for the state or the selected district to approximate the total number of students eligible to graduate there. The number of CTE concentrators

eligible to graduate and the number who actually did graduate are publicly available. The number of CTE concentrators was subtracted from the approximate total of students eligible to graduate and the number of CTE graduates was subtracted from the total number of graduates to produce approximate numbers of non-CTE 12th grade students and of non-CTE graduates, from which a non-CTE graduation rate was determined. While this may not have produced the precise number of non-CTE concentrators or non-CTE graduates or their precise graduation rate, when spread over samples of all public high school students in the state of Tennessee or in the selected urban and rural school districts, this approximation was deemed sufficient to allow consideration of the relationship between CTE participation and student graduation rates.

Because there was no direct contact between the researcher and the subjects, and all the relevant data had already been collected by a public body, there were no concerns about the physical safety of the subjects. Emotional and psychological harm and intrusions on privacy were also unlikely, as all data were aggregated and no individual's information about CTE participation, graduation, or secondary placement was revealed on the report card from which this study drew its data. To further alleviate concerns about privacy, the school districts studied were selected randomly from numbered lists of eligible urban and rural schools using the random number generator found at http://www.random.org. They were then described anonymously with designations such as U1 for an urban school and R1 for a rural school. As described below, detailed analysis of the data might make it possible to connect aggregate data reported in this study with the anonymous school districts, but even that could not reveal any information about individual students.

The use of students' data could pose ethical issues regarding privacy for students who might be identified by their graduation year or CTE participation. School district or school-level

administrators might also feel that their data have been used in a critical or invasive fashion. Because all the basic data were anonymous, publicly available information, and names of the school districts chosen by random selection were kept anonymous in the reporting of this research, many of the ethical concerns about privacy in this study should have been obviated. However, the fact that the data were publicly available might allow someone interested in finding out more about an individual school district to determine which were used in the study by considering the lists of urban and rural districts from which the school systems were chosen and comparing the information publicly reported about those systems with the selected data presented in this study, thereby inferring which school districts might have been included in the analysis. That in turn might present a problem in terms of privacy. However, since this study revealed no new information about any school system, but simply analyzed publicly available data about them, even determining which school systems were used should not compromise any individual's privacy or the privacy of the administrators of any individual school in school systems comprising more than one high school. This study was determined to be exempt from the need for IRB approval because it used a widely-known and publicly available set of aggregated data in which all personal information about individuals is confidential (McMillan & Schumacher, 2010).

This study's validity was based on the well-established methods of collecting and reporting the data found in the Tennessee Department of Education's Report Card, from which the data analyzed by this study were drawn. Furthermore, the definitions of CTE participation, CTE concentration, graduation rates, and secondary placement rates are official, established definitions of those terms, understood by professional educators throughout the state of Tennessee (Tennessee Department of Education Division of Career and Technical Education,

2013a) and the definitions of urban and rural areas are official, established definitions of those terms used by the U.S. Census Bureau (Department of Commerce, 2011). Finally, while this study expanded earlier research in this field by using a larger sample size and considering the possibility of differences in the CTE participation experiences of rural and urban students, its methodology was still related to earlier published research, increasingly the likelihood of its own validity. Reliability was also established by the use of publicly available data and official government definitions of the terms used to describe the sample groups. This will make it a straightforward matter for future studies to replicate or expand this research.

There were possibilities for bias in this study, as the researcher worked in an urban Tennessee public school that contributed data to the Report Card during the years considered by this study. In addition to protecting the privacy of students in the school systems under study, the random selection of subject school districts from clearly defined lists was also meant to help mitigate any personal bias by the researcher. While some home-schooled students take some of the same standardized state tests that public school students in Tennessee do, not all home-schooled students were required to do so during the years considered in this study (Wright, 2012). Likewise, most categories of private schools in Tennessee were not required to administer the standardized state tests that were mandatory for public school students (Tennessee State Board of Education, 2014b). Because the academic achievement of some home-schooled students and students at private schools was not reported on the Tennessee Department of Education Report Card, there may have been a reporting bias against students who did not attend public schools in the years under consideration. While Tennessee did not report the total number of school-aged children not attending schools that provided data to the Tennessee Department of Education Report Card during the school years analyzed in this study, the U.S. Census Bureau

used data provided by the American Community Survey to report that 90% of students in the United States attended public schools in 2011 (Davis & Bauman, 2013). Therefore, if Tennessee fit the national trend, up to 10% of Tennessee students may have been excluded from the population of this study.

Research Questions and Null Hypotheses

The following research questions guided this study in order to determine the relationship between student participation in CTE and graduation rates and between rural and urban school districts' CTE participation, graduation rates, and secondary placement rates.

1. Is there a significant difference in the overall CTE graduation rate and the overall non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$1: There is no significant difference in the overall CTE graduation rate and the overall non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012.

2. Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$2: There is no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

3. Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$3: There is no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

4. Is there a significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$4: There is no a significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

5. Is there a significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$5: There is no significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

6. Is there a significant difference in the rate of high school CTE graduates in the selected urban school districts who are secondarily placed and the rate of high school CTE graduates in the selected rural school districts who are secondarily placed for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0 6_1$: There is no significant difference in the rate of high school CTE graduates in the selected urban school districts who are secondarily placed and the rate of high school CTE graduates in the selected rural school districts who are secondarily placed for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Population and Sample

The population for this study consisted of all the students eligible to graduate from Tennessee public high schools in the school years 2009-2010, 2010-2011, and 2011-2012. Furthermore, eighteen school districts, nine urban and nine rural, were also selected to create sample groups to address the specific research questions. Three urban school districts and three rural school districts were selected in each of the three Grand Divisions of the state of Tennessee, as defined by Tennessee law and described in the Tennessee Blue Book (Hargett, 2013). For each Grand Division, a list of all the areas defined as urbanized by the U.S. Census Bureau (Department of Commerce, 2012) along with the school districts found in the central counties of those urbanized areas was created (see Appendix B). For each Grand Division, a list of all areas defined as urban clusters by the U.S. Census Bureau (Department of Commerce, 2012) along with the school districts found in within their boundaries was also created (see Appendix B). A list of all urbanized areas and the three most populous urban clusters in each Grand Division was created, and three of those were selected at random from each Grand Division (see Appendix C). The three most populous urban clusters were included because the Middle Division only has three urbanized areas and the Western Division only has two, so it was necessary to include more possibilities for random selection in order to preserve anonymity. If an urbanized area or urban cluster had more than one school district associated with it, one of those was then selected at

random to represent that urbanized area or urban cluster. The nine school districts thus selected were assigned designations of U1-U9 to preserve anonymity and defined as urban school districts for the purpose of this study. All school districts in each Grand Division not associated with any urbanized area or urban clusters in that division were listed (see Appendix D) and three from each Grand Division were chosen at random and assigned designations of R1-9 to preserve anonymity and defined as rural school districts for the purposes of this study. The number of graduates in the state as a whole and in selected school systems was collected from the annual statistical reports of the Tennessee Department of Education (2014a) for the school years 2009-2010 (Webb, 2010), 2010-2011 (Huffman, 2011), and 2011-2012 (Huffman, 2012). Other information about graduation rates and student participation rates was collected from the Tennessee Report Card (Tennessee Department of Education, 2015).

For the first research question, all CTE concentrators in the State of Tennessee eligible to graduate in the selected school years were taken as a sample for comparison with the sample of all non-CTE concentrators in the State of Tennessee eligible to graduate in the same school years. In 2009-2010 there were 72,620 12^{th} grade students in Tennessee, of whom 62,526 graduated. 51,711 12^{th} graders were non-CTE students, of whom 43,710 graduated. 20,909 12^{th} graders were CTE students, of whom 18,816 graduated. In 2010-2011 there were 74,090 12^{th} grade students in Tennessee, of whom 63,347 graduated. 54,894 12^{th} graders were non-CTE students, of whom 44,916 graduated. 19,196 12^{th} graders were CTE students, of whom 18,431 graduated. In 2011-2012 there were 71,281 12^{th} grade students in Tennessee, of whom 62,157 graduated. 49,826 12^{th} graders were non-CTE students, of whom 41,444 graduated. 21,455 12^{th} graders were CTE students, of whom 20,713 graduated.

For the second research question, all CTE concentrators in nine selected urban school districts who were eligible to graduate in the selected school years were taken as a sample for comparison with the sample of all non-CTE student concentrators in the same nine selected urban school districts who were eligible to graduate in the same school years. In 2009-2010 there were 10,641 12th grade students in the nine selected urban school districts, of whom 9,490 graduated. 7,465 were non-CTE students, of whom 6,550 graduated. 3,176 were CTE students, of whom 2,940 graduated. In 2010-2011 there were 10,786 12th grade students in the nine selected urban school districts, of whom 9,589 graduated. 8,102 were non-CTE students, of whom 6,990graduated. 2,684 were CTE students, of whom 2,599 graduated. In 2011-2012 there were 10,440 12th grade students in the nine selected urban school districts, of whom 9,532 graduated. 7,226 were non-CTE students, of whom 6,388 graduated. 3,214 were CTE students, of whom 3,144 graduated.

For the third research question, all CTE concentrators in nine selected rural school districts who were eligible to graduate in the selected school years were taken as a sample for comparison with the sample of all non-CTE concentrators in the same nine selected rural school districts who were eligible to graduate in the same school years. In 2009-2010 there were 1,155 12th grade students in the nine selected rural school districts, of whom 1,029 graduated. 575 were non-CTE students, of whom 479 graduated. 580 were CTE students, of whom 550 graduated. In 2010-2011 there were 1,133 12th grade students in the nine selected rural school districts, of whom 975 graduated. 566 were non-CTE students, of whom 433 graduated. 567 were CTE students, of whom 542 graduated. In 2011-2012 there were 1,106 12th grade students in the nine selected rural school districts, of whom 994 graduated. 605 were non-CTE students, of whom 515 graduated. 501 were CTE students, of whom 479 graduated.

For the fourth research question, which investigated the difference between urban and rural CTE participation rates, all high school students in the selected urban districts formed one sample and all high school students in the selected rural districts formed another. In 2009-2010 there were 43,506 high school students in the selected urban districts, of whom 26,700 participated in CTE. In 2009-2010 there were 4,483 high school students in the selected rural districts, of whom 3,607 participated in CTE. In 2010-2011 there were 46,265 high school students in the selected urban districts, of whom 26,382 participated in CTE. In 2010-2011 there were 4,554 high school students in the selected rural districts, of whom 3,507 participated in CTE. In 2011-2012 there were 42,863 high school students in the selected urban districts, of whom 26,295 participated in CTE. In 2011-2012 there were 4,402 high school students in the selected rural districts, of whom 3,443 participated in CTE.

In question five, all students who were eligible to graduate in urban districts were considered to be one sample and all those who were eligible to graduate in rural districts made up another sample. In 2009-2010 there were 10,641 12^{th} grade students in the nine selected urban school districts, of whom 9,490 graduated. In 2009-2010 there were 1,155 12^{th} grade students in the nine selected rural school districts, of whom 1,029 graduated. In 2010-2011 there were 10,786 12^{th} grade students in the nine selected urban school districts, of whom 9,589 graduated. In 2010-2011 there were 1,133 12^{th} grade students in the nine selected rural school districts, of whom 975 graduated. 605 were non-CTE students, of whom 515 graduated. In 2011-2012 there were 10,440 12^{th} grade students in the nine selected urban school districts, of whom 9,532 graduated. In 2011-2012 there were 1,106 12^{th} grade students in the nine selected rural school districts, of whom 994 graduated.

In question six, urban CTE participants who graduated and were contacted by their schools to determine their secondary placement status in the selected school years were considered to be one sample while rural CTE participants who graduated and were contacted by their schools to determine their secondary placement status will be considered to be another sample. In 2009-2010, 2,172 graduates from urban school districts were contacted, of whom 1,613 had found secondary placement. In 2009-2010, 665 graduates from rural school districts were contacted, of whom 599 had found secondary placement. In 2010-2011, 2,191 graduates from urban school districts were contacted, of whom 2,006 had found secondary placement. In 2010-2011, 570 graduates from rural school districts were contacted, of whom 541 had found secondary placement. In 2011-2012, 1,968 graduates from urban school districts were contacted, of whom 1,811 had found secondary placement. In 2011-2012, 534 graduates from rural school districts were contacted, of whom 490 had found secondary placement.

Instrumentation

The primary data collection instrument for this study was the Tennessee Report Card. This annual publication of the Tennessee Department of Education is made available on-line at http://tn.gov/education/data/report_card/index.shtml and reports demographic information, such as number of students, gender, and ethnic origin for the population of individual schools, school districts, and the population of Tennessee's public schools as a whole. It also reports various measures of accountability such as standardized test scores, attendance, graduation rates, and number of CTE concentrators for individual public schools, school districts, and the state as a whole (Tennessee Department of Education, 2015). These data are disaggregated so that no personal identifying information about any student can be revealed (Tennessee Department of

Education, 2010). Further data about overall student enrollment are provided by the annual statistical reports of the Tennessee Department of Education (2014a).

The data on the Tennessee Report Card web site are presented in convenient formats, and the school years 2009-2010, 2010-2011, and 2011-2012 were selected for this study because they are presented in the same format as each other, which is also the same format used for the school years 2007-2008 and 2008-2009 which were used by the studies by Loveless (2011) and Shadden (2011) which this study extends. However, the publicly data provided for more recent school years did not include some of the information involved in investigating this study's research questions, including the CTE participation rate, the CTE graduation rate, and the numbers of CTE concentrators who graduated and who were eligible to graduate. Electronic communication with members of the research department of the Tennessee Department of Education indicated that these data will not be published (M. Batiwalla, personal communication, October 3, 2014; S. Blackman, personal communication, January 28 & January 30, 2015). This paucity of relevant data for the school years after 2011-2012 made it impossible to properly compare those school years with those that came before in investigating this study's research questions, so they were excluded from this study.

The data presented in the Tennessee Report Card and other on-line resources have been collected by the Tennessee Department of Education through data reported on standardized tests mandated by the state of Tennessee. Since 2003 all answer sheets for students participating in the Tennessee Comprehensive Assessment Program have been scored by the state Department of Education rather than by local school systems, and the demographic information on those and other required tests form the basis of the demographic and accountability information published as the Tennessee Report Card. The demographic information was provided by students when

they took the test or was filled out by school personnel based on existing school records. Records of school attendance were based partly on the number of students taking each test and on school-reported information. Other accountability information was reported by school personnel to the Department of Education (Tennessee Department of Education, 2010).

This instrument was selected because it is publicly available, simple to use, and contains no personally identifying information about students that might pose ethical concerns about privacy. Furthermore, as an existing instrument, it did not pose potential problems of reliability in the way that an instrument created by the researcher might have. Finally, the Tennessee Report Card has been used in many other analyses of Tennessee public school data, including the earlier studies that this investigation extends (Loveless, 2011; Shadden, 2011), thus increasing the validity of this study by keeping its data collection instruments consistent with similar studies.

Data Collection

The main source of data for this study was the Tennessee Department of Education's Report Card for the state's public schools as a whole and for 18 selected public schools in particular. Those schools were selected based on the U.S. Census Bureau's population reports and definition of urban areas. All public schools in the state of Tennessee report data on their students to the Tennessee Department of Education. Among these data are information about student CTE participation, CTE concentration, graduation rates for all students and for various subgroups, including CTE students, and secondary placement rates for CTE concentrators. Data about the overall number of high school graduates are also available, and were used along with published graduation rates to approximate the number of non-CTE concentrators eligible to

graduate in the selected school years, which is not publicly reported as a separate rate. These data are made available to the public on the Tennessee Department of Education's web site, and can be viewed for the state as a whole or broken down by individual school systems, particular schools, and various subgroups. Once school districts representing rural and urban communities were selected, the appropriate data for each school district or other sample group were gathered from the information on that web site and stored in a spreadsheet with only randomly assigned alphanumeric designations used to distinguish the school districts during data analysis.

The Tennessee Department of Education's Report Card was chosen as a data source because it draws information from all the public schools in the state of Tennessee and the data it provides are available to the public, thus allowing easy access to a wide population and making selection of more specific samples very straightforward. The use of publicly available data also removed the need for researcher-created questionnaires, surveys, or other data collection instruments that might be less reliable or raise more concerns about privacy. U.S. Census data were used because they are also publicly available and are the standard record of population data in the United States. The U.S. Census Bureau's definitions of urban areas are also a widely recognized standard.

Data Analysis

A series of *z*-tests was used to analyze the data considered in this study. *Z*-tests were used because they are a common procedure for comparing sample and population means to investigate if there is a statistically significant difference between them. Because the data being compared were mean rates for the groups being sampled, *z*-tests were an appropriate method of statistical analysis. Furthermore, because the research questions involved collective data from

three years with samples sizes ranging from 3,394 students in Research Question 3 to 217,991 students in Research Question 1, *z*-tests were more appropriate than *t* tests because *t* tests are ideally suited to small sample sizes of less than 30. The .05 level of significance was used as the alpha level to test the hypotheses (McMillan & Schumacher, 2010; Pocock, 2006; Witte & Witte, 2010).

For Research Question 1, the dependent variable of students' graduation rates was compared for the populations of CTE concentrators and non-concentrators in the state of Tennessee as a whole who were eligible to graduate in the selected school years. For Research Question 2, the dependent variable of students' graduation rate was compared for the populations of CTE concentrators and nonconcentrators in selected urban school districts eligible to graduate in the selected school years. For Research Question 3, the dependent variable of students' graduation rate was compared for the populations of CTE concentrators and nonconcentrators in selected rural school districts eligible to graduate in the selected school years. For Research Question 4, the dependent variable of students' CTE participation rate was compared for the populations of selected urban school districts and selected rural school districts. For Research Question 5, the dependent variable of students' graduation rates was compared for the populations of selected urban school districts and selected rural school districts. For Research Question 6, the dependent variable of graduates' secondary placement rates was compared for the populations of selected urban school districts and selected rural school districts.

Chapter Summary

This study used quantitative methods to examine the relationships between the independent variables of participation in CTE programs and enrollment in rural and urban school

districts and the dependent variable of students' graduation rates. The relationships between the independent variable of enrollment in rural or urban school districts and the dependent variables of CTE participation rates, graduation rates, and rates of CTE students' entrance into postsecondary education or employment upon graduation were also considered. Urban and Rural school districts were selected at random from lists compiled based on U.S. Census Bureau data on population centers in the state of Tennessee. Anonymous, aggregated student data were collected from the Tennessee Department of Education Report Card and the Department of Education's Annual Statistical Analyses. The school years 2009-2010, 2010-2011, and 2011-2012 were selected in order to extend earlier studies on the school years 2007-2008 and 2008-2009 while excluding more recent school years for which some of the pertinent data were not available. The data were analyzed using *z*-tests because they are appropriate for comparing the mean of different sample groups' graduation rates, CTE participation rates, and secondary placement rates, particularly when working with sample sizes larger than 30 as this study did.

CHAPTER 4

ANALYSIS OF DATA

This study employed publicly available data from public schools in the state of Tennessee to examine relationships between students' CTE participation and their success as measured by graduation rates and postsecondary placement rates, and also to compare rates of CTE participation and overall rates of graduation between urban and rural students in Tennessee. This study used data from the Tennessee Department of Education Report Card (2015) for the 2009-2010, 2010-2011, and 2011-2102 school years and from the annual statistical reports of the Department of Education for the same school years (Huffman 2011; 2012; Webb, 2010). This chapter provides data about the populations and rates of graduation, rates of CTE participation, and rates of CTE concentrators' secondary placement for the state as a whole and the selected school districts. This chapter also presents the research questions and null hypotheses examined in this study. For each research question, a brief analysis of the statistical findings is provided as well.

In 2009-2010 there were 72,620 12^{th} grade students in Tennessee, of whom 62,526 graduated, a rate of 86.1%; 51,711 12^{th} graders were non-CTE concentrators, of whom 43,710 graduated, a rate of 84.53%; 20,909 12^{th} graders were CTE concentrators, of whom 18,816 graduated, a rate of 89.99%. In 2010-2011 there were 74,090 12^{th} grade students in Tennessee, of whom 63,347 graduated, a rate of 85.5%; 54,894 12^{th} graders were non-CTE concentrators, of whom 44,916 graduated, a rate of 81.82%; 19,196 12^{th} graders were CTE concentrators, of whom 18,431 graduated, a rate of 96.02%. In 2011-2012 there were 71,281 12^{th} grade students in Tennessee, of whom 62,157 graduated, a rate of 87.2%; 49,826 12^{th} graders were non-CTE

concentrators, of whom 41,444 graduated, a rate of 83.18%; 21,455 12th graders were CTE concentrators, of whom 20,713 graduated, a rate of 96.54%.

Eighteen school districts, nine urban and nine rural, were selected to create sample groups to test specific research questions. Three urban school districts and three rural school districts were selected from each of the three Grand Divisions of the state of Tennessee, as defined in the Tennessee Blue Book (Hargett, 2013). For each Grand Division, a list of all urbanized areas and the three most populous urban clusters as defined by the U.S. Census Bureau (Department of Commerce, 2012) in each Grand Division was created, and three of those were selected at random from each Grand Division (see Appendix C). If an urbanized area or urban cluster had more than one school district associated with it, one of those was then selected at random to represent that urbanized area or urban cluster. The nine school districts thus selected were assigned designations of U1-U9 to preserve anonymity and defined as urban school districts for the purpose of this study. All school districts in each Grand Division not associated with any urbanized area or urban clusters in that division were listed separately (see Appendix D) and three from each Grand Division were chosen at random and assigned designations of R1-9 to preserve anonymity and defined as rural school districts for the purposes of this study.

In 2009-2010 there were 10,641 12th grade students in the nine selected urban school districts, of whom 9,490 graduated, a rate of 90.93%; 7,465 were non-CTE students, of whom 6,550 graduated, a rate of 89.48%; 3,176 were CTE students, of whom 2,940 graduated, a rate of 91.59%. In 2010-2011 there were 10,786 12th grade students in the nine selected urban school districts, of whom 9,589 graduated, a rate of 89.19%; 8,102 were non-CTE students, of whom 6,990 graduated, a rate of 85.98%; 2,684 were CTE students, of whom 2,599 graduated, a rate of 93.33%. In 2011-2012 there were 10,440 12th grade students in the nine selected urban school

districts, of whom 9,532 graduated, a rate of 93.02%; 7,226 were non-CTE students, of whom 6,388 graduated, a rate of 89.87%; 3,214 were CTE students, of whom 3,144 graduated, a rate of 98.65%. The number of 12th grade students and their graduation rates broken down by district are provided in Tables 1, 2, and 3.

Table 1

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Urban School Districts for School Year 2009-2010

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
U1	221	96.7%	189	98.94%	23	78.26%
U2	447	93.5%	351	93.45%	96	93.75%
U3	4,180	86.6%	2,861	84.27%	1,319	91.66%
U4	852	83.8%	541	80%	311	90.35%
U5	2,101	91%	1,812	90.8%	289	92.39%
U6	835	91%	637	91.21%	198	90.4%
U7	799	94.3%	326	86.81%	473	97.44%
U8	251	90%	197	87.31%	54	100%
U9	964	91.5%	551	92.56%	413	90.07%

Table 2

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Urban School Districts for School Year 2010-2011

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
U1	202	93.6%	200	93.5%	2	100%
U2	537	90.1%	426	87.56%	111	100%
U3	4,196	86.6%	3,109	83.92%	1,087	94.3%
U4	851	81.9%	537	73.74%	314	96.18%
U5	2,110	93.5%	1,884	92.78%	226	99.56%
U6	835	85.3%	691	82.92%	144	96.53%
U7	818	96.5%	435	93.56%	383	99.22%
U8	274	83.6%	211	78.67%	63	100%
U9	963	91.6%	609	87.19%	354	99.15%

Table 3

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Urban School Districts for School Year 2011-2012

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
U1	234	97.4%	211	97.16%	23	100%
U2	526	91.8%	380	88.16%	146	98.65%
U3	4,226	90.3%	2,889	87.44%	1,337	96.49%
U4	781	87.5%	459	79.3%	322	99.07%
U5	1,981	95.5%	1,794	95.21%	187	98.4%
U6	731	91.4%	600	90.33%	131	96.18%
U7	793	95.5%	307	92.83%	486	99.04%
U8	233	92.7%	155	89.03%	78	100%
U9	935	95.1%	431	89.33%	504	100%

In 2009-2010 there were 1,155 12th grade students in the nine selected rural school districts, of whom 1,029 graduated, a rate of 89.59%; 575 were non-CTE students, of whom 479 graduated, a rate of 83.84%; 580 were CTE students, of whom 550 graduated, a rate of 93.18%. In 2010-2011 there were 1,133 12th grade students in the nine selected rural school districts, of whom 975 graduated, a rate of 88.99%; 566 were non-CTE students, of whom 433 graduated, a rate of 82.71%; 567 were CTE students, of whom 542 graduated, a rate of 95.67%. In 2011-2012 there were 1,106 12th grade students in the nine selected rural school districts, of whom 994 graduated, a rate of 90.33%; 605 were non-CTE students, of whom 515 graduated, a rate of 86.75%; 501 were CTE students, of whom 479 graduated, a rate of 96.85%. The number of students and their graduation rates broken down by district are provided in Tables 4, 5, and 6.

Table 4

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Rural School Districts for School Year 2009-2010

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
R1	131	84%	61	75.41%	70	91.43%
R2	226	74%	132	87.88%	94	86.17%
R3	295	89.4%	172	84.3%	123	96.75%
R4	42	96%	24	100%	18	88.89%
R5	110	93%	28	71.43%	82	100%
R6	100	92.2%	66	87.88%	34	100%
R7	73	95.5%	29	100%	44	93.18%
R8	43	100%	21	100%	22	90.91%
R9	135	82.2%	42	47.62%	93	91.3%

Table 5

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Rural School Districts for School Year 2010-2011

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
R1	133	77.4%	83	68.67%	50	92%
R2	249	71.8%	128	50.78%	121	94.22%
R3	284	91.9%	143	88.11%	141	95.75%
R4	47	95.7%	25	96%	22	95.46%
R5	103	96.1%	41	90.24%	62	100%
R6	77	87%	57	85.96%	20	90%
R7	73	98.6%	34	100%	39	97.44%
R8	42	95.2%	18	88.89%	24	100%
R9	135	87.2%	42	75.76%	93	96.15%

Table 6

Enrollment and Graduation Rates of 12th Grade Students in Nine Selected Rural School Districts for School Year 2011-2012

District	Total Enrollment	Overall Graduation Rate	Non-CTE Enrollment	Non-CTE Graduation Rate	CTE Enrollment	CTE Graduation Rate
R1	137	81%	88	71.59%	49	97.96%
R2	209	80.9%	96	73.96%	113	86.73%
R3	268	92.2%	181	90.61%	87	95.4%
R4	54	93.9%	29	89.66%	25	100%
R5	101	95%	46	86.96%	55	100%
R6	79	88.6%	47	78.72%	32	96.97%
R7	65	98.5%	21	95.24%	44	100%
R8	70	98.6%	52	98.08%	18	100%
R9	123	84.3%	45	95.96%	78	94.6%

In 2009-2010 there were 4,483 high school students in the selected rural districts, of whom 3,607 participated in CTE, a rate of 81.2%. In 2009-2010 there were 43,506 high school students in the selected urban districts, of whom 26,700 participated in CTE, a rate of 63.09%. In 2010-2011 there were 4,554 high school students in the selected rural districts, of whom 3,507 participated in CTE, a rate of 77.56%. In 2010-2011 there were 46,265 high school students in the selected urban districts, of whom 26,382 participated in CTE, a rate of 56.86%. In 2011-2012 there were 4,402 high school students in the selected rural districts, of whom 3,443 participated in CTE, a rate of 78.92%. In 2011-2012 there were 42,863 high school students in the selected urban districts, of whom 26,295 participated in CTE, a rate of 59.5%. The number of students and their participation rates broken down by district are provided in Tables 7, 8, 9, 10, 11, and 12.

Table 7

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Urban School Districts for School Year 2009-2010

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
U1	882	312	35.6%
U2	2,153	1,518	70.51%
U3	17,255	11,027	63.91%
U4	3,291	2,567	82.51%
U5	8,176	4,038	72.76%
U6	3,171	1,420	44.78%
U7	3,592	2,619	72.91%
U8	1,023	608	59.43%
U9	3,963	2,591	65.38%

Table 8

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Urban School Districts for School Year 2010-2011

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
U1	902	192	21.29%
U2	2,857	1,523	53.31%
U3	17,739	10,210	74.73%
U4	3,436	2,577	75%
U5	9,149	4,393	48.02%
U6	3,236	1,678	51.85%
U7	3,800	2,677	70.45%
U8	1,058	587	55.48%
U9	4,088	2,545	61.58%

Table 9

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Urban School Districts for School Year 2011-2012

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
U1	847	165	19.48%
U2	2,176	1,393	64.02%
U3	16,967	9,640	58.53%
U4	3,216	2,552	78.26%
U5	8,182	5,469	66.84%
U6	3,179	1,554	48.88%
U7	3,595	2,589	72.02%
U8	893	588	65.85%
U9	3,808	2,345	61.58%

Table 10

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Rural School Districts for School Year 2009-2010

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
R1	543	412	75.88%
R2	890	683	76.74%
R3	1,097	845	77.03%
R4	182	152	83.52%
R5	433	375	86.61%
R6	308	260	84.42%
R7	311	255	81.99%
R8	220	155	70.46%
R9	499	470	94.19%

Table 11

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Rural School Districts for School Year 2010-2011

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
R1	549	463	83.34%
R2	878	559	63.67%
R3	1,131	887	78.43%
R4	193	159	82.38%
R5	439	337	76.77%
R6	311	234	75.24%
R7	320	266	85.81%
R8	228	138	60.53%
R9	505	464	91.88%

Table 12

Enrollment and CTE Participation Rates of Public High School Students in Nine Selected Rural School Districts for School Year 2011-2012

District	Total Enrollment	CTE Enrollment	CTE Participation Rate
R1	565	416	73.67%
R2	849	623	73.38%
R3	1,095	853	77.9%
R4	198	154	77.87%
R5	391	278	71.1%
R6	310	262	84.52%
R7	305	257	84.26%
R8	218	163	74.77%
R9	471	437	92.78%

The rate of CTE concentrators who entered into postsecondary education or advanced training, began military service, or were employed in the second quarter following the academic year in which they graduated from secondary education is called the secondary placement rate by the Tennessee Department of Education. These data on secondary placement were based on information reported by school officials based on their own efforts to gather data on their graduates following graduation. The reported secondary placement rate for a given school year was based on the count of the previous school year's CTE cohort concentrators who graduated. In 2009-2010, 2,172 graduates from urban school districts were contacted, of whom 1,613 had found secondary placement, a rate of 83.53%. In 2009-2010, 665 graduates from rural school districts were contacted, of whom 599 had found secondary placement, a rate of 92.29%. In

2010-2011, 2,191 graduates from urban school districts were contacted, of whom 2,006 had found secondary placement, a rate of 91.01%. In 2010-2011, 570 graduates from rural school districts were contacted, of whom 541 had found secondary placement, a rate of 92.74%. In 2011-2012, 1,968 graduates from urban school districts were contacted, of whom 1,811 had found secondary placement, a rate of 93.41%. In 2011-2012, 534 graduates from rural school districts were contacted, of whom 490 had found secondary placement, a rate of 91.22%. The secondary placements rates broken down by district are provided in Tables 13 and 14.

Table 13

Reported Secondary Placement Rates of Public High School Students in Nine Selected Urban School Districts for School Years 2009-2010, 2010-2011, and 2011-2012

District	Contacted Graduates 2009-2010	Secondary Placement Rate 2009-2010	Contacted Graduates 2010-2011	Secondary Placement Rate 2010-2011	Contacted Graduates 2011-2012	Secondary Placement Rate 2011-2012
U1	78	96.15%	48	91.67%	2	100%
U2	0	93.75%	53	86.79%	0	98.65%
U3	640	50.31%	695	99.71%	890	92.02%
U4	254	92.13%	268	90.67%	280	93.93%
U5	125	81.6%	133	90.98%	94	88.3%
U6	134	88.06%	184	96.2%	77	89.61%
U7	489	91.62%	376	89.1%	345	89.86%
U8	96	95.83%	55	96.36%	67	98.51%
U9	356	62.36%	379	77.57%	213	93.43%

Table 14

Reported Secondary Placement Rates of Public High School Students in Nine Selected Rural School Districts for School Years 2009-2010, 2010-2011, and 2011-2012

District	Contacted Graduates 2009-2010	Secondary Placement Rate 2009-2010	Contacted Graduates 2010-2011	Secondary Placement Rate 2010-2011	Contacted Graduates 2011-2012	Secondary Placement Rate 2011-2012
R1	97	86.69%	70	94.29%	42	92.86%
R2	76	88.84%	84	89.29%	102	78.43%
R3	117	89.74%	86	97.67%	151	98.01%
R4	25	100%	18	72.22%	22	81.82%
R5	55	98.18%	68	95.59%	49	93.88%
R6	0	94.29%	32	87.5%	20	90%
R7	156	86.54%	78	100%	30	90%
R8	25	96%	31	100%	19	100%
R9	114	90.35%	103	98.06%	99	95.96%

Research Question 1

Is there a significant difference in the overall CTE graduation rate and the overall non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$1: There is no significant difference in the overall CTE graduation rate and the overall non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the graduation rate of CTE concentrators in Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the graduation rate of students who were not

CTE concentrators in Tennessee public high schools during the same school years. The collective graduation rate for CTE concentrators was 94.18% and the collective graduation rate for nonconcentrators was 83.18%. The *z*-value was calculated by dividing the difference between the three-year average of the two graduation rates by the square root of the sum of the three-year average of the two graduation rates. The results of the test were not significant, $z = .826$, $p > .05$. Therefore, the null hypothesis was retained. Although CTE concentrators did graduate at a higher rate than nonconcentrators, there was no significant difference in the overall CTE graduation rate and the non-CTE graduation rate for all Tennessee students for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Research Question 2

Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$2: There is no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the graduation rate of CTE concentrators in nine selected urban Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the graduation rate of students who were not CTE concentrators in nine selected urban Tennessee public high schools during the same school years. The collective graduation rate for urban CTE concentrators was 96.19% and the collective graduation rate for urban nonconcentrators was 88.44%. This was

calculated by dividing the difference between the three-year average of the nine districts' CTE graduation rates and non-CTE graduation rates by the square root of the sum of the three-year average of the nine districts' CTE graduation rates and non-CTE graduation rates. The results of the test were not significant, $z = .8743$, $p > .05$. Therefore, the null hypothesis was retained. Although urban CTE concentrators did graduate at a higher rate than nonconcentrators, there was no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected urban school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Research Question 3

Is there a significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$3: There is no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the graduation rate of CTE concentrators in nine selected rural Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the graduation rate of students who were not CTE concentrators in nine selected rural Tennessee public high schools during the same school years. The collective graduation rate for rural CTE concentrators was 95.23% and the collective graduation rate for rural nonconcentrators was 84.43%. This was calculated by dividing the difference between the three-year average of the nine districts' CTE

graduation rates and non-CTE graduation rates by the square root of the sum of the three-year average of the nine districts' CTE graduation rates and non-CTE graduation rates. The results of the test were not significant, $z = .8059$, $p > .05$. Therefore, the null hypothesis was retained. Although rural CTE concentrators did graduate at a higher rate than nonconcentrators, there was no significant difference in the CTE graduation rate and the non-CTE graduation rate for the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Research Question 4

Is there a significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$4: There is no a significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the CTE participation rate in nine selected urban Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the CTE participation rate in nine selected rural Tennessee public high schools during the same school years. The collective CTE participation rate for the selected urban school districts was 59.81% and the collective CTE participation rate for the selected rural school districts was 79.23%. This was calculated by dividing the difference between the three-year average of the nine urban districts' CTE

participation rates and nine rural districts' CTE participation rates by the square root of the sum of the three-year averages of the nine urban districts' and nine rural districts' CTE participation rates. The results of the test were not significant, $z = 1.6469$, $p > .05$. Therefore, the null hypothesis was retained. Although rural school districts had a higher rate of CTE participation than urban school districts, there was no significant difference in the CTE participation rate in the selected urban school districts and the CTE participation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Research Question 5

Is there a significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$5: There is no significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the graduation rate in nine selected urban Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the graduation rate in nine selected rural Tennessee public high schools during the same school years. The collective graduation rate for the selected urban school districts was 91.05% and the collective graduation rate for the selected rural school districts was 89.64%. This was calculated by dividing the difference between the three-year average of the nine urban districts' graduation rates and the nine rural districts' graduation rates by the square root of the sum of the three-year average of the nine urban

districts' and nine rural districts' graduation rates. The results of the test were not significant, $z = .1049$, $p > .05$. Therefore, the null hypothesis was retained. There was no significant difference in the graduation rate in the selected urban school districts and the graduation rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Research Question 6

Is there a significant difference in the rate of high school CTE graduates in the selected urban school districts who are secondarily placed and the rate of high school CTE graduates in the selected rural school districts who are secondarily placed for the collective school years 2009-2010, 2010-2011, and 2011-2012?

$H_0$6: There is no significant difference in the rate of high school CTE graduates in the selected urban school districts who are secondarily placed and the rate of high school CTE graduates in the selected rural school districts who are secondarily placed for the collective school years 2009-2010, 2010-2011, and 2011-2012.

A *z*-test was conducted to assess whether there was a significant difference in the secondary placement rate of CTE graduates in nine selected urban Tennessee public high schools in the collective school years 2009-2010, 2010-2011, and 2011-2012 and the secondary placement rate of CTE graduates in nine selected rural Tennessee public high schools during the same school years. The collective secondary placement rate for the selected urban school districts was 89.45% and the collective secondary placement rate for the selected rural school districts was 92.08 %. This was calculated by dividing the difference between the three-year average of the nine urban districts' secondary placement rates and the nine rural districts' secondary placement rates by the square root of the sum of the three-year average of the nine

urban and nine rural districts' graduation rates. The results of the test were not significant, $z = .1952$, $p > .05$. Therefore, the null hypothesis was retained. There was no significant difference in the secondary placement rate in the selected urban school districts and the secondary placement rate in the selected rural school districts for the collective school years 2009-2010, 2010-2011, and 2011-2012.

Chapter Summary

Six research questions were investigated to examine the relationships between the independent variables of participation in CTE programs and enrollment in rural and urban school districts and the dependent variable of students' graduation rates. The relationships between the independent variable of enrollment in urban or rural districts and the dependent variables of CTE participation rates, graduation rates, and rates of CTE students' entrance into postsecondary education or employment upon graduation were also considered. Publicly available data on high school students in the state of Tennessee for the school years 2009-2010, 2010-2011, and 2011-2012 were analyzed to compare the graduation rates of CTE participants with the graduation rates of non-CTE participants in the state as a whole and in nine selected urban and nine selected rural school districts. None of the research questions revealed a statistically significantly difference between the variables tested using the .05 level of significance. Although CTE concentrators did graduate at higher rates statewide and in the selected urban and rural school districts, there was no statistically significant difference between the graduation rates of CTE concentrators and nonconcentrators at the state level or within the selected urban or rural school districts. When considering CTE participation rates, rural students participated at a higher rate than urban ones in the selected school district, but the difference was not statistically significant.

When overall graduation rates and secondary placement rates were considered, there was no statistically significant difference between urban and rural school districts.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter 5 contains the findings, conclusions, and recommendations for readers who may use the results when designing, leading, or participating in a Career and Technical Education (CTE) program within a school system. The findings may also be useful in the planning of a high school student's course of study and postsecondary career. In the state of Tennessee, all students are required to choose an elective focus, which can include a CTE concentration. This may make information about CTE programs and their possible relationship to student rates of graduation and secondary placement valuable for both educators and students as they make decisions about their use of CTE.

Statement of Purpose

The purpose of this quantitative study was to examine the relationship between participation in CTE programs and students' graduation rates and rates of CTE students' entrance into postsecondary education or employment after graduation. Possible differences between students' enrollment in urban and rural school districts and their graduation, participation, and secondary placement rates were also considered. Publicly available data on high school students in the state of Tennessee were analyzed to compare the graduation rates of CTE participants with the graduation rates of non-CTE participants in the state as a whole and in 18 selected school districts. Nine of those school districts were urban districts and nine were rural. Three school districts of each type were selected randomly from each of the three Grand Divisions of the state of Tennessee. Publicly available data were also analyzed to investigate

possible differences between the effects of CTE programs in urban and rural areas through comparison of urban and rural CTE participation rates, overall graduation rates, and CTE participants' secondary placement rates in nine selected urban school districts and nine selected rural school districts.

It has long been the mission of educators to prepare students for future academic work and to serve as productive citizens in their adult lives, in large part by preparing them to enter the workforce with the potential to pursue a satisfying career (Ozman & Craver, 2008). For professional public educators of the 21st century this mission has been emphasized by the creation of new and rigorous standards through the No Child Left Behind Act's renewal of the Elementary and Secondary Education Act of 1965 and through other national and state-level laws that require high graduation rates and track student attendance and success in various ways (Tennessee Department of Education, 2010). Furthermore, many prospective employers report they have difficulty finding workers who have many of the basic skills, let alone the more advanced ones, necessary for working in skilled trades (Society for Human Resource Management, 2013) and even in more high-tech fields (Bray et al., 2011).

Both to conform to the letter of the law and to fulfill the spirit of their educational mission to prepare students for their future careers, school leaders must be diligent and creative in encouraging the student involvement that promotes student retention and success as measured both by test scores and graduation rates and in preparing students for meaningful careers following their graduation (Wilkin & Nwoke, 2011). Career Technical Education programs are one way in which educational leaders try to do this. Research by Loveless (2011) and Shadden (2011) indicated that involvement in CTE classes can increase student success in Tennessee. Other research (Aliaga et al., 2011; Aliaga et al., 2012) analyzing schools throughout the country

produced similar findings both for students who followed a CTE curriculum and for students following a primarily academic curriculum who experimented with one or a few CTE classes. This study was meant to extend and expand that research.

The data for this study were taken from the school years 2009-2010, 2010-2011, and 2011-2012. These years were selected because their methods of data collection and reporting were consistent with each other and with earlier studies by Loveless (2011) and Shadden (2011) investigating CTE in the state of Tennessee in the school years 2007-2008 and 2008-2009 which this study was meant to extend. Although data for the school years 2012-2013 and 2013-2014 were available by the time this study was completed, those years were excluded because the data that were publicly available at the time did not include information that was necessary to address some of the research questions such as the CTE participation rate, the CTE graduation rate, and the numbers of CTE concentrators who graduated and who were eligible to graduate. Electronic communication with members of the research department of the Tennessee Department of Education indicated that there are no plans to publish these data.

Summary of Findings

The statistical findings reported in this study were guided by the research questions presented in Chapter 1 and explained in Chapter 3. In Chapter 3, six null hypotheses were presented for the six research questions included in this study. Each hypothesis was tested using a *z*-test to analyze publicly available data collected by the researcher from the Tennessee Department of Education from the school years 2009-2010, 2010-2011, and 2011-2012. The .05 level of significance was used to test all six research questions.

For Research Question 1, the independent variable of CTE concentration was considered to compare the dependent variables of graduation rates of 12th grade CTE concentrators and 12th grade non-CTE concentrators across the state of Tennessee. No significant difference in the graduation rate between the two groups was found. For Research Question 2 the independent variable of CTE concentration was considered to compare the dependent variables of graduation rates of 12th grade CTE concentrators and 12th grade non-CTE concentrators in nine selected urban school districts. No significant difference in the graduation rate between the two groups was found. For Research Question 3 the independent variable of CTE concentration was considered to compare the dependent variables of graduation rates of 12th grade CTE concentrators and 12th grade non-CTE concentrators in nine selected rural school districts. No significant difference in the graduation rate between the two groups was found. For Research Question 4 the independent variable of enrollment in a urban or rural school district was considered to compare the dependent variables of rates of CTE participation for public high school students in nine selected urban and nine selected rural school districts. No significant difference in the graduation rate between the two groups was found. For Research Question 5 the independent variable of enrollment in a urban or rural school district was considered to compare the dependent variables of rates of 12th grade graduation for public high school students in nine selected urban and nine selected rural school districts. No significant difference in the graduation rate between the two groups was found. For Research Question 6 the independent variable of enrollment in an urban or rural school district was considered to compare the dependent variables of rates of secondary placement for public high school graduates in nine selected urban and nine selected rural school districts. No significant difference in the secondary placement rate between the two groups was found.

Conclusions

The following conclusions were based upon the findings from the data for this study:

1. No statistically significant difference was found between the graduation rates of 12th grade CTE concentrators and 12th grade non-CTE concentrators across the state of Tennessee or in the eighteen selected school districts for the school years 2009-2010, 2010-2011, and 2011-2012. However, statewide in 2009-2010 89.99% of CTE concentrators graduated, while 84.53% of non-CTE concentrators did. In 2010-2011 96.02% of CTE concentrators graduated, while 81.82% of non-CTE concentrators did. In 2011-2012 96.54% of CTE concentrators graduated, while 83.18% of non-CTE concentrators did. Likewise, in the selected school districts for all three school years considered in this study the average urban rate of graduation and the average rural rate of graduation for CTE concentrators were higher than the rates of graduation for students who were not CTE concentrators. Although this difference was not statistically significant, it seems consistent with existing research on the possible benefits of CTE for improving graduation rates.
2. No statistically significant difference was found between the CTE participation rates of urban and rural students in the selected school districts. However, in all three school years studied the average rate of CTE participation in rural school districts was greater than that found in urban school districts. In 2009-2010 63.09% of high school students in the selected urban districts participated in CTE. In 2009-2010 81.2% of high school students in the selected rural districts participated in CTE. In 2010-2011 56.86% of high school students in the selected urban districts participated in CTE. In 2010-2011 77.56% of high school students in the selected rural districts participated in CTE. In 2011-2012

59.5% of high school students in the selected urban districts participated in CTE. In 2011-2012 78.92% of high school students in the selected rural districts participated in CTE. Although this difference was not statistically significant, the greater rate of rural CTE participation was consistent with other research indicating that rural students are more likely than urban students to complete high school CTE concentrations (Jacobson & Mokher, 2014).

3. No statistically significant difference was found between the graduation rates of urban and rural students in the selected school districts. In all three years the graduation rate of urban students was slightly higher than that of rural students, but by a very small margin, and the statistical difference between the two groups revealed by the *z*-test was the smallest of all the differences shown by the tests of all six null hypotheses. This was consistent with some existing research (Jordan et al., 2012) suggesting that there is little statistical difference between most urban and rural high school students' tendency to drop out before graduation, particularly when ethnicity and socioeconomic status were controlled for.
4. No statistically significant difference was found between the rates of secondary placement for urban and rural students in the selected school districts. Furthermore, while the selected rural school systems enjoyed a slightly higher average secondary placement rate in 2009-2010 and 2010-2011, the selected urban school districts had a slightly higher secondary placement rate in 2011-2012. This is supported by some research (Jordan et al., 2012) indicating that urban and rural high school graduates may expect similar levels of income after high school. This may be especially true considering that some statistical models employed by Jordan et al. distinguished between

urban and suburban schools systems and found that post-graduation incomes of rural and suburban students were particularly similar. According to the 2010 Census, Tennessee only had 12 urbanized areas with at least 50,000 residents, so the experience of students in some of those urbanized areas and in the 79 urban clusters with at least 2,500 but fewer than 50,000 residents according to the 2010 Census (Department of Commerce, 2011; 2012) may have been more similar to what would be considered a suburban experience in more populous states.

Recommendations for Practice

Results of this study indicate that CTE concentrators may have higher graduation rates than non-CTE concentrators in both urban and rural school systems. However, because the difference in graduation rates between CTE concentrators and nonconcentrators was not statistically significant, the results of this study alone cannot lead to a strong recommendation in favor of increased emphasis on CTE. They certainly cannot suggest reducing support for CTE either, particularly as many other studies do indicate that CTE can have a statistically significant influence on promoting higher graduation rates. School leaders making decisions about their curriculum, funding, and employment levels as well as students making their high school and post-graduation plans should consider all available information about how CTE may be useful for them in the context of their own professional or personal needs.

Recommendations for Future Research

Although results of this study do not indicate a statistically significant difference between the graduation rates of CTE concentrators and students who were not CTE concentrators, this

study did indicate a slightly higher graduation rate for CTE concentrators across urban and rural school systems in all three school years that were considered. Other studies have shown statistically significant benefits as well as anecdotal qualitative benefits to CTE participation both in school and following graduation. Because this study only focused on 18 school districts in a single state over three consecutive school years, a replication study encompassing more school systems and more school years is recommended, particularly if data from multiple states or even the nation as a whole is included.

Despite not being statistically significant, there were differences between the rates of CTE participation in urban and rural school districts. There are several possible reasons for this. They may include a shortage of academic classes available to students in some rural districts either due to a lack of interest by school administrators in offering those classes or a lack of resources to do so, which may leave students little option but to concentrate in CTE. Likewise, some urban school districts may offer fewer CTE courses than rural districts so that urban students may have difficulty finding enough CTE classes to concentrate in an area that interests them. Furthermore, certain districts may tend to focus on particular areas of CTE (such as agriculture programs in some rural districts or medical technologies in an urban district that already employs a large number of medical professionals) to the exclusion of others, and that may affect students' decisions to concentrate in CTE or to avoid it. Determining if differing availabilities of course offerings between urban and rural school systems is typical and if the reason for any such a difference is cultural or financial is recommended. Other studies, either quantitative or qualitative, to investigate why CTE participation is higher is rural school districts than urban ones are recommended as well.

This study also did not take income levels, family educational levels, or other socioeconomic elements of students' background into account. Jacobson and Mokher (2014) found no evidence that CTE improved students' graduation rates in high school after other factors were controlled for, although they did find that CTE in college or other postsecondary education did increase rates of graduation and income levels for students who earned a certificate or degree in CTE. Investigating local or family income levels, educational levels, and other socioeconomic factors and their correlation with student CTE participation or their relationships with students' CTE concentration and their success in graduation and secondary placement may also be a worthy area of study. Likewise, extending this study to the college level in a study similar to that of Jacobson and Mokher may be worth conducting in future research.

One reason this study did not extend beyond the 2011-2012 school year was that the Tennessee Department of Education did not report some pertinent data for more recent school years, which placed certain limits on consistent statistical analysis of some of the research questions. Another recommendation for the Tennessee Department of Education's research department is to expand the amount of data made publicly available in order to keep more recent years' Report Cards consistent with older ones to facilitate consistent and detailed studies of as many school years as possible.

Finally, the data available on students following their graduation from high school is very limited. The published secondary placement rate is based on school administrators' success in contacting students approximately six months following their graduation, and the only data reported from those contacts is whether the students found some form of placement in college, the workforce, or the military. More detailed studies involving the collection and analysis of quantitative data about the form and income levels of students' secondary placement as well as

qualitative studies of students' perceptions of the role of CTE in their high school experience and postsecondary careers are also recommended.

Summary

The purpose of this quantitative study was to examine the relationships between the independent variables of participation in CTE programs and enrollment in urban and rural school districts and the dependent variable of students' graduation rates. The relationships between the independent variable of enrollment in urban or rural school districts and the dependent variables of CTE participation rates, graduation rates, and rates of CTE students' entrance into postsecondary education or employment upon graduation were also considered. Publicly available data on high school students in the state of Tennessee were analyzed to compare the graduation rates of CTE concentrators with the graduation rates of students who were not classified as CTE concentrators in the state as a whole and in 18 selected school districts. Nine of those school districts were urban districts and nine were rural. Three school districts of each type were selected randomly from each of the three Grand Divisions of the state of Tennessee. Publicly available data were also analyzed to investigate possible differences between the effects of CTE programs in urban and rural areas through comparison of urban and rural CTE participation rates, overall graduation rates, and CTE concentrators' postsecondary placement rates in nine selected urban school districts and nine selected rural school districts. This methodology was primarily based on the work of Loveless (2011), but also on work by Shadden (2011), Aliaga et al. (2011), and Aliaga et al. (2012). The data used in this study were collected from the Tennessee Department of Education Report Card (2015) for the 2009-2010, 2010-2011,

and 2011-2102 school years and from the annual statistical reports of the Department of Education for the same school years (Huffman 2011; 2012; Webb, 2010).

The majority of the literature reviewed for this study indicated that participation in CTE can lead to higher rates of high school graduation and of employment following graduation. Furthermore, there has been an increase in support, or at least in expressions of support, for CTE from political leaders in many states and at the national level. Reports from business leaders have also indicated a need for improved CTE in public schools. However, a few studies dissented and suggested that CTE had no significant effect on student success once other factors were controlled for. Some researchers even suggested that the stigma associated with CTE might even reduce students' engagement in school. The general promotion of CTE as a panacea for educational and economic problems as well as the minority of reports to the contrary made the contribution of CTE to student success seem worthy of study.

A series of *z*-tests indicated that, for the school years and school systems selected in the state of Tennessee, there was no statistically significant difference between the graduation rates of CTE concentrators and nonconcentrators, nor was there a statistically significant difference between urban and rural students' CTE participation rates, graduation rates, or rates of CTE concentrators' placement in college, the military, or the workforce within one year of graduation. However, the existence of slightly higher rates of graduation among CTE concentrators combined with the evidence found by other researchers that CTE participation is often correlated with above average graduation rates led to the recommendation that further research be conducted into a possible relationship between CTE participation and student graduation rates.

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APPENDICES

APPENDIX A

GRAND DIVISIONS OF TENNESSEE

The state of Tennessee is officially divided into three Grand Divisions. These are geographical, historical, cultural, and legal regions within Tennessee, defined by state law as the Eastern Division, Middle Division, and Western Division (Hargett, 2013).

Counties of the Eastern Division

Anderson
Bledsoe
Blount
Bradley
Campbell
Carter
Claiborne
Cocke
Cumberland
Grainger
Greene
Hamblen
Hamilton
Hancock
Hawkins
Jefferson
Johnson
Knox
Loudon
Marion
McMinn
Meigs
Monroe
Morgan
Polk
Rhea
Roane
Scott
Sevier
Sullivan
Unicoi
Union
Washington

Counties of the Middle Division

Bedford
Cannon
Cheatham
Clay
Coffee
Davidson
DeKalb
Dickson
Fentress
Franklin
Giles
Grundy
Hickman
Houston
Humphreys
Jackson
Lawrence
Lewis
Lincoln
Macon
Marshall
Maury
Montgomery
Moore
Overton
Perry
Pickett
Putnam
Robertson
Rutherford
Sequatchie
Smith
Stewart
Sumner
Trousdale
Van Buren
Warren
Wayne
White
Williamson
Wilson

Counties of the Western Division

Benton
Carroll
Chester
Crockett
Decatur
Dyer
Fayette
Gibson
Hardeman
Hardin
Haywood
Henderson
Henry
Lake
Lauderdale
Madison
McNairy
Obion
Shelby
Tipton
Weakley

APPENDIX B

URBANIZED AREAS AND URBAN CLUSTERS IN TENNESSEE

For the purposes of the 2010 census, the U.S. Census Bureau defined an urbanized area as a delineated geographical area with a densely settled core and contiguous populated areas with at least 50,000 residents. The U.S. Census Bureau defined an urban cluster as a delineated geographical area with a densely settled core and contiguous populated areas with at least 2,500 but fewer than 50,000 residents, which might include multiple central counties and the cities and town within them (Department of Commerce, 2011). Tennessee has 12 urbanized areas and 79 urban clusters according to the 2010 Census (Department of Commerce, 2012). These urbanized areas and urban clusters are listed below along with their populations and the Tennessee public school districts that serve them. The county school systems and any separate city school systems included in a county defined as being a central county in an urbanized area's metropolitan statistical area by the Office of Management and Budget's (2013, February 28) were included in the lists of school districts in urbanized areas and urban clusters below. The two urban clusters defined as Middlesborough, KY—TN—VA and Fulton, KY—TN are among Tennessee's 79 urban clusters and are included in the lists for reference, but have no Tennessee school districts associated with them because their central counties are in Kentucky, despite having some economic connection with a few Tennessee residents.

Urbanized Areas

Table B1

Urbanized Areas of the Eastern Division of Tennessee

Urbanized Area	Population	Tennessee School District or Districts
Knoxville, TN	558,696	Alcoa City Schools Anderson County Schools Blount County Schools Clinton City Schools Knox County Schools Lenoir City Schools Loudon County Schools Maryville City Schools Oak Ridge City Schools
Chattanooga, TN—GA	381,112	Hamilton County Schools
Johnson City, TN	120,415	Carter County Schools Elizabethton City Schools Johnson City Schools Washington County Schools
Kingsport, TN—VA	106,571	Hawkins County Schools Kingsport City Schools Sullivan County Schools
Bristol—Bristol, TN—VA	69,501	Bristol City Schools Sullivan County Schools
Cleveland, TN	66,777	Bradley County Schools Cleveland City Schools
Morristown, TN	59,036	Hamblen County Schools Jefferson County Schools

Table B2

Urbanized Areas of the Middle Division of Tennessee

Urbanized Area	Population	Tennessee School District or Districts
Nashville-Davidson, TN	969,587	Franklin City Elementary Schools Metropolitan Nashville Public Schools Sumner County Schools Williamson County Schools Wilson County Schools
Clarksville, TN—KY	158,655	Clarksville-Montgomery County School System
Murfreesboro, TN	133,228	Murfreesboro City Schools Rutherford County Schools

Table B3

Urbanized Areas of the Western Division of Tennessee

Urbanized Area	Population	Tennessee School District or Districts
Memphis, TN—MS—AR	1,060,061	Memphis City Schools Shelby County Schools
Jackson, TN	71,880	Jackson-Madison Consolidated Schools

Urban Clusters

Table B4

Urban Clusters of the Eastern Division of Tennessee

Urban Cluster	Population	Tennessee School District or Districts
Greeneville, TN	23,957	Greeneville City Schools Greene County Schools
Harriman—Kingston—Rockwood, TN	23,515	Roane County Schools
Sevierville, TN	22,108	Sevier County Schools
La Follette, TN	21,055	Campbell County Schools
Crossville, TN	16,337	Cumberland County Schools

Athens, TN	15,985	Athens City Elementary Schools McMinn County Schools
Middlesborough, KY—TN—VA	15,330	Contains no Tennessee school districts in its central county
Newport, TN	11,603	Cocke County Schools Newport City Elementary Schools
Dayton, TN	10,174	Dayton City Elementary Schools Rhea County Schools
Erwin, TN	9,788	Unicoi County Schools
Rogersville, TN	6,444	Hawkins County Schools Rogersville City Elementary Schools
Fairfield Glade, TN	5,584	Cumberland County Schools
Sweetwater, TN	5,430	Monroe County Schools Sweetwater City Schools
Madisonville, TN	5,391	Monroe County Schools
South Pittsburg, TN—AL	5,373	Marion County Schools Richard City Special School District
Dandridge, TN	4,959	Jefferson County Schools
New Tazewell, TN	4,598	Claiborne County Schools
Oneida, TN	4,322	Oneida Special School District
Etowah, TN	4,129	Etowah City Elementary Schools McMinn County Schools
Strawberry Plains, TN	3,906	Knox County Schools
Jasper, TN	3,281	Marion County Schools
White Pine, TN	3,061	Jefferson County Schools
Norris, TN	3,005	Anderson County Schools
Mountain City, TN	2,698	Johnson County Schools

Table B5

Urban Clusters of the Middle Division of Tennessee

Urban Cluster	Population	Tennessee School District or Districts
Cookeville, TN	44,207	Putnam County Schools
Columbia, TN	34,965	Maury County Schools
Spring Hill, TN	31,208	Maury County Schools
Lebanon, TN	27,653	Lebanon Special School District Wilson County Schools
Shelbyville, TN	20,005	Bedford County Schools
Springfield, TN	17,357	Robertson County Schools
Dickson, TN	16,016	Dickson County Schools
McMinnville, TN	15,386	Warren County Schools
Manchester, TN	11,379	Manchester City Schools
Portland, TN—KY	10,869	Sumner County Schools
Lewisburg, TN	10,464	Marshall County Schools
Lawrenceburg, TN	10,100	Lawrence County Schools
Fayetteville, TN	9,178	Fayetteville City Schools Lincoln County Schools
Pulaski, TN	7,741	Giles County Schools
Fairview, TN	6,373	Williamson County Schools
Sparta, TN	5,449	White County Schools
Lafayette, TN	4,545	Macon County Schools
Pleasant View, TN	3,730	Cheatham County Schools
Dunlap, TN	3,691	Sequatchie County Schools
Hohenwald, TN	3,625	Lewis County Schools
Mount Pleasant, TN	3,507	Maury County Schools
Livingston, TN	3,485	Overton County Schools
Ashland City, TN	3,384	Cheatham County Schools
Carthage, TN	3,282	Smith County Schools
Monterey, TN	3,010	Putnam County Schools

Table B6

Urban Clusters of the Western Division of Tennessee

Urban Cluster	Population	Tennessee School District or Districts
Dyersburg, TN	21,903	Dyer County Schools Dyersburg City Schools
Atoka, TN	18,885	Tipton County Schools
Arlington, TN	11,502	Shelby County Schools
Martin, TN	11,397	Weakley County Schools
Paris, TN	10,642	Henry County Schools Paris City Special Schools
Union City, TN	10,303	Obion County Schools Union City School
Brownsville, TN	9,879	Haywood County Schools
Humboldt, TN	8,769	Humboldt City Schools
Ripley, TN	8,763	Lauderdale County Schools
Covington, TN	8,578	Tipton County Schools
Savannah, TN	8,347	Hardin County Schools
Milan, TN	7,427	Milan Special School District
Oakland, TN	7,057	Fayette County Schools
Lexington, TN	6,560	Henderson County Schools Lexington City Elementary Schools
Henderson, TN	6,027	Chester County Schools
Bolivar, TN	5,394	Hardeman County Schools
McKenzie, TN	5,066	McKenzie Special School District
Bells, TN	4,758	Bells City Schools Crockett County Schools
Fulton, KY—TN	4,339	Contains no Tennessee school districts in its central county
Trenton, TN	3,852	Trenton City Schools
Selmer, TN	3,840	McNairy County Schools

Medina, TN	3,636	Gibson County Special School District
Camden, TN	3,552	Benton County Schools
Dyer, TN	3,248	Gibson County Special School District
Halls, TN	2,735	Lauderdale County Schools

APPENDIX C

MAJOR URBAN AREAS IN TENNESSEE

The urban school systems used in this study were selected from the following lists. Each list contains all the urbanized areas and the three most populous urban clusters according to the 2010 Census (Department of Commerce, 2012) for each of Tennessee's Grand Divisions. The county school systems and any separate city school systems included in a county defined as being a central county in an urbanized area's metropolitan statistical area by the Office of Management and Budget (2013, February 28) were included in the lists of school districts of the urbanized areas and urban clusters provided below. Three urban areas were randomly selected for study from each Grand Division. In any selected urban area that encompassed more than one school district, one school district was selected at random to represent that urban area.

Eastern Division

Table C1

Urban Areas of the Eastern Division of Tennessee

Urban Area	Population	Tennessee School District or Districts
Knoxville, TN	558,696	Alcoa City Schools Anderson County Schools Blount County Schools Clinton City Schools Knox County Schools Lenoir City Schools Loudon County Schools Maryville City Schools Oak Ridge City Schools
Chattanooga, TN—GA	381,112	Hamilton County Schools
Johnson City, TN	120,415	Carter County Schools Elizabethton City Schools Johnson City Schools Washington County Schools
Kingsport, TN—VA	106,571	Hawkins County Schools Kingsport City Schools Sullivan County Schools
Bristol—Bristol, TN—VA	69,501	Bristol City Schools Sullivan County Schools
Cleveland, TN	66,777	Bradley County Schools Cleveland City Schools
Morristown, TN	59,036	Hamblen County Schools Jefferson County Schools
Greeneville, TN	23,957	Greeneville City Schools Greene County Schools
Harriman—Kingston—Rockwood, TN	23,515	Roane County Schools
Sevierville, TN	22,108	Sevier County Schools

Middle Division

Table C2

Urban Areas of the Middle Division of Tennessee

Urban Area	Population	Tennessee School District or Districts
Nashville-Davidson, TN	969,587	Franklin City Elementary Schools Metropolitan Nashville Public Schools Sumner County Schools Williamson County Schools Wilson County Schools
Clarksville, TN—KY	158,655	Clarksville-Montgomery County School System
Murfreesboro, TN	133,228	Murfreesboro City Schools Rutherford County Schools
Cookeville, TN	44,207	Putnam County Schools
Columbia, TN	34,965	Maury County Schools
Spring Hill, TN	31,208	Maury County Schools

Western Division

Table C3

Urban Areas of the Western Division of Tennessee

Urban Area	Population	Tennessee School District or Districts
Memphis, TN—MS—AR	1,060,061	Memphis City Schools Shelby County Schools
Jackson, TN	71,880	Jackson-Madison Consolidated Schools
Dyersburg, TN	21,903	Dyer County Schools Dyersburg City Schools
Atoka, TN	18,885	Tipton County Schools
Arlington, TN	11,502	Shelby County Schools

APPENDIX D

RURAL AREAS IN TENNESSEE

A rural area is defined as any area not included in an urbanized area or an urban cluster (Department of Commerce, 2011), meaning it must be an area with fewer than 2,500 residents and no large population concentrations immediately nearby (otherwise it would become part of that urbanized area or urban cluster). School systems not included in any urbanized area or urban cluster were considered rural. The counties these school systems were included in were confirmed as being fully or predominantly rural by the Census Bureau's map of the percent of population residing in urban areas by county (U.S. Census Bureau, 2010). Tennessee has 31 school districts serving only or primarily rural areas. These school districts are listed below. For the purposes of this study, three school systems were chosen at random from each of the lists below.

Eastern Division

Bledsoe County Schools
Grainger County Schools
Hancock County Schools
Meigs County Schools
Morgan County Schools
Polk County Schools
Scott County Schools
Union County School

Middle Division

Clay County Schools
Dekalb County Schools
Fentress County Schools
Grundy County Schools
Hickman County Schools
Houston County Schools
Jackson County Schools
Moore County Schools
Perry County Schools
Pickett County Schools
Stewart County Schools
Trousdale County Schools
Van Buren County Schools
Wayne County Schools

Western Division

Alamo City Schools
Bradford Special Schools
Carroll County Schools
Decatur County Schools
Hollow Rock-Bruceton Schools
Huntingdon Special Schools
Lake County Schools
South Carroll Special School District
West Carroll Special School District

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