CAPTURING THE IMPACT OF CAREER AND TECHNICAL EDUCATION

PARTICIPATION ON GRADUATION LIKELIHOOD

by

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Dedication

The capstone of this journey is dedicated to my wife, Sara, and my children, Katelyn, Lauren, and Jack. Sara, without your sacrifice and support this endeavor would not have been possible. Katelyn, Lauren, and Jack, thank you for giving your time with me to the field of education to make a difference in other children's lives. I would also like to dedicate this work to my parents, Gerald and Robbin Seeton. You always allowed me the space and afforded me the tools to pursue my passion. You instilled a "why not" attitude in me. The only thing you ever took from me was excuses about why I could not accomplish whatever I wanted to accomplish. Finally, I would like to dedicate this dissertation my colleagues in the field of education who supported me throughout this journey. Without your constant encouragement and belief in me, this would not have been possible.

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Abstract

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Graduation rate is a common measure of public school system productivity. Previous

literature indicates some of the characteristics known to be associated with disparities in

graduation rates include associations of race and ethnicity, socioeconomic status, and English

language learner/proficiency status. In Texas, the graduation gap facing historically marginalized

populations of students continues to present a problem for educators, citizens, policy makers, and

society as a whole.

Industry input, future earning potential, and potential future employment can play a

significant role in most learners' decisions. The integration of work-based learning with a

streamlined curriculum can lead to higher wages after high school (Hoachlander, 2008). Learners

who participate in career and technical education (CTE) programs have the opportunity to gain

the technical knowledge and skill set to help businesses grow (Magnuson, 2013). When students

who elect to engage in CTE receive their employment opportunity from industry partners, it is

often times accompanied with a substantially higher wage rate in the eighteen months following

graduation (Kang & Bishop, 1989). Plenty of qualitative affirmations exist in previous research

about CTE. CTE coursework can contribute to learners' perceived relevance to every life

(Hyslop & Imperatore, 2013), encouraging students to become productive members of society

(Stone III & Aliaga, 2005). Further, CTE courses can positively complement specific academic

subjects by allowing students to contextualize what they learn in core academic areas (Bozick & Dalton, 2012).

In this study, I analyze the graduation rates of CTE students. Specifically, I seek to determine whether CTE involvement is associated with graduation outcome. I use a logistic regression, in which the dependent variable is a dichotomous measure of whether or not the student graduated from high school. The independent variables included in this study are those that have previously shown association with graduation rates.

Results from this analysis indicate that CTE participation is significantly associated with graduation. Moreover, students enrolled in a coherent CTE course sequence (the acquisition of three or more credits in two or more courses within the same program of study) have over twice the odds of graduating high school than students whom do not enroll in a coherent sequence. This relationship persists when controlling for other factors known to impact graduation.

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Chapter 1

Capturing the Impact of Career and Technical Education Participation on Graduation Likelihood

Graduation rate is a common measure of public school system productivity. Yearly, the state of Texas devotes billions of tax payers' dollars to funding public education with the intent to provide resources for its students, presumably leading to graduation (Texas Education Agency, 2015). However, the extent to which these financial resources are directed to areas that affect a school district's graduation rate is unclear. The ambiguous nature of the funding necessitates continuous investigation into the factors that contribute to the variability in graduation rates among high school students.

A myriad of co-curricular and extra-curricular programs are available to students throughout many institutions in public education. The multitude of athletic competitions, fine arts performances, and co-curricular club activities offer places for students to pursue their passions as well as fulfill a need for association. However, disparities in graduation rates among certain populations of students still exist. Based on a plethora of previous literature, some of the characteristics known to be associated with disparities in graduation rates include associations of race and ethnicity, socioeconomic status, and English language learner/proficiency status.

According to the U.S. Department of Education National Center for Education Statistics (heretofore NCES), only 75.2% of Hispanic and 70.7% of African American high school students graduated on a four-year graduation plan in 2013; compared to an 86.6% four-year completion for White students. In the 2013 graduating cohort, 12% of the nation's Hispanic high school students and 7% of the nation's African American high schoolers dropped out, while only 5% of the nation's White population left high school before graduating (Kena et al., 2015). For many years, associations of race and ethnicity consistently manifest as factors in the variability

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in graduation rates (Aliaga, Kotamraju, & Stone III, 2014; Bloom, & Unterman, 2014; Christle, Jolivette, & Nelson, 2007; Evan, Burden, Gheen, & Smerdon, 2013; Fitzgerald et al., 2013; Izumi, Shen, & Xia, 2015; Kamalludeen,2012; Lim, Owen, & Nordin, 2013; Plank, 2001a; Plank, 2001b; Plank, DeLuca, & Estacion, 2005; Plank, DeLuca, & Estacion, 2008; Rasinski & Pedlow,1994; Subedi, Reese, & Powell, 2015; Suh, Malchow, & Suh, 2014).

In addition to graduation rates of different races and ethnicities, researchers find that socioeconomic status of students and their families affect student achievement (Aliaga et al., 2014; Bloom, & Unterman, 2014; Christle et al., 2007; Kamalludeen, 2012; Lamote et al., 2013; Papay, Murnane, & Willett, 2015; Pittman, 1991; Plank, 2001a; Plank, 2001b; Plank et al., 2005; Plank et al., 2008; Rasinski & Pedlow, 1994; Suh et al., 2014). Often, family income can affect individual's educational outcomes. The financial resources required for tutorials and educational enrichment are many times not available to those that are economically disadvantaged. Consequently, students whose families reside below or around the poverty line may not have access to the supplemental resources that are instrumental in many students' success.

Finally, an emergent factor affecting the success of students is that of English language proficiency (Aliaga et al., 2014; Bloom, & Unterman, 2014; Christle et al., 2007; Fitzgerald et al., 2013; Kamalludeen, 2012; Lamote et al., 2013). Many students, especially in Texas, do not claim English as their first language or their choice of language outside of school. For these students, success can be especially difficult. When students must navigate language barriers, as well as conceptual understandings, their chances for success in school are potentially hindered.

Although the aforementioned factors reported to affect the variability in success rates of different populations is primitive, provided in Chapter 2 is a more thorough description of relevant literature. While career and technical education (heretofore CTE) is well funded at the

federal and state level and can be portrayed as "good for kids," scant quantitative evidence exists

pertaining to its benefits, particularly in comparison to the wealth of knowledge around the

aforementioned areas of race, class, and language status. Further, precious little is known about

the benefits of completing a coherent sequence of CTE courses. Students who completed a

coherent sequence of CTE courses earned at least three CTE credits from two or more CTE

courses in the same program of study or career cluster. Exploring the effects of a coherent

sequence of CTE course taking represents a departure from extant literature. I intend to explore

this gap in empirical knowledge concerning CTE and its contribution to student achievement as

it pertains to students completing a coherent CTE course sequence. The proceeding section

contains the problem statement, purpose statement, and research questions of this dissertation.

Problem Statement

In Texas, the graduation gap facing historically marginalized populations of students

continues to present a problem for educators, citizens, policy makers, and society as a whole.

According to the Texas Education Agency's (TEA) 2015 Texas Academic Performance Report

(TAPR), only 85.1% of Hispanic students graduated on a four-year graduation plan in 2014;

compared to a 93% rate for their White counterparts. Additionally, the Hispanic graduation rate

fell three percentage points short of the state's overall average (Texas Education Agency, 2015).

Given the disparity (7.9 percentage points) between the graduation rates of Hispanics and

Whites, one can expect the dropout rates to follow suit. In the class of 2013, 8.2% of the state's

Hispanic population and 9.9% of African American students dropped out of high school, while

only 3.5% of the state's White population left high school before graduating (Texas Education

Agency).

Earning a High School Diploma

The benefits of a high school diploma are numerous in scope. For instance, those that graduate high school are much less likely to go to jail than those that fail to complete grades K-12 (Messacar & Oreopoulos, 2013). In recent years, research shows that 16% of high school dropouts are unemployed, while 32% live under the poverty line (Messacar & Oreopoulos). Additionally, a disparity exists between incomes of those that graduate versus those who dropout. In 2013, a high school dropout earned on average, only $12.75 per hour; once they reach age 50, their hourly wage averages $16.50 an hour (Messacar & Oreopoulos). Dansby and Dansby-Giles (2011) estimate that, over a lifetime, high school graduates earn about $260,000 more than citizens who do not earn a high school diploma.

Possible Solution

Theoretically, each student enrolled in secondary education has an end game in mind, along with aspirations to be successful. Industry input, future earning potential, and potential future employment can play a significant role in most learners' decisions. The integration of work-based learning with a streamlined curriculum can lead to higher wages after high school (Hoachlander, 2008). Learners who participate in CTE programs have the opportunity to gain the technical knowledge and skill set to help businesses grow (Magnuson, 2013). When students who elect to engage in CTE receive their employment opportunity from industry partners, it is often times accompanied with a substantially higher wage rate in the eighteen months following graduation (Kang & Bishop, 1989).

The gap in empirical evidence around coherent CTE course sequence taking and its effect on graduation rates is the problem addressed in subsequent sections. Specifically, I explore the association of CTE participation with variability in graduation rates, alone and in combination

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with other variables. While the graduation rate gap of certain populations of students still exists (Alexander, Entwisle, & Kabbani, 2001; Christle, Jolivette, & Nelson, 2007; Evan, Burden, Gheen, & Smerdon, 2013; Fitzgerald et al., 2013;Lamote et al., 2013; Lim, Owen, & Nordin, 2013; Rumberger & Thomas, 2000), there has been limited quantitative exploration of the benefits of enrollment in a coherent sequence of CTE courses. The gap in previous research to explore, empirically, the benefits of coherent CTE course sequence taking, supports the necessity of this study.

Purpose

In this study, I analyze the graduation rates of CTE students. Specifically, I seek to determine whether CTE involvement is associated with graduation outcome. I use a logistic regression, in which the dependent variable is a dichotomous measure of whether or not the student graduated from high school. The independent variables included in this study are those that have previously shown association with graduation rates. The 2015 graduate-eligible cohort of seniors from three suburban school districts in the North Texas area comprise the research sample. I utilize a convenience sampling method to select the group of students for analysis. Specifics of the sample, sample selection, and a more in depth discussion of the specific variables take place in Chapter 3.

Plenty of qualitative affirmations exist in previous research about CTE. CTE coursework can contribute to learners' perceived relevance to every life (Hyslop & Imperatore, 2013), encouraging students to become productive members of society (Stone III & Aliaga, 2005). Further, CTE courses can positively complement specific academic subjects by allowing students to contextualize what they learn in core academic areas (Bozick & Dalton, 2012). While CTE participation seems to have its benefits, as understood in the qualitative literature, what is

missing is a quantification of its impact on graduation, particularly when that participation is in the form of a coherent sequence of CTE courses. I strive to bring new empirical data and analysis to light from a seemingly underrepresented methodological tradition (quantitative inquiry) within extant literature. The results of this work can inform the Texas Education Agency, policy makers, local districts, and campus level administration. Regarding the Texas Education Agency, the study's results can be used to guide relevant education and administrative code. From a legislative standpoint, the results can shed light on where some of the financial resources and human capital should be directed in public education. At the local district level, results from this analysis can inform local policy and curriculum direction. Finally, at the campus level, administrators can use the information from this study to support students in their academic endeavors.

Given 1) the gap in quantitative literature devoted to coherent CTE course sequence taking on graduation likelihood, and 2) the growing policy interest in CTE, this work is timely and important. As such, the purpose of this dissertation is to contribute to the body of secondary school outcomes research by exploring how CTE can be a mitigating factor for graduation. In the subsequent section, I present the research questions that inform this study.

Research Questions

In order to inform readers on the benefits of CTE and how CTE affects graduation, the following research questions are posed:

1) Is coherent CTE course sequence completion associated with graduation? Specifically, what association, if any, exists between a student's coherent CTE course sequence completion and graduation from high school? The intent of this research question is to establish whether students who enrolled in a coherent sequence of CTE

courses are more likely to graduate than those not enrolled in a coherent sequence of CTE courses.

2) Should a significant association be established, does it persist in the presence of other measures known to impact graduation likelihood? More specifically, when controlling for other independent variables, does a student's coherent CTE course sequence completion and the chosen independent variable(s) make a significant contribution to graduation? The purpose of this question is to inform readers on whether a student's CTE participation makes a significant contribution to graduation, when controlling for other independent variables established via extant literature as meaningful determinants of high school completion (e.g. race, socioeconomic status, gender, at risk status, English language proficiency status, special education status, and relative academic achievement).

Document Organization

In the following section, I outline the organization of this dissertation. First, a brief definition of terms informs the reader of concepts used throughout the study. Following that, I provide a roadmap for the reader to follow throughout their analysis. Finally, I present a preview of the upcoming chapter.

Definition of Terms

In order for the reader to understand the purpose, results, and discussion of this study, it is important to define the terms not commonly known in the research community. The terms below deal specifically with CTE codes from a federal and state level. All students in public school in Texas are assigned a CTE indicator code of "0", "1", or "2" (State of Texas Student Attendance Accounting Handbook, 2015):

Federal CTE student codes (Carl D. Perkins Career and Technical Education Act, 2006):

1) 0- the code assigned to a student that is not enrolled in a CTE course and no plans of future enrollment in a CTE course.

2) 1- the code assigned to a student that is enrolled in a CTE course but has no plans of future enrollment in a CTE course.

3) 2- the code assigned to a student that is enrolled in a CTE course, or has previously enrolled in a CTE course and has a plan to enroll in future CTE courses in the same career cluster. This student is coded a two if they will acquire or have acquired three or more credits in two or more courses in the same program of study. Students that complete a coherent sequence of CTE courses are known as coherent CTE course sequence completers.

State contact hour codes (Texas Student Attendance Accounting Handbook, 2015):

1) V1- A daily average per week of 45-89 minutes of contact seat hours in a CTE course.

2) V-2- A daily average per week of 90-149 minutes of contact seat hours in a CTE course.

3) V-3- A daily average per week of 150-189 minutes of contact seat hours in a CTE course.

These terms will be fully articulated in Chapter 3.

The following terms will be used to describe the different graduation plans in Texas, as they pertain to the data set in this study. The data from this study was collected during a transition from the previous graduation plan (minimum/recommended) in Texas to a new graduation plan (foundations/distinguished level of achievement) (HB 5: Public School

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Accountability, 2013). The knowledge of differentiation in graduation plans that students choose becomes important to the reader in the results and discussion section of the dissertation.

1) Recommended graduation plan- students ending with the graduating cohort of 2017 are on a graduation plan that requires students to attain 26 total credits. The credits must consist of: Four English/Language arts credits, four math credits, four science credits, four social studies credits, two foreign language credits, one fine arts credit, one physical education credit, one technology credit, one-half of a speech credit, one-half of a health credit, and four elective credits of the students choosing.

2) Minimum graduation plan- students ending with the graduating cohort of 2017 are still eligible to attain a diploma on a graduation plan that requires students to attain 22 total credits. The credits must consist of: Four English/Language arts credits, three math credits, two science credits, four social studies credits, one fine arts credit, one physical education credit, one technology credit, one-half of a speech credit, one-half of a health credit, and five elective credits of the students choosing.

3) Distinguished level of achievement graduation plan- students beginning with the 2018 cohort of graduating seniors are on a graduation plan that requires students to earn 26 credits. However, students on this plan must choose an endorsement from one of five concentration areas. Credits must consist of: Four English/Language arts credits, four math credits, four science credits, four social studies credits, two foreign language credits, one fine arts credit, one physical education credit, one technology credit, and five elective credits of the students choosing from the student's selected endorsement area (HB 5: Public School Accountability, 2013).

4) Foundation graduation plan- students beginning with the 2018 cohort of graduating seniors can still obtain a high school diploma on a graduation plan that requires students to earn only 22 credits. Students on this plan may choose to opt out of an endorsement from one of five concentration areas. Credits must consist of: Four English/Language arts credits, three math credits, three science credits, three social studies credits, two foreign language credits, one fine arts credit, one physical education credit, and five elective credits of the students choosing (HB 5: Public School Accountability, 2013).

Dissertation Overview

The preceding sections were an introduction to the background information necessitating investigation of the topics discussed in this study. I presented a concise introduction to the topic, followed by the problem statement, emphasizing the importance of obtaining a high school diploma and the possible solution offered by CTE. To close Chapter 1, I communicated the purpose of the study and the research questions to answer in the study, followed by a brief definition of terms.

Chapter 2. Chapter 2 contains the literature review and theoretical perspective sections of the dissertation. Due to the fact that empirical research in the area of CTE is sparse, I present a thorough literature review on the subject. Specifically, I review literature on the history of CTE, CTE policy, and the implications of CTE. Further, I review literature on the espoused benefits of CTE for students, schools, and communities. Next, I provide a thorough review of factors known to influence graduation likelihood. I include variables relating to each of these factors in the data analysis procedure outlined in Chapter 3.

The lens through which I view the data and data analysis revolves around the concept of neoliberalism and neoliberal ideology. Neoliberalism is a perspective that articulates all of our actions, in education and otherwise, pointing to an entrepreneurial motive and ultimate economic end. I present neoliberalism as a perspective to explain the relationship of CTE's effect on the economic and social relationships with which we engage.

Chapter 3. In chapter 3 of this dissertation, I explain the proposed methodology. In order to understand the methodology, I present the definition, source, and reasoning behind the chosen sample. Then, I present the variables used in this study and an explanation of the CTE variable by deciphering what the CTE variable captures, how the CTE variable is measured, how the CTE variable is recorded, and what the CTE variable means to policy and funding. Next, I present a concise explanation as to why I choose logistic regression to analyze the sample; followed by a thorough definition of the technique. Finally, Chapter 3 concludes with ethical considerations when engaging with data and the overall validity of the research design.

Chapter 4. Chapter 4 contains the findings of the study as they pertain to the research questions presented in Chapter 1. It is in Chapter 4 that I will provide a summarization of collected data and explain the statistical results of the data. Moreover, I will go through the descriptive statistics to thoroughly describe the sample. Then, I will present findings from the inferential analyses, which ultimately provide answers to both research questions.

Chapter 5. Chapter 5 of this dissertation contains the implications of findings from data analysis, replete with consideration of how policy makers, local education agencies, school district administrators, and campus level administrators might use the results found in this study. I present recommendations for future research, as well as the limitations and possible biases associated with this work. I provide answers to each research question, along with primary

empirical evidence to support the answers. Finally, I explain the overall contribution of the study

to the field of education.

Chapter 2

Capturing the Impact of Career and Technical Education Participation on Graduation Likelihood

This dissertation is concerned with the association between high school graduation and career and technical education (heretofore CTE) participation. Before discussing the relevant literature on the factors affecting graduate rates of students, I start with a review of CTE. Specifically, work outlining CTE policy, federal and state funding, and implications and benefits of CTE are points of discussion. The second part of this chapter is devoted to the factors affecting graduate rates of students followed the by theoretical perspective for this work. I use neoliberal ideology as the lens from which to view and make sense of the findings in this study. Accordingly, I give a brief description of how neoliberalism allows me to shape my study design and how conceptualizing neoliberalism can help interpret the results of the analysis. A combination of the previously mentioned sections of this literature review informs the methodology outlined in Chapter 3.

Career and Technical Education

CTE, previously known as vocational education, has emerged as an alternative to traditional, mainstream public education. Students have the opportunity to supplement their academic coursework with CTE courses that teach them a trade (vocation) that can lead to a job directly out of high school or prepare them to enter post-secondary training. As recently as 2006, restructuring of CTE in the United States took place in order to integrate with traditional academic coursework and provide learners a rich academic experience (Carl D. Perkins Career and Technical Education Act, 2006). One of the goals of CTE programs in this country is to lower the disparate dropout rates and increase graduation rates currently plaguing historically marginalized populations of students (Carl D. Perkins Career and Technical Education Act). As

such, this dissertation serves as a de facto assessment of this goal. In this section, I outline the policy and funding implications surrounding CTE. I address funding at the federal and state level before moving to the implications and benefits of a well-rounded CTE program. Finally, I visit some of the effects of CTE participation.

Policy

In January of 2013, the state of Texas finalized House Bill 5 (heretofore HB 5) (House Bill 5: Public School Accountability, 2013). Under HB 5, students have the opportunity to earn endorsements on their high school transcript as well as performance acknowledgements for high school industry certifications (HB 5: Public School Accountability). Endorsements are various combinations of courses that lead to a student earning a seal on their diploma and transcript based on the course of study with which they engage. Where most high school diplomas in the past looked the same, differentiated only by GPA, post-HB 5 diplomas can look rather different depending on the endorsement students earn and the performance acknowledgement they receive. Students can earn performance acknowledgements in the form of industry standard certifications, advanced placement coursework, dual credit coursework, and the like. This new graduation track is a package requiring students to earn 26 total credits, which includes earning endorsements and performance acknowledgements in their field of study. There are five different areas from which students can earn endorsements, three of which directly involve CTE courses.

Policy mandates require that industry advisement and representation are part of CTE programs. Legislators strongly encourage CTE program coordinators to actively seek out industry advisory teams, which help drive their curriculum and budgeting decisions (Carl D. Perkins Career and Technical Education Act, 2006). The structure of CTE is in constant flux based on local demand data. In times of economic downturn or progress, the job market for a

particular area may change. This could lead to a higher demand in one occupational area and a lower demand in another. Moreover, CTE structure depends heavily on the amount of funding a district receives.

Federal Funding

Funding in CTE at the federal level began with the passing of the Smith-Hughes Act (1917). This legislation marked the first time that federal funds were earmarked for secondary vocational training. In 1936, the George-Deen Act authorized funds for the areas in vocational education that dealt directly with distributive occupations. The National Defense Education Act (1958) then followed, and provided funds to support technical programs, vocational guidance, training programs, and training institutes. Soon after, the Vocational Education Act (1963) authorized federal funds to support residential vocational schools, work-study programs, research, training, and demonstrations in vocational as well as business education. This historical chronology leads to the current funding program from the United States government for CTE, the Carl D. Perkins Vocational Education Act of 1976 (heretofore Perkins I).

Under Perkins I (1976), the U.S. government aimed to expand, improve, modernize, and develop quality vocational education programs to meet the demands of an industrialized workforce and to promote economic growth. The authors of The Carl D. Perkins Vocational and Applied Technology Education Act of 1986 (heretofore Perkins II) attempted to provide greater vocational opportunities to disadvantaged students and assist state and local school systems in teaching the skills and competencies necessary to compete in a technologically advanced society. Perkins II marked the first time federal funds became available to integrate academic and vocational coursework, as well as introduce tech preparation programs. In 1998, the authors of Carl D. Perkins Vocational and Technical Education Act granted states and local agencies

greater flexibility in developing vocational programs with the additional accountability for student performance as an included stipulation for utilization of the funds into areas such as tech-prep, school-to-work, gender equity, and students with disabilities.

Currently, federal funding for CTE operates under The Carl D. Perkins Career and Technical Education Act (2006) (heretofore Perkins IV), where policymakers aim specifically at the academic achievement of CTE students. Perkins IV authors attempt to (1) strengthen the connections between secondary and post-secondary education and (2) improve state and local accountability. Distribution of funds from Perkins IV is based on the socioeconomic status of the local school district's population and the number of coherent CTE course sequence takers a school district has from 7th through 12th grade. That is, funding eligibility is determined by the number of students who are taking courses in the same career pathway from year-to-year or semester-to-semester within the school district's 9th through 12th grades. A specified percentage of students that a school district must have in coherent sequences within CTE programs is not required in order to get Perkins funding. Perkins funding stipulates that either a school district has students in coherent CTE course sequences or they do not. The amount of money a school district receives is based on ten-year census data, re-evaluated each year by the state education agencies for consideration of dramatic economic growth or downturn. Along with federal funding in CTE, there are several components to the manner in which Texas funds CTE.

State Funding

The state distributes the second source of funding for CTE. The state funding in Texas is directly dependent upon the number of students in CTE, the average daily attendance of CTE students, the number of seat hours associated with each course, and the district's adjusted allotment from the state (Career and Technical Education Administrators Conference, 2014;

Texas Education Agency, 2013). The initial funding variable relates to the number of contact hours (seat hours) a course offers and whether a certified teacher administers the CTE course. A daily average per week calculates as follows: 45-89 minutes equals one contact hour (V1), 90-149 minutes is considered two contact hours (V2), and 150-189 minutes gives students three contact hours (V3). If a certified teacher is teaching the CTE course, the course is eligible for state funding. If a school district has an uncertified teacher teaching a CTE course, they sacrifice available state funding.

Seat hours and student attendance yield a full time equivalent multiplier. This multiplier factors into an equation that contains the average daily attendance number for the student (180 days is the maximum), the local school district's adjusted allotment, and the district's cost of education index to yield a district's CTE weighted funding amount. The amount distributed to school districts carries two purposes. While 58% percent of the weighted funding must be used for the district's CTE program, 42% accounts for indirect CTE costs allocated for the district's general fund. Additional sources of funding emerge from students enrolled in dual credit CTE courses, disabled students in middle school enrolled in CTE courses, and each student in an advanced CTE course ($50 per full time equivalent). The funding opportunities in CTE can help any school district build a respectable CTE program. Given the extensive policy history of CTE, the need to quantify the relationship between coherent CTE course sequence completion and graduation becomes all the more apparent, especially in light of the espoused benefits of CTE participation.

Implications and Benefits

Some scholars characterize CTE as the answer to many of the maladies that plague the American educational system. CTE has become an avenue for students to connect learning to

real life, work-based opportunity (Gentry, Rizza, Peters & Hu, 2005). Some of the basic tenants

of CTE lie in the traditional humanistic and cultural scope of what scholars consider education

(Bradshaw, 1993). In the proceeding text, Symonds (2012) comments on the benefits of CTE for

the American way of life.

> We can build a more effective American system by (1) offering young people in high
>
> school and beyond multiple pathways to success, instead of putting so much emphasis on
>
> attending a four-year college; (2) engaging employers in the crucial work of preparing
>
> young people for success, such as by providing career counseling and offering
>
> opportunities for work-based learning and actual employment; and (3) creating a new
>
> social compact with youth, in which key stakeholders in a state or region—educators,
>
> employers, and government officials— pledge to collaboratively improve pathways for
>
> those who are now being left behind. (p. 36)

In another example, Brewer (2004) communicates that CTE prepares students for the

transition from high school to post-secondary education and offers a fulfilling career through rich

educational experiences. CTE promotes lifelong learning and prepares students to enter a

workforce well equipped for any task (Gentry, Rizza, Peters & Hu, 2005). CTE develops

leadership skills in learners through training that places them in work environments to foster

leadership development (Magnuson, 2013). This environment leads students to explore their

career interests while navigating a general education curriculum (Gentry et al., 2005). For

children who may feel like there is no other alternative than to give up on education altogether,

CTE could be an attractive alternative. Participation in CTE can make the difference between

having a graduation day or a troublesome secondary experience.

Effects of CTE Participation

Perceptions of CTE are positioned positively within literature in many cases. However, those benefits will continually fall short if they cannot answer the basic most basic question: What is the effect of CTE on student achievement? In a study conducted by Gentry, Rizza, Peters and Hu (2005), students in a rural high school reported more appeal, challenge, choices, meaningfulness, and self-efficacy in CTE courses than in non-CTE courses. The programs at this particular high school (a CTE center) involved hands on, real-world applications, preparing students for life in the 21st century (Gentry et al., 2005).

The achievement gap among different races demands a substantial amount of attention when addressing learning in the United States. Stone III and Aliaga (2005) found that achievement gaps were smaller amongst CTE students (students taking predominantly CTE courses) than non-CTE students (students taking only academic courses). Furthermore, when substituted for less challenging general studies courses, Bozick and Dalton (2012) determined that CTE courses offered more positive effects on learning because the CTE courses complemented specific academic subject skills in courses such as math, science, and English.

In their study of participation in CTE courses using National Longitudinal Survey of Youth 1997, Stone III & Aliaga (2005) determined that CTE course taking helps decrease dropout rates, improves attendance and grades in high school, and increases enrollment in post-secondary education. Gentry, Rizza, Peters & Hu (2005) find that 70% of students enrolled in one career center participated in CTE extra-curricular activities that led to state and national competitions and leadership opportunities. Due to the fact that CTE is typically project based and career focused, these leadership opportunities are not only offered, but also sometimes required (Magnuson, 2013). This type of involvement could contribute to gains in engagement and

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attendance. A core component of engagement is learners' perceived relevance of coursework to everyday life (Hyslop & Imperatore, 2013). Additionally, this type of involvement can encourage learners to realize their goals of becoming productive members of society. Many youth in CTE are likely to aspire to attend two-year colleges, trade schools, post-secondary certification programs, etc. and move on to become productive citizens (Stone III & Aliaga, 2005).

Collectively, these studies suggest that CTE participation has meaningful influences on school outcomes, student's experiences, and student's opportunities. What remains to be identified, is the influence on more traditional and straightforward measures of academic achievement such as high school completion. Further, much of the existing research is qualitative in nature; and the quantitative research that is available does not consider coherent CTE course sequence taking and its relationship to graduation rate. This opens the space for research in capturing the impact of CTE participation on graduation likelihood.

In this section, I provided an overview of CTE. It is important that readers understand CTE policy, federal funding, state funding, implications and benefits of CTE, and effects of CTE participation for this analysis. In the next section, I present the factors that some researchers, through previous literature, report effect secondary dropout and graduation rates.

Factors Affecting High School Dropout and Completion Rates

The existing literature exploring the factors affecting graduation likelihood is numerous in scope. For the purposes of this study, I limit my review to the following factors, which collectively, are those most established: socioeconomic status, associations of race/ethnicity, special education status, English language proficiency, school and staffing characteristics, and course taking. In this review, lies the motivation for the second research question: 2) Should a

significant association between coherent CTE course sequence completion and graduation be established, does it persist in the presence of other measures known to impact graduation likelihood? More specifically, when controlling for other independent variables, do a student's coherent CTE course sequence completion and the chosen independent variable(s) make a significant contribution to whether or not they graduate? Below is a summation of the research for each contributor as well as the outcomes of specific studies that involve the various factors that affect graduation rates along with some mitigating factors for graduation.

Socioeconomic Status

Students of low socioeconomic status have a lower probability for graduating high school and a higher probability for dropping out of high school (Alexander, Entwisle, & Kabbani, 2001; Chapman, Laird, Ifill, & Kewal-Ramani, 2011; Christle, Jolivette, & Nelson, 2007; Goldschmidt & Wang, 1999; Kamalludeen, 2012; Lamote et al., 2013; Papay, Murnane, & Willett, 2015). Socioeconomic status can make a significant contribution to whether or not a student graduates high school (Goldschmidt & Wang 1999; Plank, 2001b). Students living in poverty may fare worse than those from more financially advantaged backgrounds (Evan, Burden, Gheen, & Smerdon, 2013). Previous literature reveals that students living in poverty can be more likely to drop out of high school (Christle et al., 2007). At the school level, institutions with a majority of students from predominantly low socioeconomic backgrounds can show a higher dropout rate than schools with students predominantly from average socioeconomic backgrounds (Rumberger & Thomas, 2000). Moreover, the dropout rate for students from low-income families is sometimes higher than the rate for students from high-income families (Chapman et al., 2011).

In moving from a broad discussion to more specific examples, Lamote et al. (2013) present a study on dropout in secondary education. Using a sample of students from longitudinal research in Flemish secondary education, they find that the highest probability of a student's early exit from school occurs in grade 11. Put another way, if a student starts their secondary education on time, students from a lower socioeconomic background have a very high chance of dropping out of high school, most likely in grade 11. Moreover, these researchers find that students who are retained in secondary education from high-income backgrounds have a much better chance of completing high school than students who are retained in secondary education from low-income backgrounds. Finally, Lamote et al. (2013) note that, overall, school-level socioeconomic status is a factor for student dropout. Schools with a low socioeconomic school student composition have a higher dropout rate than schools with an average socioeconomic student composition. Interestingly, regardless of academic achievement, students from low socioeconomic backgrounds still show a higher probability of dropping out of high school. Papay, Murnane, and Willett (2015) corroborated Lamote et al. (2013) with a study on income-based gaps in educational attainment. The researchers report that income-related gaps in educational credentials and academic skill have narrowed over previous years. They find that educational attainment favors students with a higher socioeconomic status. Additionally, the gap between low and higher income level student attainment can become wider as family income increases. Similarly, Goldschmidt and Wang (1999) examine student and school level factors associated with students dropping out in different grades. The researchers report that average family socioeconomic status is more important in affecting dropout status than school composition, but do not see any evidence that private schools are any more effective in keeping students in school than public schools. Finally, the authors show that, even after accounting for

individual socioeconomic status, the school's average family socioeconomic status is a significant predictor of dropout.

While the above authors reveal that socioeconomic status can be a significant predictor of dropout, some researchers show that CTE can be a mitigating factor for socioeconomic status. Plank (2001a) studies the optimum balance of CTE courses and academic courses. Plank finds that CTE course taking is a mitigating factor for socioeconomic status when considering whether students graduate high school. Specifically, when controlling for socioeconomic status, CTE course taking can reduce the likelihood of dropping out of high school for the lowest and second lowest quartile of students from a low-income background (Plank, 2001a).

Socioeconomic status can be a major barrier to graduation for many students. However, school district recognition of this barrier puts stakeholders in a better position to help students be successful. In the next section, I discuss the implications of associations of race and ethnicity on secondary graduation and dropout rates.

Race and Ethnicity

Over the last few years, researchers document disparities in graduation rates between students of different races (Evan, Burden, Gheen, & Smerdon, 2013; Fitzgerald et al., 2013; Lim, Owen, & Nordin, 2013). The most glaring facet of the racial achievement gap is in regards to high school completion (Chapman, Laird, Ifill, & Kewal-Ramani, 2011; Christle, Jolivette, & Nelson, 2007; Kamaludeen, 2012; Plank, 2001b). From 1972-2009 the percentage of Hispanics aged 16-24 who dropped out was consistently higher than that of African American and White students (Chapman et al., 2011). When comparing African American, Hispanic, and White students, the graduation rate of White students is higher than that of African American and Hispanic students (Evan et al., 2103; Lim et al., 2013). Accordingly, the dropout rate for African

American and Hispanic students is considerably higher than the dropout rates for White students (Christle et al., 2007).

Considering associations of race and school size, Fitzgerald et al. (2013) conducted a study to analyze the differences in graduation rates between African American, Hispanic, and White students in small, medium, and large school settings in Texas. Their findings are consistent with previous research in that White students complete high school at a higher rate than African American students and Hispanic students. Fitzgerald et al. (2013) reported that significant differences emerged in favor of White students for the 2008-2009 and 2010-2011 school years. A statistically significant difference emerged between African American, Hispanic, and White students' graduation rates for the 2010-2011 academic year. More specifically, among these three groups of students over the 2010-2011 school year, White student graduation rates were higher than African American and Hispanic student graduation rates in small, medium, and large schools.

Chapman, Laird, Ifill, & Kewal-Ramani (2011) contribute research that analyzes trends in dropout and completion rates in the United States over a 37 year period, from 1972-2009. Chapman et al. present results that are consistent with previous research in that African American students, overall, have lower graduation and higher dropout rates than White students. The researchers report that Hispanic students, ages 16-24, dropped out of school at a higher rate than African American and White students over the 37 year period of the study. Of the races and ethnicities analyzed in this study, Asian students had the lowest status dropout rate, followed by White students (5.2%), then African American students (9.3%), and finally Hispanic students (17.6%).

The effects of associations of race on graduation rates are evident; however, CTE can be a mitigating factor for associations of race and ethnic dropout challenges. Bloom and Unterman (2014) conducted an analysis of the implementation of small schools of choice (SSC) in New York between 2002 and 2008. The authors found that SSC increases graduation rates by 9.5% in New York. This is equivalent to roughly one-half of the gap in graduation rates between students of color and White students.

Associations of race and ethnicity can play an important role in determining barriers to graduation and likelihood of dropout. The influences of race and ethnicity are largely out of students' hands, but are a very meaningful construct. Additional, meaningful factors that can contribute to high school graduation are special education services and English language proficiency.

Special Education and English Language Learners

Previous researchers show that students who receive special education services have a lower chance for high school completion and a greater chance of dropping out (Bloom, & Unterman, 2014; Christle, Jolivette, & Nelson, 2007; Evan, Burden, Gheen, & Smerdon, 2013). Additionally, researchers indicate that English language learners, often mistaken for needing special education services (Barrera, 2006), have a difficult time completing high school and have a higher propensity to drop out (Bloom, & Unterman, 2014; Evan et al., 2013; Griffin & Heidorn, 1996; Perreira, Harris, & Lee, 2006; Subedi, Reese, & Powell, 2015; Zsembik & Llanes, 1996). Students who receive special education services and have cognitive disabilities graduate at a lower rate and dropout at a higher rate than White students (Christle et al. 2007, Evan et al., 2013). Students with limited English proficiency graduate at a lower rate than White students (Evan et al.). Alternatively, students with higher English language proficiency have

lower dropout rates (Griffin & Heidorn, 1996; Perreira et al., 2006; Zsembik & Llanes, 1996). Providing English language instruction to students, who are English language learners, can decrease the number of students who are limited English proficient and decrease dropout rates for this population of students (Subedi et al., 2015).

Students requiring special education services and those who are limited English proficient face a difficult time in school in many cases. This population of students is a considerable and growing part of public education and warrants overdue, effective intervention. In the next section, I discuss relevant literature pertaining to school and staffing characteristics and its relevance to graduation.

School and Staffing Characteristics

Not only does previous research suggest that school characteristics can affect dropout and completion rates (Christle, Jolivette, & Nelson, 2007; Griffin, Hoffman, & Hunter, 1984; Izumi, Shen, & Xia, 2015; Knesting, 2008; Lamote et al., 2013; Lim, Owen, & Nordin, 2013; Nichols & Steffy, 1999), but staffing characteristics of those schools have some useful associations to secondary graduation and dropout rates as well (Croninger & Lee, 2001; Izumi et al., 2015; Knesting, 2008; Nichols & Steffy, 1999). Griffin et al. (1984) report that a school structured with self-paced, individual or small group instruction can help in reducing dropout rates. For example, when staff members are in charge of small groups of students, in a capacity as a facilitator of learning, students can be more successful. Student teacher ratio has an effect on dropout and completion rates as well. Schools structured with lower student to teacher ratios support a better chance that students will graduate from high school (Christle et al. 2007; Nichols & Steffy, 1999). The interaction between students and teachers is also an important school-staffing characteristic. Knesting (2008), reports that frequent comments regarding students' futures,

personal conversations, smiles, and eye contact with students have an effect on high school persistence.

The characteristics of teachers within the school are key factors in reducing dropout rates (Croninger & Lee, 2001). Itzumi, Shen, and Xia (2015) report that school characteristics have a significant effect on dropout and completion rates. Researchers used data from public and private alternative schools from the Schools and Staffing Survey of 2007-2008 to report that having a traditional grade structure has a negative correlation to completion rates. Itzumi et al. (2015) contend that a traditional grade structure, pre-kindergarten through 12th grade, can be detrimental to student success. Itzumi et al. (2015) present research that staffing characteristics within schools have a significant correlation to dropout and completion rates. Having the same teachers on staff is a marginal positive predictor of graduation. With this finding, authors show that a low staff turnover rate is a positive predictor of student success. However, the authors find that Hispanic teacher ratio is significantly associated with graduation rate. The Hispanic teacher ratio has a positive correlation with student completion and dropout rates.

Previous literature reveals that school and staffing characteristics can have an effect on graduation likelihood. However, course taking within the structure of an institution is also important. In the following section, I discuss literature pertaining to the effects of course taking on high school graduation.

Course Taking

A substantial amount of research exists on course taking affecting high school graduation rates. For the purposes of this analysis, I analyze literature that deals with CTE course taking and its effect on graduation rates. Many studies report that CTE course taking has a positive effect on graduation rates for many students (Agodini & Deke, 2004; Bishop & Mane, 2004; Bishop &

Mane, 2005; Kulik, 1998; Lim, Owen & Nordin, 2013; Maxwell, 2013; Plank, 2001a; Plank, 2001b; Plank, Deluca, & Estacion, 2005; Plank, Deluca, & Estacion, 2008; Rasinski & Steven, 1994; Rumberger, 2011; Rumberger & Lim, 2008; Schimpf, 2011). However, some researchers suggest CTE course taking in high school can be detrimental to student achievement (Agodini & Deke; Bishop & Mane, 2005; Plank, 2001a; Plank, 2001b; Plank, Deluca, & Estacion, 2005; Plank, Deluca, & Estacion, 2008; Pittman, 1991). Some research advocates for a healthy balance of CTE courses and academic courses with which students should engage to increase their chances of graduating high school (Bishop & Mane, 2005; Plank, 2001a; Plank, 2001b; Plank, Deluca, & Estacion, 2005; Plank, Deluca, & Estacion, 2008). Many territories in the United States see the potential power of CTE to be a mitigating factor for high school graduation (Lim et al., 2013) In a South Texas school district, the author reports that CTE was introduced to improve graduation rates and was successful in reducing the dropout rate by 90% between 2006 and 2008 (Maxwell, 2013). However, average students who purely concentrate on CTE course taking have just as much of a chance to dropout as those students who concentrate on purely academic course taking (Agodini & Deke, 2004). Contrary to a majority of researchers, Pittman (1991) finds no correlation between CTE course taking and dropout rate reduction. Moreover, Pittman reports that the level of participation in CTE programs does not have a strong effect on dropout rate. In a study by Plank, Deluca, & Estacion (2008), researchers evaluate 1997 Longitudinal Survey of Youth data to evaluate students' high school course taking and its association with dropout. They use data from approximately 8900 participants as well as annual interviews of the participants and interviews of parents. Their findings are consistent with Bishop and Mane (2005), Plank (2001a), Plank (2001b), and Deluca and Estacion (2005) that a middle range of CTE course taking is best. I assume this middle range of CTE course taking to be the

most similar to coherent CTE course sequence taking. However, research does not exist using the coherent CTE course sequence taking terminology, nor does research exist definitely using a similarly defined measure of CTE course taking.

CTE can have a positive effect on graduation and dropout rates. Plank, Deluca, & Estacion (2008) study of NELS:1997 data shows that some CTE combined with academic course taking is the prescription for success. They uncovered a curvilinear relationship showing that the further course taking gets from a 2:1 academic to CTE course taking ratio, the greater the chance for dropout. For example, in a high school where students amass 24 credits over a four-year period, researchers suggest student engage with 13 academic units, 6.5 CTE units, and 4.5 alternative units (foreign language, fine arts, physical education, etc.). HB 5 mandates that students take 15 core academic units in order to graduate high school in Texas. Based on Plank et al. (2008) research, a recommendation of 7.5 CTE credits could lead to success for students. If students engaged with 7.5 CTE credits, they would be considered a coherent CTE course sequence taker. Rasinski and Steven (1994) using NELS:88 data, conducted a study on whether student participation in CTE programs reduces the likelihood of dropping out of high school and found that the number of students that dropout in the 11th and 12th grade is significantly less in CTE programs than general programs. Moreover, the researchers found that each credit of CTE that a student earns in the first two years of high school correlates to a reduction in the odds of dropping out of high school (Rasinski & Steven). However, Agodini and Deke (2004), using NELS:88 data, conducted a study to determine whether CTE course taking can reduce dropout rates and found that there was no significant difference in the likelihood of dropping out whether students took predominantly CTE courses or the basic academic program. For students wanting to pursue CTE and not planning to attend college, Agodini and Deke suggest that dropping out is

less likely when they participate in predominately CTE courses in the same area of interest rather than when students explore a broad range of CTE courses. Bishop and Mane (2004) analyzed international cross-section data regarding offering upper-secondary students CTE options and found that nations with schools having CTE course options in the upper secondary years of a student's academic career has a significant effect on attendance and graduation rates, improving both. Specifically, Bishop and Mane show that a 10% increase in the share of upper-secondary students in vocational and pre-vocational programs is associated with a 2.6% increase in graduation rate.

Course taking in secondary education that offers opportunities for success can be difficult for students to navigate in their high school experience. However, CTE course taking can increase the odds of staying in school. Students enrolled in CTE early in secondary education can reduce their chances of dropping out of high school and improve their chance for graduation. Further, enrolling in a CTE program, keeping a 2:1 academic to CTE course ratio, increases the student's chances for success.

In this section I presented the factors associated with whether or not a student graduates high school. In the proceeding section, I present a theoretical perspective for consideration. I use neoliberal ideology as the lens from which to view and make sense of the data and findings in this study.

Neoliberalism

Neoliberalism is the belief that everything has an economic end. This ideology, closely aligned with the American political right, is rooted in the premise that one's only responsibility, outside of the family unit, is to build their entrepreneurial self. The neoliberal perspective is that the only acceptable departure from building the entrepreneurial self is that which involves raising

a family. Moreover, neoliberal ideology manifests in many different areas of our society including, but not limited to, government, political systems, corporate structures, and most relevant to the present study, our education system.

One can only make sense of the neoliberal agenda if they can clearly articulate from which context they view neoliberal ideology. While many of the concepts discussed below are portrayed negatively, neoliberalism is the dominant ideology of CTE. In order to establish a complete understanding of CTE as a fast growing, increasingly supported, and funded means of public education, one must recognize and comprehend the organizing frame within which CTE is situated.

The neoliberal perspective has many different pieces and, sometimes, indiscernible, moving parts. Staunch neoliberals attempt to hide neoliberal manifestations by fervently implicating other beliefs when warranted (Mirowski, 2013). More specifically, neoliberal advocates attempt to hide neoliberal ideology in organizations under the guise of capitalism in order to push a favorable economic outcome. Mirowski (2013) posits that neoliberalism is rooted in constructivism, harboring the inevitability of an economic end. Neoliberalism can be best understood as a way to restore marginalization and inequities associated with class power (Harvey, 2005). These inequities are exacerbated in a structure comprised of individual relationships among producers and consumers, where deficits are seen as a personal failures but necessary to attain meritocratic achievement (Gilborn & Youdell, 2000). These inequities lead to a continuously growing gap, between those that are included and those that are excluded (Giroux, 2011), which professional educators meticulously and intentionally work to close.

Neoliberal ideals are rooted in belief in the entrepreneurial self (Brown, 2015; Lakes, 2008; Mirowski, 2013), and the transfer of responsibility from the welfare state to the individual

(Koo, 2016). The only acceptable social harbor is that of the family unit (Brown, 2015). The family unit is the only acceptable retreat from building the entrepreneurial self. This individualization and flexibility empowers public risk-taking and the reliance on oneself (Lakes, 2008). Individuals advance their well-being by liberating their entrepreneurial freedom and skills from the state apparatus (Harvey, 2005). Under neoliberal ideology, the purpose for individuals in all activities is to behave and act in ways that present capital value and afford the opportunity to increase future value, while affirming free markets (Brown, 2015). This form of entrepreneur has the "licensed autonomy" to exploit a free supermarket (Apple, 2012), deciding how to construct their entrepreneurial images to best serve their exploitative activities (Brown, 2015). Whether amongst the abundance the capitalist market has to offer or on a mission to attract investors, neoliberal ideology seeks to continuously strengthen competitive position (Brown), resisting collectivity and the notion of team in any and all forms (Lakes, 2008). This rhetoric is appealing to the believers in meritocratic success and widening market-based opportunities.

The most powerful form of rationality for neoliberals is an economic rationality, recognizing that efficiency and the viability of the cost benefit analysis are supremely important (Apple, 1998; Apple 2000). The generation of a free and competitive market that increases economic profits is the end goal (Apple, 2000). Neoliberal rhetoric stresses the importance of privatization of public goods and the deregulation of supervision of private producers. Moreover, the neoliberal perspective challenges all structures that interfere, or are capable of interfering, with the logic of the pure market environment (Tabb, 2002). Neoliberals see the marketplace as the center of freedom; where everyone can consume something (Apple, 2001). Neoliberal ideology works to increase the dominance of financial capital over productive capital by making everything a financial exchange, making it a valuation scheme (Brown, 2015). In this instance,

productive capital is used to describe one's contribution to the overall economy, not just the entrepreneurial self. If ever there is economic downturn, the free market and economic consumption become crucial to recovery and the well being of citizens (Munoz, 2015).

The aforementioned characteristics articulated the basic components of the neoliberal outlook. Basically, "neoliberalism is the rationality through which capitalism finally swallows humanity…" (Brown, 2015, p. 44). In other words, although capitalism harbors an economic inevitability, there is still a human element to capitalism that makes capitalism tolerable to society. The neoliberal perspective removes any and all social responsibility from the actor. When actors are operating from a neoliberal perspective, the entrepreneurial self comes first, above all else, including the desire to create a better society. Neoliberal ideology seeks to make everything in society an economic competition, without considering the human capital involved. This ideology withers away the collective social responsibility and focuses on the rise of individualism and market exploitation (Hursh & Martina, 2003). Now, the interest turns to how neoliberalism manifests in particular ways in specific spaces. The proceeding section will shed some light on how the neoliberal agenda manifests in government, policy, and education.

Government

In a capitalist economy, neoliberalism is responsible for how citizens make sense of the role of their government and the relationship that exists between the individual and society (Hursh, 2007). Governments indoctrinated with neoliberal principles witness a blanketing presence of neoliberal ideology that commodifies consumption and cuts off any potential for political and social alternatives (Marginson, 2006). Developing states have embraced neoliberalism, seeing it as the best economic and political strategy to remain competitive with the global economy (Bonal, 2003). Governments have reinvented their identities under advanced

capitalism (Lakes, 2008), concentrating on providing a market that allows for the maximization of individual capital accumulation and corporate profit (Apple, 2012). Even the most powerful state apparatuses encourage neoliberalism as the major global project for economic growth and development (Bonal, 2003). In the neoliberal framework, states must be competitive and continuously seek a competitive advantage (Bonal, 2003). However, big government's role in neoliberal ideology is scaled down to increase regional, municipal, and private control (Hill, 2010).

The role of the state under a neoliberal regime is to create conditions that attract capital and allow for technological innovation and advancement through investment (Bonal, 2003). Governments are to offer incentives, rather than prescribe control, to those committed to developing human capital and labor power in the interest of capital and owners of capital (Hill, 2010; Hursh & Martina, 2003). In education, this can take the form of more specific graduation plans, increased local (school district) control, and industry involvement in the decision making process for various programs. These forms of increased accountability, contractualism, and decentralization can drastically change the nature of the capitalist state under neoliberal principles (Bonal, 2003).

When dealing with education, neoliberal governments attempt to retain legitimacy by shifting the social responsibility of educating its citizens to the individual, using auditing and accounting procedures to improve efficiency (Hursh & Martina, 2003). Efficiency in education in the neoliberal state, through selection, can lead to opportunity for the individual to acquire additional cultural capital though a hierarchically stratified system of schooling (Hill, 2010). Acting as a facilitator, the state is to ensure that necessary educational provisions (market) are

available that will allow the individuals to become more employable and realize the potential in themselves (Cort, 2009).

Policy

Regarding policy in a capitalist economy, neoliberalism is the leading political paradigm and the economization of social structure is the goal (Marginson, 2006). Policy emphasis is on individualism and self-entrepreneurialism, making individuals and communities responsible for their decisions and the resulting outcomes (Bonal, 2003). Policymakers reinforce the neoliberal compact by bringing together statehouse political managers and corporate capitalists with the common goal of accumulation and massive wealth (Lakes, 2008).

The social structure of education is further connected to making the economy more competitive through the commodification of education (Apple, 1998). Specifically, commodification of education refers to education being bought and sold by corporate interests through the use of training programs, certification tracks, and the like. In an example from Europe, educational policy is subject to the condition of the economy, with the priority areas aimed at training future employees and promoting the entrepreneurial self (Munoz, 2015). One of the priority policies of the Council of the European Union (2010) was to promote knowledge partnerships between education, businesses, research, and innovation that would facilitate entrepreneurship by supporting young innovative companies. This neoliberal policy in education helps to prepare skilled workers that have the capacity and potential to generate economic value (Hursh & Martina, 2003). For policymakers in a neoliberal state, the solution to an economic crisis is to generate new jobs that allow citizens to accumulate wealth and spend in the capitalist market (Munoz, 2015).

Education

The ultimate neoliberal educational subject is not one that has to do with the individual, but with the market (Marginson, 2006). The neoliberal project (one of the final stages of the capitalist project) is hard at work reshaping the public's perceptions of common spaces where learning takes place (Hill, 2010). Education's stakeholders often see industry experts, and their facilities, as very beneficial to students' education outcomes. However, closer examination might reveal that industry experts engage in talent evaluation without the expense of training programs.

Neoliberal economies are comprised of students who are addressed as consumers of education products in expanding markets and are coerced into making self-interested, self-responsible choices (Koo, 2016). Places such as libraries, public secondary schools, and universities are these spaces. This ideology is borne of labor power for capitalist corporate enterprise and coerces citizens into believing that individual and major inequalities are natural products of capitalist regime (Hill, 2010). Consequently, the reduction of government expenditures on social services through education is part of the overall neoliberal plan (Hursh & Martina, 2003). In turn, Hursh and Martina explain that schools are required to do more with less because they are expected to increase its citizens' economic productivity using fewer resources from the state apparatus. These social institutions continuously disseminate messages of selectivity and individuality, limited opportunity, and rivalry in order to maintain the ethic of globalized business (Lakes, 2008).

Another aspect of the neoliberalism of education deals with the social momentum of education. This momentum is continuously matriculating towards modernization and credentialism, not for the individual, but for the viability of the market (Marginson, 2006). This leads to education being a vehicle for professional training to produce a profit in the United

States and abroad (Munoz, 2015). For example, the United States government reimburses local school districts for student industry training certification program exam expenditures (Carl D. Perkins Career and Technical Education Act, 2006). This is one of many examples in which the neoliberal perspective manifests in public education.

      Abroad. Internationally, education increasingly focuses on the curriculum and actions that increase its citizens' economic productivity (Hursh & Matina, 2003). Neoliberalism's most recent attack on educational policy in Europe was through the E2020 Strategy. According to Munoz (2015), this European Union, neoliberal, reproductive educational policy asserts that the function of education is to turn out graduates capable of producing profits, based on production, free trade, and consumption. Here, the schools are positioned to serve the economy, for the sake of profit and growth and not necessarily the actualization of individuals. Interestingly, vocational educational training opportunities have increased in European countries (Munoz, 2015), characterized by providing quality manpower for those countries (Cort, 2009). This implementation of CTE training is the way that the neoliberal perspective teaches specialized skills for the creation of economic benefits (Munoz, 2015). Through various programs of study in CTE secondary education, neoliberal ideology attempts to retain a stronghold on future entrepreneurs.

      In China, the rapid expansion of vocational education contributes to the rise of the country to a world-factory (Koo, 2016). Koo asserts that credentials earned by students in vocational schools come with an expectation of an increase in immediate employability, instant earning potential, and future income. The growing neoliberal influence manifests in the trend for business input into schools, deciding what is taught and what is excluded (Manteaw, 2008). Risk management, employability promises, motivation and effort at studies (meritocracy), and

customized training pathways are all part of neoliberal rhetoric (Lakes, 2008), signifying an unprecedented business offensive (Apple, 2012). Businesses expect these customized training services from public learning spaces along with assessments that filter future workers from others (Lakes, 2008). Schools have become places that operate to provide assistance with gaining the knowledge to research, expand, and control markets through the infiltration of industry into schools (Apple, 2012).

  United States. In the United States, the entrance of neoliberal ideology into education comes through CTE, creating prescriptive curriculums and specific training paths (Lakes, 2008). Previously, CTE was a sector approach done at the community level, which would set policies, regulations, and directives (Cort, 2009). The CTE training policy has morphed from the training of coal and steel workers to becoming a lifelong learning discourse that transcends formal educational institutions and sectors.

  Cort (2009) asserts that neoliberal ideology aims to create educational policy objectives that demand CTE, and business-training policies converge, creating the idea of school-to-work transition. When CTE policy and business-training practices converge, businesses are able to engage in direct profit taking (Hill, 2010). Businesses are able to do this because the funding for business training shifts from capitalist producers (corporations) to the consumers of education (students and stakeholders), as the training for success in a capitalist economy is shifted through educational policy to the funding structure (public tax dollars) (HB 5: Public School Accountability, 2013). In effect, business profits come from secondary and post-secondary educational institutions through CTE training programs (Hill, 2010). The metrics of return on investment quickly replace the measures of educational quality (Brown, 2015). Through this

process, economic growth can be attained through the maintenance and retention of a large supply of inexpensively trained labor (Koo, 2016).

My intention of the previous sections focused on providing an understanding of neoliberalism and how it manifests in particular ways in specific contexts. One can only make sense of the neoliberal agenda if they can clearly articulate from which context they view neoliberal ideology. The proceeding section will look at neoliberal ideology embedded in CTE. This analysis will explain why neoliberalism is a useful theoretical perspective from which to look at data for this study.

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Neoliberalism and Career and Technical Education

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Given the previous discussion on the definitions and manifestations of neoliberalism and the outline of CTE, the reader can see the possibility of neoliberal ideology shaping CTE. Much of the structure and policy in CTE echoes the sentiments of the neoliberal framework referred to by previous researchers earlier in this analysis. The next section will be devoted to showing the parallels between some of the CTE policies and funding, and the definitions and manifestations of neoliberalism.

Career and Technical Education Policy and Neoliberalism

The governing document for public education in Texas, HB 5, offers students a myriad of options to acquire endorsements and performance acknowledgements (HB 5: Public School Accountability, 2013). Of particular importance to this argument, is the option for the many possibilities through CTE. The Texas Administrative Code (2015) is very clear to ensure that these options are local decisions. This policy substantiates the work of Bonal (2013) and Hill (2010), which posits that the political role in neoliberalism is to reduce the role of big

government and make local education agencies (districts) and the surrounding communities responsible for their educational decisions and outcomes.

Industry advisement through CTE is strongly encouraged in the CTE portion of No Child Left Behind (2001) legislation. This legislation was reauthorized through the Every Student Succeeds Act in 2015, which charges local education agencies with soliciting advice from industry representatives on curriculum and budgeting decisions for CTE programs. These manifestations of neoliberal ideologies are consistent with the research by Hill (2010) in that neoliberalism aims to create policy objectives that demand the convergence of CTE and business training policies so that industry can engage in direct profit taking. Further, this partnership is in line with Munoz' (2015) findings that educational policies in a neoliberal state are subject to the condition of the economy. These conditions open up the possibilities for training future employees and promoting the entrepreneurial self through CTE so that students are ready for entrance into industry.

Career and Technical Education Funding and Neoliberalism

The neoliberal influence in the federal funding of CTE is quite clear. The Carl D. Perkins Career and Technical Education Act (2006) stipulates that local education agencies with a population of students that take a coherent sequence of CTE courses will receive funding. This amount of funding is based on the socioeconomic status of school age children's families in a district. This expenditure is quite substantial, given all of the school districts in the United States. The expenditure requirements are very specific in that the grant can only be spent on line items stipulated by federal guidelines and is exclusively distributed to CTE. These federal guidelines aim to improve the expansion of CTE and create more opportunity for students to attain a specific skill set while in high school. The specificity and support for the production of a skilled

labor force echoes the findings of Hursh & Martina (2003). The responsibility of this production of a skilled workforce quickly goes from our federal government to the individual school districts; who can increase the capacity and potential of its students to generate value for the economy as a whole. The Carl D. Perkins Career and Technical Education Act (2006) reduces the amount of government expenditures on social services and increases investment in private enterprise by training a labor force for the capitalist enterprise. This is a major function of the neoliberal plan.

The state funding structure for CTE is not absent of neoliberal undertones. The amount of money a school district receives from the state is directly related to the number of students in CTE courses, the length of time they are in those courses (per day), and the attendance rate of CTE students (Texas Student Attendance Accounting Handbook, 2015). The state-funding rate for CTE students is 35% higher than funding for students in general education courses. Counter intuitively; the accountability system in Texas does not put much emphasis on CTE programs. However, one could surmise that with the amount of funding CTE generates, these programs could be favored over traditional academics. This notion falls in line with the work of Mirowski (2013) as another attempt of a neoliberal faction to disguise itself as progress. When leaders are planning for growth and funding, they often turn to CTE courses to fill in the funding shortages. This scramble for funding fits with the work of Brown (2015). Brown notes, under neoliberal perspective, that all spheres of existence are transformed into economic terms, including educational spaces. The metrics of return on investment can replace measures of educational quality in the name of the American dollar for industry-trained students.

Given the previously pronounced parallels between the policy, funding, and decision-making structure in CTE and neoliberalism, I use the neoliberal perspective to shape this study's

design. While neoliberalism is a departure from what most might consider fair and just, is it detrimental to the success of a students who aspire to become productive citizens? It is not my intent to justify, right or wrong, the presence of neoliberal ideals in CTE. It is documented that the neoliberal perspective exists in CTE through education tracks that involve a coherent sequence of CTE courses. The design of this study can contribute to the argument of the efficacy of a neoliberal agenda in the locations from where I collect data. Further, I am able to articulate the findings presented in Chapter 4 through the lens of neoliberal ideology and the neoliberal agenda. To conclude, I develop recommendations for policy makers, the Texas Education Agency, and local educational agencies (school districts), based on the conclusions in Chapter 5, through a neoliberal lens.

Summary

Chapter 2 of this dissertation, I provided a synthesis of literature outlining CTE policy, federal and state funding for CTE, and implications and benefits of CTE. I then reviewed relevant literature on the factors affecting dropout and graduation rates. The last section of Chapter 2 consisted of an outline of my theoretical perspective, neoliberalism, and detailed the ways it informs the design and analysis phases of this study.

While many of the factors affecting graduation likelihood are outlined in Chapter 2, the course taking research is very important to this dissertation. Many researchers discuss the implications for CTE course taking on student success. However, I have not found research that discusses coherent CTE course sequence taking and its effect on graduation likelihood. This opens the space to situate findings from this study in the larger body of secondary graduation research. The analysis in Chapter 2 informs the methodology of this study, which is discussed in greater detail in Chapter 3.

Chapter 3

Capturing the Impact of Career and Technical Education Participation on Graduation Likelihood

In this chapter, I detail the present dissertation's methodology. In order to completely articulate the methodology in this study, I present the research design with the justification for its use, along with the hypotheses for each research question. Then, I outline the setting and participants for this study. Following that, I discuss the variables for analysis in the study, which lead to the instrumentation, then the precise method of data processing and analysis. Finally, I conclude the chapter with ethical considerations for the study and the external validity of the design.

Research Design

All of the variables under consideration for this study can be handled numerically. To understand career and technical education's (heretofore CTE) effect on graduation on a large scale, it is important to consider many cases at once. Given these two conditions, a quantitative approach is most reasonable. A quantitative research design allows me to attempt to describe, predict, and explain this data more accurately than a qualitative design (Vogt & Johnson, 2011).

Revisiting the Research Questions

In asking research question one, I attempt to determine whether an association exists between a student's CTE participation and graduation. Specifically, is coherent CTE course sequence completion significantly associated with graduation? The intent of this research question is to establish whether students who enrolled in a coherent CTE course sequence are more likely to graduate than those not enrolled in a coherent sequence of CTE courses.

Should an association between CTE participation and graduation be established, research question two seeks to determine if this relationship persists when controlling for other variables

known to impact graduation likelihood (i.e. the factors outlined in Chapter 2). Specifically, when controlling for other independent variables into a regression, does a student's CTE participation have a statistically significant association with graduation? In the proceeding section, I discuss the setting and participants for this study.

Hypotheses

The null hypothesis for research question one is: There is no relationship between coherent CTE course sequence completion and high school graduation. The equation for the research question one null hypothesis can be written in the form:

H_0= There is no relationship between coherent CTE course sequence completion and
    graduation

The alternative hypothesis for research question one is: There is a relationship between a coherent CTE course sequence completion and high school graduation. The equation for the research question one alternative hypothesis can be written in the form:

H_1= There is a relationship between coherent CTE course sequence completion and
    graduation

The null hypothesis for research question two is: When grouped with other independent variables known to impact graduation likelihood, there is no relationship between coherent CTE course sequence completion and graduation. The equation for the research question two null hypothesis can be written in the form:

H_0= When grouped with other independent variables, there is no relationship between
    coherent CTE course sequence completion and graduation.

The alternative hypothesis for research question two is: When grouped with other independent variables known to impact graduation likelihood, there is a significant relationship

between coherent CTE course sequence completion and graduation. The equation for the research question two alternative hypothesis can be written in the form:

H_1 = When grouped with other independent variables, there is a significant relationship between coherent CTE course sequence completion and graduation.

Setting and Participants

I selected the sample for this study based on location and CTE program structure within the districts. Districts A, B, and C are suburban school districts in the North Texas area. Districts B and C have center centers that service multiple high school in the district. Most, but not all, of the CTE courses are housed at these centers. Students are bused to or drive their vehicles to the centers for classes. The CTE centers are not separate campuses of record in either district, but serve only as supplemental campuses to the districts' high school campuses. The fact that the districts have CTE centers devoted to CTE program courses speaks to the strength of CTE in these two districts. District A has an up and coming CTE program that offers 15 of the 16 possible CTE career clusters and over 90 CTE classes within a comprehensive high school setting. All districts have a close proximity to industry and have internship opportunities as capstone courses in the majority of their programs of study. Additionally, the student sample makeup is very diverse, which is discussed in Chapter 4. Additionally, I chose sites based on my familiarity with the districts, confidence in the integrity of the data, and my professional network from a 14-year career in public education.

Setting

The data for this study comes from three suburban school districts in the North Texas area of the United States. Each district is a midsize school district that has a size classification for its schools ranging from 5A to 6A. This classification means that the high schools in the districts

have at least 1,100 students (University Interscholastic League, 2015). Each district has comprehensive high schools from where I collect data. District A has one high school in the District, District B has two high schools in the district, and District C has five high schools in the district. District A serves close to 7,000 students, District B serves nearly 15,000 students, and District C serves over 30,000 students.

Participants

This study's population includes students from all three districts that were eligible to graduate in the 2014-15 school year. All of the students in the sample were classified as seniors at the beginning of the academic year. The total sample of 3534 students is comprised of 356 students from District A, 1020 from District B, and 2158 from District C.

In the above sections, I discuss the very basic data that drives this study. I outline the setting and participants more specifically in Chapter 4 of this dissertation via descriptive analyses. This dissertation does not constitute human subjects research because the participants are not identifiable in the data. In the proceeding section, I present the instrumentation used for data collection and analysis, variables included in the design, and the procedure for collecting data.

<div align="center">

Data

</div>

In Texas, the majority of school districts use a database management system called Skyward (Skyward, 2014). Skyward houses all of the student data for the districts, including, but not limited to race, ethnicity, sex, socioeconomic status, CTE indicator codes, special education status, at risk status, and cumulative grade point average. This data is loaded into the Texas Education Agency's Public Education Information Management System (PEIMS). PEIMS standardizes data for submission to the Texas Education Agency for all Texas school districts.

All study data were extracted from PEIMS via Skyward by the participating districts. The data that I received is cross-sectional data for the 2015 cohort of graduation-eligible seniors. There is only one observation for each of the 3534 individual students.

Variables Included

In Chapter 2, I outlined several important factors that contribute to whether a student graduates high school. As previously discussed, socioeconomic status, race/ethnicity, special education status, English language status, school and staffing characteristics, and student course taking are all associated with whether a student graduates high school.

The dependent variable for this study is graduation. Graduation is a dichotomous measure in that students either graduated high school or they did not. The primary independent variable of interest is CTE participation, as measured by whether or not a student completed a coherent sequence of CTE courses. The CTE indicator status is measured by the career and technology indicator code and is the main independent variable of interest in this study. This code marks the level of involvement in CTE courses for students in the sample. For the purposes for this study, I am interested in whether students who participated in a coherent sequence of CTE courses graduated at a higher rate than those that did not. A CTE indicator code of "2" shows that a student completed a coherent sequence of CTE courses.

Race/ethnicity is one of the independent variables in this study. In this variable, race and ethnicity are combined. From the data collected, I break down the race and ethnicity from the sample into five categories. Important to note, it is not my intent to conflate race and ethnicity. I understand that people of a common race can be ethnically diverse, just as people of a common ethnicity can be racially diverse. For the purposes of this study, I categorize race and ethnicity together to determine the graduation outcomes of different groups in the sample. Race/ethnicity

is coded through five, mutually exclusive dichotomous variables recording whether or not a student is African American, Asian, Latino, White, or other (students who are not one of the previously mentioned races or ethnicities). In cases where students identify themselves as Latino for ethnicity and another race, I code these students as Latino. The gender variable I use in this analysis is restricted to either male or female. The Public Education Information Management System (PEIMS) restricts to male or female and is based on student registration data. The gender data is presented as received from the database management software.

Socioeconomic status in public schools is taken from a student's eligibility for free or reduced lunch based on income level of the student's family. Their eligibility is a federal determination made by the National School Lunch Program (United States Department of Agriculture, 2015). Students are coded as low socioeconomic status (eligible for free or reduced price lunch) or not.

In the state of Texas, at risk status is a single, dichotomous measure of whether a student is at risk of not graduating high school. Factors that contribute to this assignment include, but are not limited to: failing any previous grade, special education status, socioeconomic status, previous state assessment scores, and 504 status (State of Texas Student Attendance Accounting Handbook, 2015). Districts in Texas use this variable to alert educators to students who are at risk of not graduating high school or at risk for not performing well on measures that lead to graduation.

I use the special education status variable to determine whether or not students are served by special education services. While I understand that special needs status can be a complex measure, this study design only involves whether or not the students in the sample are served by special education. In Texas, English language learners make up 18.2% of the public school

population (Texas Education Agency, 2015). The measure public educators in Texas use to code English language learners is English proficiency status. While there are varying degrees of English proficiency among English language learners, Texas only collects data on whether students are limited English proficient or not. As such, this is a dichotomous variable for the purposes of this study.

I use cumulative grade point average (GPA) as a control variable because of the influence course performance has on graduation likelihood. Additionally, GPA is a straightforward measure of interpreting academic performance. There is a high possibility that GPA will account for a substantial portion of variability in the graduation variable. The data collected for GPA is on a scale from 0-4 (four-point scale) as each school district uses this scale. However it is important to note that there could be observations where students have higher than a 4.0 GPA. This is due to the fact that many advanced placement courses and dual credit courses are weighted higher than normal courses. In order to account for variability in GPA calculation, I convert the GPA measure to standard deviations for each campus. I use this value as a pseudo class rank for the purposes of this analysis.

The final variables are those representing campus fixed effects. These variables are meant to capture variation in CTE implementation and campus-specific graduate rates. A unique campus membership variable (student does or does not attend the campus) was created for each school in the study. I chose to exclude School 3 from the analysis as the reference category because it is the largest school in the sample. Table 1 shows the variables used in this study and how each are treated in this analysis.

Table 1

Defined Variables

Variable	Definition	Type	Code
grad	Measure of whether or not student graduated	Categorical, dichotomous	0 or 1
cte	Measure of whether or not student completed a coherent CTE course sequence	Categorical, dichotomous	0 or 1
ethnicity	Combined measure of race and ethnicity.	Categorical, nominal	Asian, Black, Latino, Other, or White
ecodis	Measure of whether or not student is eligible for free or reduced price lunch	Categorical, dichotomous	0 or 1
atrisk	Measure of whether or not student is considered "at risk"	Categorical, dichotomous	0 or 1
sped	Measure of whether or not student is served by special education	Categorical, dichotomous	0 or 1
lep	Measure of whether or not student is limited English proficient	Categorical, dichotomous	0 or 1
female	Measure of whether or not student is female	Categorical, dichotomous	0 or 1
gpa	School-specific, standardized measure of grade point average	Continuous	N/A
school	Series of dummy codes representing campus membership	Categorical, dichotomous	0 or 1

In the preceding paragraphs, I revisited the research questions and outlined the variables associated with each. Additionally, I justified the use of the variables and how they are recorded. Next, I explain the instrumentation and precise method of data processing used for this analysis.

Instrumentation

For this study, I collect the data from the Skyward database from each school district. Next, I construct charts and tables from Stata 13 (StataCorp, 2013) as a graphic representation of demographic characteristics of the sample. Further, I generate descriptive analyses of the statistical outcomes using Stata 13 (StataCorp, 2013). Finally, I use Stata 13 to perform

inferential analyses and compile results. The exact data processing method is discussed in detail in subsequent sections.

In the next section, I define the technique for this study. I discuss the precise method I use to process and analyze data. Further, I articulate the analysis I use as well as the statistical tests and reasoning behind the tests.

Technique

In the subsequent section, I define the type of analysis and the techniques I use in this study. I address the descriptive as well as inferential techniques. Additionally, I outline the characteristics, reasons, and limitations of the analysis and techniques I use to process the data.

For the purposes of this study, the relationship in which I am interested is between the CTE indicator code and graduation. I create cross-tabulations of the students' CTE status and graduation. I use this table to inform the reader on the frequency in which CTE status "0"and "2" coded students graduated or did not graduate. I complete this process for each campus. Additionally, I offer summary descriptive statistics of the entire data set in Chapter 4. I use a chi-square test of independence to determine the significance of any difference between expected and observed frequencies. The two assumptions for a chi-square test of independence are that the sample is randomly drawn and that all expected values are at least five (Gravetter and Wallnau, 2013).

To answer the second research question, I call upon binary logistic regression. Logistic regression allows me to understand how a discrete outcome (in this case, whether or not a student graduated high school) is influenced by a set of independent variables that may be discrete or continuous (Tabachnick & Fidell, 2013). This analysis is more flexible due to the fact that logistic regression has no assumptions about the distribution of the independent variables

(Abu-Bader, 2010). Moreover, the predictors do not have to be normally distributed, linearly related to the dependent variable, or of equal variance within each group (Mertler & Reinhart, 2016).

      Assumptions in logistic regression lie in the practical issues associated with the ratio of cases to variables, the adequacy of expected frequencies and power, linearity in the logit, absence of multicollinearity, absence of outliers in the solution, and independence of errors (Tabachnick & Fidell, 2013). If there are too few cases relative to the number of independent variables, logistic regression can produce larger than normal parameter estimates and standard errors (Stevens, 2012). With respect to adequacy of expected frequencies and power when using a goodness-of-fit test, the analysis may have little power if expected frequencies are too small (Abu-Bader, 2010). An underlying assumption of logistic regression is that of a linear relationship between continuous independent variables and the logit transformation of the dependent variable (Mertler & Reinhart, 2016). Logistic regression is sensitive to extremely high correlations among independent variables (Tabachnick & Fidell, 2013). In order to find any source of multicollinearity between continuous independent variables, I will calculate variance inflation factors (VIFs) for all independent variables. With logistic regression, one must consider outliers in the solution (Mertler & Reinhart, 2016). I plan to examine the residuals in order to evaluate the possibility of outliers. Finally, independence of errors must be considered when engaging with logistic regression (Stevens, 2012). In this study, I do not match control groups with experimental subjects, nor do I utilize before and after strategies. Consequently, this analysis fits a between subject strategy and maintains independence of cases.

The form of the link I am using in the logistic regression is logit. Because graduating or not is a dichotomous outcome, it naturally lends itself to loglinear modeling. The logit regression equation for this study takes the form:

$$\text{Logit } Y_{graduation} = b_0 + b_1 X_{CTE} + b_2 X_{race} + b_3 X_{economically\ disadvantaged} + b_4 X_{at\ risk} +$$

$$b_5 X_{special\ education} + b_6 X_{English\ proficiency} + b_7 X_{gender} + b_8 X_{gpa} + b_9 X_{school}$$

For the purposes of this analysis, I transform the resultant coefficients into odds ratios. This will allow me to more easily understand how the odds of graduation are affected by the independent variables. More specifically, the odds ratios will be measures of the change in relative odds of gradation that an individual might experience with a 0 to 1 change in the independent variable of interest. Put another way, the odds ratios for this study are a measure of the impact a 0 to 1 increase (or no to yes, as in the case of dummy variables such as low socioeconomic status), in the particular covariate of interest, has on the odds of graduating, holding all other variables constant.

In order to assess the fit of the model, I calculate the pseudo r-squared. This calculation will capture the predictive power of the model (UCLA: Statistical Consulting Group, 2011). The higher the pseudo r-squared value, the better the model can account for the proportion of the total variability of the outcome. I hypothesize that there are a sufficient number of variables in this study that will not warrant additional variables to improve the model.

In the preceding section, I outlined the data processing associated with this study. I presented the analysis I use in the study as well as characteristics of logistic regression. Additionally, I discussed the descriptive and inferential techniques for the analysis. I included the logit regression equation comprised of the dependent and independent variables described in

previous sections. Finally, I examined the goodness of fit for this model. In the next section, I discuss the ethical considerations associated with this study as well as validity concerns.

Ethical Considerations and Validity

It is important to consider the ethical considerations and validity concerns associated with this study. I communicate the confidentiality of the data in the study. Further, in this section I will address the generalizability of the findings from this work.

Ethical Considerations

Confidentiality of the data used in this study will remain with my supervising professor and me and will not be shared with anyone. Further, the identities of the participants are not known to my supervising professor or me as the data was presented without any identifying information. The identity of the sites from where the data originates will not be shared with anyone other than my supervising professor.

External Validity

External validity lays the groundwork for future research stemming from the present study. To the extent a study is generalizable to other populations, determines the course of action by other researchers. Regarding this study, the findings and results are not generalizable outside of the sample in the analysis as the independent and dependent measures may differ in other samples. The information is very informative for the sites from where the information came, but not entirely applicable outside of those locations. However, the study design and methodology can be replicated to illicit findings and draw unique conclusions from other sites.

In Chapter 3, I gave and in depth analysis of the methodology used in this research. First, I spelled out the research design and presented reasoning for its use. After that, I discussed the setting and participants for this analysis. Next, I revisited the research questions; outlining the

independent and dependent variables associated with the research questions. From there, I developed the hypotheses for the study and constructed the null and alternative hypotheses equations. In the next section, I reviewed the instrumentation I used for data analysis, followed by the techniques. In the techniques section, I discussed descriptive and inferential techniques associated with the methodology. Finally, Chapter 3 concluded with a synopsis of ethical considerations and the external validity of the study.

In the next chapter, I discuss the findings and results of the study as they pertain to the research questions. This section of the research study gives a summarization of data and explains the statistical treatment of the data. Moreover, I present the descriptive statistics and results from the specified tests, as they relate to the specifics of the research questions.

Chapter 4

Capturing the Impact of Career and Technical Education Participation on Graduation Likelihood

In this chapter, I discuss the specifics of the data analysis. I begin by presenting a table of descriptive statistics (see Table 2) for the data set in this study. Following that, I refresh the research questions along with the variables associated with the research questions. After that, I report the findings of the chi-square logistic regression analyses as they pertain to the specifics of this study. Next, I assess the model fit for this study. Finally, I situate the findings within the previous research.

Table 2

Descriptive Characteristics as Percentage of the Sample for the 2015 Cohort by School

Descriptive	1	2	3	4	5	6	7	8	Total
Sample Size	356	458	562	544	434	377	364	439	3534
Graduated	93.3	97.2	96.3	99.1	95.4	97.9	97.0	97.0	96.7
CTE	28.1	43.4	31.5	29.2	27.0	23.9	17.6	23.0	28.5
Ethnicity									
Asian	2.0	2.0	3.7	4.2	8.8	1.3	8.5	7.5	4.7
Black	5.9	42.4	49.1	21.1	38.7	14.6	48.6	33.5	33.7
Latino	38.2	27.5	28.3	20.0	23.3	21.5	22.5	23.9	25.4
White	46.3	25.8	17.3	50.2	3.0	56.8	14.8	29.2	30.1
Other	7.6	2.4	1.6	4.4	26.3	5.8	5.5	5.9	7.2
Ecodis									
Free	9.0	11.6	11.4	4.0	10.8	3.2	8.8	8.2	8.4
Reduced	36.0	45.6	37.7	11.2	35.7	21.2	33.2	19.4	29.7
Atrisk	64.0	64.8	60.9	23.7	50.2	37.7	45.9	47.2	49.0
Sped	7.6	6.3	9.4	7.7	7.4	6.4	9.1	5.5	7.5
Lep	0.6	7.9	7.8	2.9	12.2	6.4	7.7	4.8	6.3
Female	52.0	49.6	46.3	48.3	52.5	49.6	50.0	45.1	49.0

Table 2 shows the descriptive characteristics as a percentage by school for this sample. It is important to note that 28.5% of the total sample completed a coherent career and technical education (heretofore CTE) course sequence. This rate of coherent CTE course completion is 6.5 percentage points higher than that of the state of Texas (Texas Education Agency, 2015). Other notable statistics include the fact that total sample is comprised of a majority of students of color and that over 38% of the total sample is economically disadvantaged to some degree. Further, almost half of the students in the sample are considered at risk. Additionally, it is important to note that School 1 has the lowest graduation rate in the sample at 93.3%. Most important for the purposes of this analysis, are students who completed a coherent CTE course sequence.

Research Question 1

With research question one, I intend to determine whether students who enrolled in a coherent sequence of CTE courses are more likely to graduate than those not enrolled in a coherent sequence of CTE courses.

Chi-square Test of Independence

In order to investigate whether a relationship exists between a student's coherent CTE course sequence completion and graduation, I used a chi-square test of independence with graduated as the dependent variable and the student's CTE code as the independent variable. The graduated variable determines whether the student graduated or not. The CTE code determines whether or not a student completed a coherent CTE course sequence.

Table 3

Cross tabulation of Coherent CTE Course Sequence Completion with Graduation

	Graduated		
CTE	No	Yes	Total
No	112.00 89.40	2415.00 2437.60	2527.00 2527.00
Yes	13.00 35.60	994.00 971.40	1007.00 1007.00
Total	125.00 125.00	3409.00 3409.00	3534.00 3534.00

In Table 3, I present the contingency table associated with the chi-square test of independence. The top and bottom number at each intersection is observed frequency and expected frequency, respectively. We see that fewer students graduated among non-coherent CTE course sequence completers than expected. Moreover, it appears that the coherent CTE course sequence completers' graduation numbers are higher than expected. This suggests that coherent CTE course sequence completion is positively related to graduation. The significance of this relationship can be measured with the chi-square test of independence. The result shows that there is a relationship between coherent CTE course sequence completion and high school graduation $(X^2 = 20.82, df = 1, N = 3{,}534, p < .01)$. Given the size and significance of the chi-square result, I am able to reject the null hypothesis, presented in Chapter 3, and conclude that there is a significant relationship between students who completed a coherent sequence of CTE courses and graduation. Specifically, it appears that students who completed a coherent CTE course sequence have a greater chance to graduate high school than students who do not complete a coherent CTE course sequence. Additionally, this finding reveals that this difference between observed and expected frequencies is less likely due to chance. Both assumptions for

the chi square test of independence are met in that the sample is randomly drawn and all expected values in the contingency table are greater than five.

Research Question 2

With research question two, I seek to determine whether coherent CTE course sequence completion makes a significant contribution to the variability graduation outcome, when controlling for other independent variables established via extant literature as meaningful determinants of high school completion.

Binary Logistic Regression

In order to investigate whether the relationship established in the chi-square test of independence persists in the presence of other measures known to impact graduation likelihood, I conducted a binary logistic regression. Using graduation (yes or no) as the dependent variable, I included the following independent variables in the regression: coherent CTE course sequence completion, ethnicity (White used as reference category), lunch status (EcoDis), at risk status, special education status (SpEd), English proficiency status (LEP), whether or not the student is female, a school-specific standardized measure of grade point average, and school membership (school 3 used as the reference category as it is the largest school in terms of enrollment). The independent variable of most interest is, of course, that which captures whether students completed a coherent CTE course sequence.

Model fit. In assessing model fit, I am apprehensive to rely on only one measure. It is in the best interest of researchers to consider multiple measures to determine the fit of the model. In order to assess the overall fit of the model for this study, I consider pseudo r-squared measures. Although there are several, many pseudo r-squared statistics share similarities with traditional R^2 values used to assess ordinary least squares (OLS) regression models (Tjur, 2009). Traditional

R^2 in OLS is a measure of the variability in the dependent variable accounted for by the independent variables. Relatedly, some pseudo r-squared measures are meant to be interpreted the same as the r-squared statistic in linear regression, again, the latter of which measures the proportion of variability in the dependent variable accounted for by the independent variable(s) (Gravetter & Wallnau, 2013). However, McFadden (1979) suggests that researchers cannot expect the values for pseudo r-squareds to be as large as traditional R^2 values. For consideration in this analysis, I present McFadden's original version of the r-squared statistic along with Tjur's coefficient of discrimination (heretofore Tjur's D), a relatively new pseudo r-squared measure.

The McFadden pseudo r-squared value for the above logistic regression is R^2_{McFadden}=.263. Although this pseudo r-squared value is considerably lower than what is traditionally deemed a desirable R^2 in OLS regression, McFadden (1979) suggests that pseudo R^2 values between 0.2 and 0.4 represent "excellent" model fit. By calculating the difference between the mean predicted probability of those who did graduated and the mean predicted probability of those who did not graduate, I am able to report Tjur's Coefficient of Discrimination (Tjur, 2009), $R^2_{Tjur's\,D}$=0.178. While this value is not as high as the McFadden pseudo r-squared, it is important to remember they are not measuring or reporting the same aspects of model fit.

Another statistic worth consideration for model fit is the chi-square statistic (Gravetter & Wallnau, 2013). The chi-square statistic measures the discrepancy between the gathered data and the hypothesis (Gravetter & Wallnau). If a larger discrepancy exists, the more justification exists to reject the null hypothesis. In the present study, $X^2 = 284.79, df = 18, N = 3,534, p < .01$, represents good model fit. According to the chi-square distribution, 284.79 is more than eight times the value recommended to reject the null hypothesis at the p<.01 level (Gravetter &

Wallnau, 2013). It is with hesitancy that I consider any one measure of model fit to be the true measure in this analysis. It is most prudent to consider multiple measures to examine model fit. In concert, the aforementioned measures suggest acceptable fit for the logistic regression.

Model results. In Table 4, I present the logarithmic coefficients, odds ratios (exponentiated versions of the raw, logarithmic coefficients), their standard errors, the z-statistics, associated p-values, and the 95% confidence interval of the odds ratios. There were only two predictors significant at the p<.01 level, and those were CTE status and GPA. This binary logistic regression shows that for a one unit increase ("no" to "yes") in CTE status, the odds of graduating (versus not graduating) increase by a factor of 2.64, $p < .001$. Put another way, coherent CTE course sequence completers' odds of graduation are 2.64 times greater than those of students who do not complete a coherent CTE course sequence, holding all other variables constant. Therefore, I reject the null hypothesis for research question two and conclude that, when controlling for other independent variables known to have an effect on graduation likelihood, a student's CTE participation does have an effect on graduation likelihood: in this case, a positive one.

This central finding aligns with previous research on CTE course taking. More specifically, this study confirms earlier research dealing with enrollment in CTE courses and the optimum balance of CTE courses and traditional, academic courses. For example, Plank, Deluca, and Estacion (2008) found that a "middle range" of CTE course taking is best for high school completion. A coherent sequence course taker and a student who engages with a middle range of CTE courses are probably the most approximate terms in the research. Further, Maxwell (2013) found CTE enrollment reduced a district's dropout rate by 90% over a two-year period. Additionally, Rasinski and Steven (1994) revealed that student participation in CTE programs

reduced the likelihood of dropping out. Finally, Agodini and Deke (2004) reported that, for students not planning to attend college, dropping out is less likely when they participate in predominately CTE courses in the same area of interest rather than when students explore a broad range of CTE courses.

Table 4

Logistic Regression of Graduation on the Major Study Variables

Variables	Coefficient	Odds Ratio	Std. Err.	z	P>|z|	95% CI Lower	Upper
CTE	0.97	2.64	0.81	3.16	0.00	1.44	4.81
Asian	-0.29	0.75	0.49	-0.44	0.66	0.20	2.73
Black	0.07	1.08	0.31	0.25	0.80	0.61	1.91
Lation	-0.21	0.81	0.24	-0.71	0.48	0.46	1.44
Other	0.78	2.18	1.48	1.15	0.25	0.58	8.23
Ecodis	-0.01	0.99	0.17	-0.04	0.97	0.71	1.38
Atrisk	0.54	1.72	0.48	1.93	0.05	0.99	2.99
Sped	0.61	1.84	0.66	1.69	0.09	0.91	3.72
Lep	-0.03	0.97	0.38	-0.07	0.94	0.45	2.11
Female	-0.37	0.69	0.14	-1.77	0.08	0.46	1.04
GPA	2.08	8.04	1.33	12.56	0.00	5.81	11.13
School 1	-0.98	0.38	0.17	-2.20	0.03	0.16	0.90
School 2	0.17	1.19	0.45	0.46	0.65	0.57	2.49
School 4	-0.52	0.59	0.25	-1.24	0.22	0.26	1.35
School 5	-0.66	0.52	0.21	-1.62	0.11	0.23	1.15
School 6	-0.16	0.86	0.42	-0.32	0.75	0.33	2.22
School 7	0.03	1.03	0.47	0.07	0.95	0.42	2.50
School 8	-0.51	0.60	0.26	-1.17	0.24	0.25	1.41
Constant	-1.28	0.28	0.13	-2.71	0.01	0.11	0.70

*Note.*CI=Confidence Interval; Lower=Lower Limit; Upper=Upper Limit

All other variables in the model were not significant at the $p < .01$ level with the exception of GPA. The odds ratio for GPA is 8.04, p<.01. For this sample, controlling for the remaining covariates, the higher a student's GPA, the greater odds they have of graduating high school. This means that students who increase their GPA by one standard deviation from the

mean, have eight times greater odds of graduating high school than those who do not, controlling for all other variables. This result is not a new finding, is expected, and corroborates previous research in this area of study. However, it important to consider GPA in this analysis, due to the fact that it accounts for a substantial portion of variability in the model (as indicted by its large z statistic). Another revelation worth noting in this analysis is the fact that School 1 has a significant association with graduation at the p<.05 level. This is expected as table two reveals that School 1 has the lowest graduation rate.

Analysis of assumptions. The first assumption in logistic regression involves the ratio of cases to variables. Given the size of the sample in this analysis, values of the parameter estimates and standard errors are within the normal range. Next, logistic regression is susceptible to deficiencies in power if expected frequencies are too small. The expected frequencies in this analysis are large enough not to warrant consideration for deficient power. Additionally, I consider linearity in the logit when evaluating this model. Due to the fact that all of the variables in this analysis are dichotomous, except for GPA (presented as a standardized measure by school); linearity in the logit is less of a concern. The next assumption in logistic regression involves absence of multicollinearity. In order to test for multicollinearity, I calculated the variance inflation factors (VIFs). O'Brien (2007) posits that VIFs over 4 and over 10 present a problem, although there is no standardized acceptable or unacceptable value for VIFs. The calculated VIFs in this analysis absolve the apprehension regarding sensitivity to extremely high correlations among the independent variables. Another assumption in logistic regression concerns outliers in the solution. Outliers in the solution are not a concern as the majority of variables associated with this study are dichotomous. The only variable that is not binary is a standardized measure of GPA among schools. Finally, independence of errors must be

considered when engaging with logistic regression. In this study, I do not match control groups

with experimental subjects, nor do I utilize before and after strategies. Consequently, this

analysis fits a between subject strategy and maintains independence of cases.

In the preceding sections of this dissertation, I discussed the specifics of the data analysis.

I evaluated the variables along with the research questions for this study. After that, I reported

the findings of the chi-square test of independence and the logistic regression analysis. Further, I

evaluated the model fit and the assumptions of the logistic regression model used for this study.

Finally, I situated the findings within existing literature from Chapter 2.

In the final chapter of this dissertation, I discuss the implications of findings from my

data analysis, replete with consideration of how policy makers, local education agencies, school

district administrators, and campus level administrators might use the results found in this study.

Additionally, I position the findings from this study in the neoliberal perspective discussed in

Chapter 2. I attempt to make sense of these finding through neoliberal ideology. Finally, Chapter

5 concludes with the overall contribution of this study to the field of education.

Chapter 5

Capturing the Impact of Career and Technical Education Participation on Graduation Likelihood

In this study, I analyze the graduation rates of CTE students. Specifically, I seek to conclusively determine whether coherent career and technical education (heretofore CTE) course sequence completion is associated with graduation likelihood. Given the gap in quantitative literature devoted to coherent CTE course sequence taking on graduation likelihood, and the growing policy interest in CTE, further investigation is warranted. As such, the purpose of this dissertation is to contribute to the body of secondary school outcomes research by exploring how CTE can be a mitigating factor for graduation.

In order to begin the process of investigation, I proposed the following research questions: 1) Is coherent CTE course sequence completion associated with graduation? 2) Should a significant association be established, does it persist in the presence of other measures known to impact graduation likelihood? Data analysis revealed that: 1) Coherent CTE course completion is significantly associated with graduation and 2) When controlling for other measures known to impact graduation likelihood, the relationship between coherent CTE course completion and graduation persists. The finding that coherent CTE course sequence completion was indeed associated with graduation likelihood was expected. Coherent CTE course sequence completion is a significant predictor of graduation when controlling for other measures known to impact graduation likelihood, including academic performance. Specifically, students who complete a coherent CTE course sequence have over twice the odds of graduating than students who do not complete a coherent CTE course sequence. Given the analysis and results in the previous chapters, I now turn to a discussion of the work.

This concluding chapter contains my interpretation of the practical implications of findings from data analysis, replete with consideration of how stakeholders at the district, state and national level can be affected with respect to funding, policy, and educational outlook. I also outline recommendations for future research, as well as potentialities in practice for district leaders, campus leaders and classroom educators. I then discuss the potential evidence of efficacy of the theoretical perspective discussed in Chapter 2, positioning the findings from this study within neoliberalism. Finally, I conclude by revisiting the study's limitations.

Practical Implications

Given the previously mentioned study results, there are some practical implications due for discussion. In Chapter 2, I described some of the espoused benefits of CTE in regards to funding, policy, and the overall secondary educational experience. In light of the findings in Chapter 4, in the proceeding sections, I discuss implications regarding those benefits.

Funding

In Chapter 2, I discussed the funding structure for CTE from a state and national perspective. CTE programs are well funded and rarely want for financial resources. Consequently, there are implications stemming from this study that could affect the funding rate and how monies from the different funding sources in CTE could be spent. In the following sections, I discuss practical implications for funding from a state and national perspective.

State. In my 14 years of experience in CTE and given my networking through professional organizations, it is my judgment that state funding formulas for CTE are structured to sufficiently fund most districts' CTE program. While districts' CTE programs receive 58% of the money earned through CTE seat hours, the remaining 42% can be utilized for general expenditures throughout the district (Texas Education Code §42.154, 2011). While the amount of

money coming from the state is sufficient to operate most districts' CTE programs, many districts fall short of being able to afford capital expansion. Building and facilities expansion are paramount to the growth of CTE programs. Given my finding that coherent CTE course taking is significantly associated with graduation, an increase in the funding rate from 1.35 may be warranted. This funding rate is the rate at which full time equivalents are funded for CTE seat hours in public education, as discussed in Chapter 2. An increase in this multiplier would increase the amount of funding to school districts for CTE participation. This would allow districts to grow programs without having to turn to the taxpayers for additional funding in the form of bonds and tax rebate elections. However, practical limitations could exist in determining from where, within the state legislature's education budget, this increase in funding might come.

A restriction in state funding allocations deals with how districts are able to spend money generated from CTE. As previously mentioned, 58% of CTE generated funds can be spent only on CTE programs. While most districts are able to spend the entire allotment of monies for CTE on CTE programs, cases exist where districts are under budget and have money left to spend for the next academic year. In cases such as this, restrictions on CTE-generated dollars do not allow districts to spend on other programs. Given the affect of coherent course sequence completion on graduation likelihood, an argument could be made for allowing more latitude in the way school districts spend CTE monies. Many school districts offer CTE courses as capstone experiences in core curriculum. Consider, as an example, a school district that offers advanced quantitative reasoning as an extra math course to students. Students can earn an extra math credit while the course generates CTE funding for the district. However, funds cannot be used to supplement the school's entire math curriculum. The only course for which CTE funds can be distributed is the specific advanced quantitative reasoning CTE course in the math program. Allowing school

districts to supplement other areas (fine arts, foreign language, other core academic areas, etc.) with CTE dollars could improve the overall secondary educational experience for high school students, leading to more opportunity for student success.

National. The United States federal government funds CTE in the form of monies from the Carl D. Perkins Career and Technical Education Act of 2006 (heretofore Perkins). Perkins funds are distributed to school districts based on the proportion of students who are in coherent CTE course sequences. The amount districts receive is further contingent upon the number of students in the district that receive free and reduced-price lunch, a de facto measure of socioeconomic status. Due to the fact that this study shows that coherent CTE course sequence takers have over twice the odds of graduating high school than those who do not, one could justify an increase in the Perkins funding rate. This would allow for some capital expansion in CTE programs and the ability for a district's CTE programs to keep up with the pace of technological innovation, which often becomes industry standard.

A restriction at the national funding level for CTE comes in the form of how money from Perkins funds can be spent. When spending CTE monies, district finance officers must adhere to nine indicators outlined by Perkins legislation. This can become restrictive and counterintuitive to the overall goal of CTE. The results presented in Chapter 4 of this analysis could justify lighter restrictions on the spending of federal Perkins money. Currently, Perkins expenditures can only account for capital growth, with no allowance for consumable spending. However, with capital growth, come higher operating expenditures, usually in the form of consumable expenses. As an illustrative example, consider a district CTE administrator tasked with purchasing a welder for an agricultural mechanics program and having to adhere to federal CTE spending guidelines. Those very same guidelines prohibit the purchase of replacement components and materials for

that very same welding machine (welding rods, connector hoses, etc.) that students use from year to year. The ability for local districts to fully supplement CTE programs using federal monies is crucial to student success in working towards future endeavors. Due to the fact that coherent CTE course sequence takers have higher odds of graduating high school, more latitude should accompany allowances in CTE federal expenditures as does spending in the CTE using local money. The relief of these restrictions would allow districts to be more responsive to programmatic needs that arise in their district.

Policy

In Chapter 2, I discussed CTE policy as it pertains to secondary education in a public school setting. Policy directives exist at the local (district), state, and national levels that are in need of reconsideration in light of the findings in this dissertation. Because there is now empirical evidence that coherent CTE course sequence completion has a strong association with graduation likelihood, this may provide opportunity to reevaluate some of the policy that guides CTE. In subsequent sections, I present implications for policy at the district, state, and national level for CTE.

District. In Chapter 2, I discussed policy as it pertains to CTE at the district level. One of the benefits enjoyed by Texas school districts is that they have the latitude to require some local credits for graduation. District leaders my sometimes fail to provide adequate attention to the formation of these requirements. It stands to reason that districts should choose courses that have research-based verifiability in contributing to student success. The majority of success in public schools is measured by the rate at which students graduate. The fact that this analysis shows that students who take a coherent sequence of CTE courses have higher odds of graduating, perhaps warrants greater attention to the role CTE could and should play in graduation requirements.

Requiring students to engage with three credits of CTE courses in the same career cluster would necessarily create more coherent CTE course sequence completers, potentially impacting district wide graduation rates.

Texas public school districts have the freedom to weigh courses based on the perceived rigor, post secondary opportunity, and concurrent post secondary enrollment with high school courses. For example, most Texas public school districts award more weight to advanced placement and dual credit courses in their grade point average (GPA) formulas. However, advanced level CTE courses, unless taken as dual credit courses, are not usually given special weighting in GPA calculation. Most capstone courses in coherent CTE course sequences lead to industry certification and internship opportunities. This positioning of students for immediate post-secondary success and workforce contribution is worthy of increased recognition and support. Accordingly, school districts should (re)evaluate their weighting of CTE courses.

State. Previously, in Chapter 2, I discussed some of the state policies associated with CTE programs throughout Texas. Much of the legislation that governs CTE in this state is advantageous to districts throughout Texas. However, one must consider the extremely small, more rural districts competing to offer CTE opportunities to their students. Most of the smaller, rural districts, due to limited personnel and resources, can offer only one to two programs from the sixteen available career clusters. More recently, many larger districts with more CTE offerings began constructing CTE centers to house their district's CTE programs. Given the results of this study, this practice seems justified in that it allows districts to be more cost efficient in offering coherent CTE course sequences to its students. However, smaller, rural districts often fall well short of the financial capital needed to offer the number of CTE programs housed in a CTE center. Justifiably, Texas policymakers could allow smaller districts to be

favored in funding formulas and/or to pool their state funding to operate regional CTE centers that service multiple districts. True to the findings in this study, this would allow for coherent CTE course sequence completers the higher odds of graduating high school that bigger district students realize.

Many of Texas's course requirements for high school graduation are considered to be outdated and archaic (Greene & Winters, 2005). Recall the discussion of the differences in the minimum/recommended and foundations/distinguished level of achievement (HB 5) graduation plans. The minimum/recommended plan included the same number of credits but had no direction for pupils. Often times, students took elective courses based on their advertised appeal and popularity of staff members delivering course content. This graduation plan allowed students to enroll in courses of their choosing with little to no advisement of the implications after high school. Previously, students were either going to college or they were not. This was part of the justification for moving from the minimum/recommended graduation plans of the past to the foundations/distinguished level of achievement plans in House Bill 5 (heretofore HB 5). This lack of direction created the space for HB 5 graduation plans that give students direction through endorsement pathways and performance acknowledgements. However, there are not any pieces of legislation at the state level that require students to engage with CTE courses. Interestingly, the majority of school districts' endorsement pathways are comprised of CTE courses. Due to the fact that coherent CTE course sequence takers have higher odds of graduating high school, Texas policy makers may have researched-based rationale for drafting legislation that requires high school students complete a coherent sequence of CTE courses in order to graduate high school. If enacted, other areas of the secondary curriculum might receive less of a focus, but students

would have clear direction on their path to post-secondary aspirations. Moreover, as previously discussed, this requirement would lead to increased funding from the state.

National. Although the Constitution of the United States of America disseminates the educating of its citizens to the individual states, there are supplemental programs that our national policymakers could explore in light of the findings from this study. Given that coherent CTE course takers have over twice the odds of graduating high school, our national government could put structures in place to facilitate transitions from high school to post-secondary aspirations. Many CTE programs offer industry standard certification options in the capstone courses of its programs. However, it can be difficult to decipher which certifications will best benefit students given the labor market conditions from where the student graduates, what the student plans to accomplish, and where the student plans to live. It would serve our public education system well to have a national clearinghouse resource devoted to industry standard certifications based on the economic viability in a given area, the needs of business and industry, and the proposed level of school for specific certification attainment.

Education

In the previous sections, I discussed the policy and funding implications from the findings in Chapter 4. In addition to funding and policy, it is important to consider the implications for the overall field of education. The finding that coherent CTE course sequence takers have higher odds of graduating high school, could inform a more career readiness-focused approach to public education. In the subsequent sections, I discuss the implications at the district, state, and national levels for taking on such an approach.

District. In Texas, House Bill 5 calls on districts to reframe the way they offer public schooling to their students. Under this legislation, students now have the opportunity to gain

endorsements and performance acknowledgement on their high school diploma. This more focused approach to public education at the district level leads to more accountability measures for each district. Currently, Texas districts and individual schools are rated in four indices for performance accountability (House Bill 5: Public School Accountability, 2013). Index four, which pertains to post secondary readiness, deals directly with measures of postsecondary readiness including, but not limited to: number of student SAT takers, dual credit enrollment, advanced placement enrollment, and of most relevance to the present study, the number of students in coherent CTE course sequences. Given that students in coherent CTE course sequences have higher odds of graduating high school, it stands to reason that parents would encourage their children to engage in a coherent course sequence. Such encouragement, on a wide scale, would directly affect districts' accountability rating on index four (again, post secondary readiness). Aside from the benefits of school and district accountability ratings, there is also an even more practical implication for students who complete a coherent CTE course sequence.

A potential problem for students transitioning out of high school, is acquiring the requisite knowledge for successfully navigating their post-secondary options. This post-secondary literacy can be a problem for high school students wanting to pursue credentials after their secondary schooling is complete. Index four of the Texas accountability ratings is exclusively concerned with all things that affect a student's post-secondary readiness. However, embedded in the space between post-secondary readiness and post-secondary fruition is the literacy piece of how the transition actually takes place. Some students may lack the post-secondary going literacy it takes to be successful in endeavors after high school. Students enrolled in coherent CTE course sequences are exposed to opportunities for certifications and

internships, which some consider forms of post-secondary opportunity. Along with having higher odds of graduating, students enrolled in coherent CTE course sequences can engage with the requirements for post-secondary transition. This could potentially fill the literacy gap from post-secondary readiness to post-secondary realization for many students. Along with a more focused approach to education at the district level, there are implications for a more focused approach to education at the state level.

State. At the state level, a more focused approach to public education could come through CTE certification alignment with Texas' major industries. Most, if not all CTE programs of study, offer internship opportunities. These opportunities lead to certifications at the end of the course sequences. Since the findings in this study show that enrollment in coherent CTE course sequences lead to student success, a more focused approach to student certification attainment in high school could assist in post-secondary success. Action at the state level to align certifications with the major industries in Texas could create opportunities for students to continue seamlessly along a career path. A state clearing house of industry certifications could be a step in the right directions. This organization could allow industry representatives to recommend entry-level certifications that high school students could work towards. These certifications could be separated according to the needs of major metropolitan cities, along with the outlying, suburban and rural, areas. The state industry certification clearinghouse might allow for standardization and transferability of certifications to serve the Texas economy. This could help alleviate the problem that so many students face coming from high school, direction. While implications for a more focused approach to education exist at the state level, there are implications at the national level.

National. During this time of national transition, there exists certain sectors of the American economy that are dealing with a shortage of skilled work force, such as petroleum engineering, industrial machinery mechanics, and personal financial advisors (Texas Workforce Commission, 2014). Whether they choose to attend college or go straight into the workforce, one of the major goals of CTE is to equip students coming out of high school with the ability to immediately contribute to the economy. Many students in college work part time or have a full time career while attending post-secondary institutions. The skill sets and certification opportunities in CTE afford a college student the opportunity to enter the workforce at a higher compensation structure while attending college. College students who are climbing a career ladder as they engage with their studies can be more beneficial in long run for these young professionals.

Coherent CTE course completers could fill a workforce shortage area. Due to the fact that findings from this study show coherent CTE course completers have greater odds of graduating high school, our national policy makers would be justified in supporting an initiative that reinforced CTE programs whose graduates contributed to a national economic shortage area. These provisions could come in the form of funding, workforce program development, district-workforce hiring agreements, and the like. In short, our federal government could take a more focused approach to calling on secondary public education to help laboring sectors of our national economy.

In the previous sections, I articulated a few of the practical implications of the findings from this study. First, I discussed practical implications for funding at the state and national level. Next, I considered practical implications for policy at the district, state, and national levels.

Finally, I conferred implications for a more focused approach to public education at the district, state, and national levels. In the next sections, I turn to implications for research and practice.

Implications for Research and Practice

While there a number of practical implications as a result of the findings in Chapter 4, there also exist implications for research and practice. In the following sections, I discuss implications for research that stem from the findings of this study. I examine potential opportunities to further delve into research in this area. I also confer how this study can inform future research in coherent CTE course taking. Finally, I examine implications for practitioners from district leader's, campus leader's, and teacher's perspectives.

Implications for Research

While an incredible amount of research exists concerning secondary schooling and graduation/dropout, CTE research and its affect on student success is relatively uncharted territory. Researchers, cited in Chapter 2, discuss CTE and CTE course taking, but until now, there was virtually no research focused on coherent CTE course taking. This opens the space for a new field of inquiry within secondary public school research, offering a more nuanced approach.

Data sources. All of the data from this study came from the Public Education Information Management System (PEIMS) in Texas. A beneficial feature of this data is that it is standardized across districts. However, there are other forms and sources of data that could inform future research on CTE.

In Texas, CTE is structured into pathways of study. Each pathway is a coherent sequence of CTE courses from the career clusters outlined by the United States Department of Education. CTE pathways are constructed from courses within each career cluster. Interestingly, what those

pathways ultimately look like is determined, in large part, at the local level. There is no standard pathway for any coherent CTE course sequence and they vary from district to district. Knowledge of and measures of how each district constructs their CTE pathways could be very beneficial to a study such as this one.

Another data piece that could inform an analysis of this type is post-secondary data of coherent CTE course sequence takers. If one were able to compile the data on which pathways coherent CTE course sequence completers embarked upon after high school, they could then establish a longer-term affect of coherent CTE course sequence completion. Data concerning college going and college retention could inform a multitude of outcomes. This could potentially lay the groundwork for reducing the difficulties in transition from high school to the post-secondary environment.

Finally, as with most secondary educational outcomes, one might wonder what affect a student's chosen path might have on their employment and earnings. Longitudinal post-secondary employment and earnings data of coherent CTE course completers could be considered against traditional comparisons such as high school graduates versus non-graduates, high school graduates versus four-year college graduates, and high school graduates versus two-year college graduates. This data could be invaluable for making the case for completing a coherent CTE course sequence while in high school.

Future research. In the practice of researching topics within the social sciences, one always seeks to inform those that come after them. In education, informing future research is paramount for continuously seeking ways to improve the educational landscape for our students. From the outcomes in this study, there lies the potential to inform future endeavors in this field.

The design of this study is straightforward and forthright. Because of this fact, future researchers could rather easily expand upon this study's design to include more school districts, different school districts, and even private secondary schools. Moreover, the design could be modified to include a state or national data set. This would allow for more generalizability of future findings.

The simplicity of the design in this study opens the space for a more sophisticated approach in future research. Although it is beneficial to find that coherent CTE course taking does significantly affect graduation, it would serve the research community better to know which groups of coherent CTE course completers are specifically affected. If one was able to determine that coherent CTE course sequence completion is a mitigating factor in the graduation of historically marginalized populations of secondary students, the findings could affect practice throughout public schooling. In the next section, I turn to implications for future practice.

Implications for Practice

In education, it is wise to use research-based practices to inform practicing educators in a school district. In light of the findings from this analysis, there are implications for practitioners. In the subsequent sections, I discuss the implications for district leaders, campus leaders, and CTE teachers.

District leaders. Part of the yearly duties of district leaders is to make long-term plans for the direction of the school district. If coherent CTE course completers have higher odds of graduating high school, it would serve district leaders well to ensure that the space exists for CTE expansion. This expansion could come in the form of building new programs within CTE or strengthening existing programs in CTE.

Another possibility for district leaders to expand CTE is through a district's primary grades. District leaders could serve students well if they were to begin to infuse CTE into the primary grades in their district. Additionally, it would be beneficial for counselors, teachers, and students currently enrolled in coherent CTE course sequences to visit middle school students to begin orienting them to the various CTE pathways. This could produce fewer students with only marginal knowledge of and interest in CTE courses and lead to more students who want to meaningfully engage with a coherent sequence of CTE courses. This would allow students to gain earlier exposure to opportunities after high school, which would in turn lead to a more focused secondary experience for students.

Campus leaders. Campus leaders are an instrumental influence upon the educational outcomes of high school students. Knowing that coherent CTE course completion is significantly associated with graduation has implications for practicing campus leaders. One of the ways that campus leaders could ensure success is through the construction of the master schedule. Allowing the space for CTE programs and courses could prove to be very beneficial to many students.

Another piece of the secondary school puzzle, is employee staffing. The campus principal is usually the person in charge of hiring staff members to fill the needs of their campus. In light of the findings in Chapter 4, it would behoove the campus principal to allocate qualified staff members to CTE programs. This would ensure that CTE programs run efficiently and effectively in order to provide opportunity to students.

CTE teachers. Those that can have the biggest affect on students in secondary school are the teachers in the classroom. In most cases, they see students every day at the same time for

nine months, sometimes longer. Given results of this study, there are implications for practicing CTE teachers.

As discussed in Chapter 2, industry advisement is embedded in CTE practice through pertinent state and national legislation. However, teachers could take this a step further and utilize industry advisors to supplement classroom instruction as well. Industry advisors that have opportunities to work hip to hip with students in the classroom could have a significant affect on student outcomes.

Another implication for practicing CTE teachers is the real world applicability to careers in the classroom. If students are able to connect their learning to something they might experience later in life, it could lead them to better internalize the concept with which they engage. This could have a positive affect of their success in completing high school and navigating post-secondary transition.

In the previous sections, I discussed implications for future research and practice. I began by communicating the various data sources that could improve the current analysis followed by how this study could inform future research in secondary education. Then, I examined the implications from the findings in this study for practitioners. Specifically, I conferred the implications for district leaders, campus principals, and practicing CTE teachers. Next, I turn to a discussion of how the findings from this study provide potential evidence of the efficacy of the neoliberal perspective.

Revisiting Neoliberalism

In Chapter 2, I presented the neoliberal perspective and how neoliberalism manifests in particular ways in particular contexts. Neoliberals believe that everything has an economic end and that the role of the state is to provide the market space to construct the entrepreneurial self.

The rationality for neoliberals is an economic one, where the goal is for the individual to build and enhance their entrepreneurial self. They engage with these ideals by exploiting public spaces, using tax payer money, to advance training programs embedded within secondary school curriculum.

Accordingly, I conferred the ways in which the neoliberal perspective operates in and around CTE. The entrance of neoliberal ideology into education comes through CTE, creating prescriptive curriculums and specific training paths (Lakes, 2008). Neoliberal ideology exists in the state and national funding structure for CTE through an increased funding rate for industry ready graduates and increased funding for students enrolled in CTE courses that have a low socioeconomic status, respectively. Additionally, the neoliberal perspective exists in policy at the state and national level through allowing and local CTE articulation decisions and encouraging industry advisement, respectively. Given the central outcome of this study, there exists potential evidence for the efficacy of neoliberalism in shaping public education policy and outcomes.

The underlying assumption in recognition of neoliberal ideology in education is that the students affected by this perspective feel marginalized in some way. In recognizing that one of the major goals in public education is to produce productive citizens; one might be remiss in thinking that those productive citizens feel marginalized or discounted. In a macro-educational context, this study provides evidence of the efficacy of a neoliberal agenda. The responsibility of the production of a skilled workforce quickly goes from our federal government to the individual school districts; who can increase the capacity and potential of its students to generate value for the economy as a whole (Hursh & Martina, 2003). However, from the context of a historically marginalized student, the results of this study could provide the economic mobility to escape the generational poverty that plagues their family tree. Additionally, the results from this study could

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afford a college student the skill set to begin a career that provides the opportunity to pay off college loans before they become unmanageable. In the 14 years that I have engaged with career and technical education, it has provided opportunity to students who had very little opportunity in their lives up to that point. I have witnessed students who refused to attend general education courses, but made sure that they never missed a day of instruction in their CTE course. These opportunities reinforce the assertions made by Mirowski (2013) in that part of the neoliberal perspective is to mask neoliberal manifestations using capitalist ideals, offering opportunity for growth.

As stated in Chapter 2, it is important that one who wishes to engage with the neoliberal perspective must clearly define from which context they view neoliberalism. While many of the concepts discussing neoliberalism are portrayed negatively, I present evidence for the efficacy of the neoliberal perspective manifesting in positive outcomes for students, schools, industry, and as a result, society. In order to establish a complete understanding of the results in this dissertation, one must recognize and comprehend the organizing frame within which one might interpret the findings in this study.

Limitations

Measurement of student success in public education continues to be debatable at every level of government. One thing that each stakeholder can agree on is that graduation rate is a meaningful indicator of student success. In this study, I present findings that show that the completion of a coherent CTE course sequence leads to higher odds of graduating high school. However, this is not absent of reservation due to some limitations of the analysis.

The present study involves only three school districts. Compared to the total number of districts in Texas, this is small. Compared to the total number of districts in the United States, the

sample is miniscule. Further, the districts analyzed in this study are all suburban school districts. Information from urban and rural populations can present very valuable information for future research in this field. The fact that the sample does not include urban and rural districts diminishes the generalizability to other student populations.

Another potential limitation is the inconsistency with the delivery of CTE programs in the sample districts. While two of the three districts deliver CTE courses through CTE centers, the other district is a comprehensive high school without a CTE center, which delivers CTE courses in a comprehensive high school setting. Future inquiry could further benefit this area of educational research if researchers accounted for the different delivery models in CTE.

Further, this analysis involved only districts from the North Texas area. Due to the connection of CTE to our economy, this geographic limitation presents a problem, as the economy, an external influencer of CTE via industry advisement and other means, differs across varying locales in Texas.

The final limitation lies in the potential for researcher bias. In research, every attempt is made to eliminate potential bias and a quantitative design aids in that effort. However, due to the fact that I am a practicing CTE professional in one of the sample districts, potential unintended bias may exist with some aspects of the study. That said, no specific examples of how this might be come to mind.

In the concluding chapter, I discussed my interpretation of the practical implications of the findings from Chapter 4. I consider how stakeholders at the district, state, and national level can be affected from the lenses of funding, policy and educational outlook. This chapter also included recommendations for future research as well as suggestions for district leaders, campus leaders, and classroom educator practitioners. In the following section, I examined the potential

evidence of the efficacy of the neoliberal perspective, given the findings of this study. Finally, I concluded Chapter 5 of this dissertation with limitations and potential biases associated with this analysis.

Conclusion

With this work, I sought to contribute to the larger body of educational inquiry by contributing to secondary graduation research. I analyzed the graduation rates from three sample districts from the North Texas that included a variety of measures demonstrated through previous research to impact graduation likelihood. In this study, I was able to show the benefits, empirically, for students who completed a coherent CTE course sequence. I employed a chi square test to indicate that there is indeed a relationship between coherent CTE course sequence completion and graduation. Moreover, I illustrated via logistic regression that this relationship persists when controlling for other factors known to affect graduation rates. More specifically, students who engaged in a coherent sequence of CTE courses had over twice the odds of graduating high school than did students whom did not engage in a coherent CTE course sequence.

While a plethora of research exists investigating the factors that affect graduation rates, CTE participation is relatively uncharted territory in the educational research community. This study is a starting point that could facilitate more in-depth investigation in to the affect that CTE participation has on student outcomes. Given the results of this study, the area of CTE participation in educational spaces warrants further attention. Considering the espoused benefits of CTE participation, the implications of the findings in this dissertation, and current perceptions of public education, it would serve the educational community well to invest in research related

to CTE participation. More specifically, research into the mitigating role that CTE participation

could play in graduation and dropout challenges could serve stakeholders in education well.

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Biographical Information

Jeff Seeton attended the University of Texas at El Paso where he earned a Bachelor of Arts degree in Psychology and a Masters in Business Administration in 2000 and 2001, respectively. Dr. Seeton spent the first 11 years of his career as a career and technical education teacher. Three years ago, he became a career and technical education administrator as the Dean of Students at a career and technology center. For the previous 2.5 years, Dr. Seeton has worked as a CTE Director in a North Texas school district. Jeff Seeton received a Doctorate of Philosophy in Educational Leadership and Policy Studies from the University of Texas at Arlington in May 2017. His major area of study is the effects of career and technical education on the secondary schooling experience. Additionally, he is interested in the role that career and technical education plays in being a mitigating factor for success for historically marginalized populations. Dr. Seeton aspires to provide all school children economically viable options that lead to becoming productive citizens when they graduate high school, whether they choose to attend college, enter the workforce, or both.