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The Relationship Between Career and Technical Education Enrollment and College and Career Readiness Outcomes

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Doctor of Education in Organizational Leadership

by

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Dedication

This dissertation is dedicated to my family, friends, and mentors who have provided unwavering support for my educational journey. I pray for a lifetime of happiness, as I dedicate my professional life to serving students, with the continued love and support of my loved ones.

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First, I am grateful to God for gracing me with the strength and courage to embark on this educational journey. I recognize that God's dream for me is greater than any dream I could ever have for myself, so I pray for His continued guidance as I navigate through a lifetime of service.

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Abstract

College and career readiness for K-12 students has become a priority of legislatures and educational leaders in the United States. In recent years, Texas public school leaders have emphasized the importance of maximizing the percentage of College, Career and Military Ready (CCMR) graduates. The specific problem studied was that a low percentage of students in Texas, in comparison to the state's graduation rate, graduate with a CCMR distinction. Career and Technical Education (CTE), a component of K-12 education, can assist school leaders in maximizing college and career readiness for students. However, it was not clear how within schools, CTE enrollment predicts CCMR outcomes. The researcher sought to determine how the percentage of CTE enrollment predicts the percentage of CCMR student outcomes as defined by the Texas Education Agency. A quantitative research design was used for the study and a simple linear regression was the statistical analysis. The sample for the study included 41 Texas public high schools and the researcher collected archival data for each of the schools. Findings from this quantitative study indicated that the percentage of CTE enrollment was not a significant predictor of the percentage of CCMR graduates which is made up of both college ready and career/military ready graduates. The percentage of CTE enrollment was a negative predictor of the percentage of college ready graduates. Furthermore, the percentage of CTE enrollment was a positive predictor of the percentage of career/military ready graduates.

Keywords: college and career readiness, Texas public schools, career and technical education, CCMR, educational leaders, school leaders

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Chapter 1: Introduction

Employment opportunities for individuals who obtain a postsecondary education are significantly higher than those who do not have a similar foundation (Pulliam & Bartek, 2017). Consequently, college and career readiness for K-12 students has become a priority of legislatures and educational leaders in the United States to maximize equity and access to higher education (Morgan, 2016). Educational leaders in Texas have demonstrated their priority for college, career, and military readiness (CCMR) by including CCMR indicators in the “student achievement” domain of the state’s accountability system for public schools (TEA, 2019e). A student can demonstrate CCMR in one of the following ways: meet Texas Success Initiative (TSI) criteria in ELA/Reading and Mathematics; meet criteria on Advanced Placement (AP)/International Baccalaureate (IB) examination; earn dual course credits; enlist in the armed forces; earn an industry-based certification; earn an associate’s degree; graduate with completed Individualized Education Program (IEP) and workforce readiness; complete an OnRamps dual enrollment course; graduate under an advanced degree plan and be identified as a current special education student; or earn a level I or level II certificate (TEA, 2019f). Additionally, the passing of House Bill 3 allowed for a monetary incentive for school districts and their CCMR student outcomes. Texas public school districts may earn a CCMR outcomes bonus for exceeding the expectation of an established threshold of CCMR students (TEA, 2019d).

College and Career Readiness

With an increased focus on CCMR for K-12 students, career and technical education (CTE) is at the forefront of the attention of educational leaders (Goldstein, 2017). CTE has been highlighted by both the Trump and Obama presidential administrations as a pipeline for workforce development (U.S. Department of Education, 2015, 2016). Additionally, the passage of the Every Student Succeeds Act (ESSA) in 2015, which calls for a stronger emphasis on college and career readiness, created a stronger focus on CTE programming (Plasman et al., 2017). Through CTE, educational leaders have the tools and resources to provide maximum opportunities for students to be college and career ready and to be successful in today's workforce (Saeger, 2017). In 2018, the Trump Presidential Administration signed the Strengthening Career and Technical Education for the 21st Century Act (Perkins V; TEA, 2019g) into law, committing nearly $1.3 billion annually for CTE programming in K-12 education (Ujifusa, 2018). The Perkins V Act allows for each state to create their own goals regarding CTE, requires states to make progress toward reaching their CTE goals, and expands allowable uses of CTE federal funding to the middle school level.

With the strong emphasis on college and career readiness at the national level, and the allocation of federal funds to support efforts, Texas educators are tasked with increasing CCMR and using CTE as an avenue for improvement. In 2018, 26% of students in Texas public schools participated in CTE, and of the 347,893 high school graduates, 65% achieved CCMR status while only 28.7% of the graduates met the criteria for career and military readiness (TEA, 2018b). With over 35% of students graduating from Texas public schools without being college or career ready, and over 70% of students not meeting career or military readiness criteria, the state is implementing policies targeted at increasing CCMR. In 2019, Texas legislators passed House Bill 3, which allows for CTE funding in seventh and eighth grade for high school level CTE courses (TEA, 2019d). In an attempt to prioritize CCMR in Texas public schools, House Bill 3 requires districts to adopt annual board goals and plans for aggregate student growth on CCMR indicators evaluated under the closing the gaps and student achievement domains in the Texas accountability system for public schools (TEA, 2019e). To support the CCMR focus, beginning in 2020, the TEA will fund CTE summer programming via a $5 million grant to provide students access to CTE during the summer. Unfortunately, despite the increased focus on CCMR and CTE programming, the percentage of CCMR graduates remains low, compared to the state's graduation rate.

Statement of the Problem

Students becoming college and career ready is critical to their future success due to the rapidly evolving technology and advances in communication, which mandates highly skilled and prepared workers in today's workplace (Carnevale et al., 2010; Villarreal et al., 2018). Mastering academic knowledge, soft or employability skills, and technical skills means that a student is college or career ready (Stone & Lewis, 2012). Conley (2010) defined a student as college and career ready when the student is able to "enroll and succeed – without remediation – in a credit-bearing course at a postsecondary institution that offers a baccalaureate degree… or in a high-quality certificate program that enables students to enter a career pathway with potential future advancements" (p. 21). A student graduating from high school college-ready, without having to enroll in remedial courses in college, is more likely to complete a college degree (Perna & Jones, 2013). A student graduating from high school with an industry-based certification may be more prepared to enter the workforce successfully because of their training and skill attainment.

In 2018, Texas had a four-year longitudinal high school graduation rate of 90% (TEA, 2018a). A four-year longitudinal graduation rate refers to the percentage of Texas public high school graduates that are graduating within four years. However, only 65% of graduates are CCMR (TEA, 2018b). The specific problem to be studied in this study is that a low percentage of students in Texas, in comparison to the state's graduation rate, is graduating with a CCMR distinction. Educational leaders have the responsibility of ensuring K-12 students will have the opportunity to be successful in postsecondary education. Career and Technical Education (CTE) is a component of K-12 education that can assist educational leaders in maximizing college and career readiness for students. However, it is not clear how within schools, CTE enrollment predicts CCMR outcomes. Without more information about CTE, leaders will not be able to provide effective programming and equip graduates for success in postsecondary education and employment.

Purpose of the Study

The purpose of this quantitative archival study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of college, career, and military readiness (CCMR) student outcomes as defined by the TEA. The significance of this relationship is that it may inform K-12 educational leadership about the level of statistical significance CTE enrollment at Texas public schools has on CCMR student outcomes.

Research Questions

This correlational research study used two unmanipulated ratio level variables in each research question. Variables in this study included percentage of CTE enrollment, percentage of CCMR graduates, percentage of college-ready graduates, and percent of career or military ready graduates.

RQ1: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas?

$H1_A$: The percentage of students enrolled in CTE is a statistically significant predictor of CCMR graduates in Texas.

$H1_0$: The percentage of students enrolled in CTE is not a statistically significant predictor of CCMR graduates in Texas.

RQ2: How does the percentage of CTE students enrolled predict the percentage of college-ready graduates?

$H2_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of college-ready graduates.

$H2_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of college-ready graduates.

RQ3: How does the percentage of CTE students enrolled predict the percentage of career or military ready graduates?

$H3_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of career or military graduates.

$H3_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of career or military ready graduates.

Definition of Key Terms

Campus comparison group. The campus comparison group is a group of 41 campuses assigned by the TEA based on similarities in grade level served, size, percentage of students who are economically disadvantaged, mobility rate, percentage of English learners, percentage of special education students, and students enrolled in an early college high school program (TEA, 2019c).

Career and technical education (CTE). CTE is an academic and technical curriculum and instructional program targeted at providing knowledge and skills to students about emerging careers and industries, formerly known as "vocational education" (Perkins, 2006).

Career clusters. The United States Department of Education recognizes 16 national career clusters including Agriculture, Food, and Natural Resources; Architecture and

Construction; Arts, A/V and Communications; Business, Management and Administration; Education and Training; Finance; Government and Public Administration; Health Science; Hospitality and Tourism; Human Service; Information Technology; Law, Public Safety, Corrections, and Security; Manufacturing; Marketing, Sales, and Service; Science Technology, Engineering and Mathematics (STEM); and Transportation, Distribution, and Logistics (U.S. Department of Education, 2006).

Career readiness. Students that graduate career ready are students that pass an approved industry-based certification, graduate with completed Individualized Education Plan (IEP) and workforce readiness, enlist in the United States Armed Forces, graduate under an advanced degree plan and are identified as a current special education student, or graduates with a level I or level II certificate (TEA, 2019d).

Carl D. Perkins Act of 2006. Is a reauthorization of the Carl D. Perkins Act of 1998 which allocated 1.3 billion dollars in federal funding to CTE programs and created greater accountability on integration of academic standards strongly aligned to the No Child Left Behind (NCLB) movement (Threeton, 2007).

Certificate. A certificate is a formal award a student may earn granted exclusively by an institution of higher education upon the completion of a higher education program (Texas Higher Education Coordinating Board, 2018).

Certification. A certification is a validation that a student has an occupational skill earned by successfully passing a test or battery of tests administered by a certification body such as a trade organization or testing entity that is industry-approved (Texas Higher Education Coordinating Board, 2018).

College, career, military readiness (CCMR) graduates. Annual graduates in a school year who demonstrate college, career, or military readiness, regardless of cohort, by meeting any one or more of the following criteria: meet Texas Success Initiative (TSI) criteria in ELA/Reading and Mathematics; meet criteria on Advanced Placement (AP) or International Baccalaureate (IB) examination; enlist in the Armed Forces; earn an industry-based certification; earn an associate degree; graduate with completed Individualized Education Program (IEP) and workforce readiness; complete an OnRamps dual enrollment courses; graduate under an advanced degree plan and be identified as a current special education student, or earn a level I or Level II certificate (TEA, 2019).

College readiness. Students that graduate college-ready are students that meet TSI criteria in ELA/Reading and mathematics, meet criteria on AP or IB examination, earn an associate degree, complete an OnRamps dual enrollment course (TEA, 2019d).

Endorsement. An endorsement is a performance acknowledgement on a student's transcript in STEM, business and industry, public services, arts and humanities, or multi-disciplinary studies that is earned by meeting the curriculum requirements in each endorsement area in addition to earning four credits in math and science, and two additional elective credits (TEA, 2014a).

House Bill 3. House Bill 3 is legislation passed by the 86th Texas Legislature which reformed finance for Texas public schools (TEA, 2019d).

House Bill 5. House Bill 5 is legislation passed by the 83rd Texas Legislature which established the Foundation High School Program as the default graduation program all Texas students entering high school in the 2014-2015 school year (TEA, 2013).

Level I certificate. A student completing a program that consists of at least 15 but not more than 42 semester credit hours may be awarded a level I certificate (Texas Higher Education Coordinating Board, 2018).

Level II certificate. A student completing a program that consists of at least 30 but not more than 51 semester credit hours may be awarded a level II certificate (Texas High Education Coordinating Board, 2018).

Programs of study. A program of study is a nonduplicative, coordinated technical and academic sequence of courses that have multiple entry and exit points, results in students attaining a postsecondary credential, addresses employability, academic, and technical skills, incorporates challenging state standards, and begins with an overview of an industry and leads to occupation specific instruction (TEA, 2019f).

Strengthening Career and Technical Education for the 21st Century Act. Commonly referred to as "Perkins V," the act is a federal legislation that reauthorized the Carl. D. Perkins Career and Technical Education Act of 2006 and provides over a billion dollars in funding annually to CTE programs (TEA, 2019g).

Texas Academic Performance Report (TAPR). TAPR provides comprehensive information on the performance of each school and district in Texas desegregated by student groups, and also provides data on student demographics, school and district staff, and programs (TEA, 2018a).

Texas Education Agency (TEA). Under the leadership of the commissioner of education, TEA is the primary and secondary public education administrative unit responsible for administering funds, assessment program and accountability system, the data collection system on public school information, supports the SBOE in the development of statewide curriculum, and monitors compliance of certain state and federal guidelines (TEA, 2014b).

Vocational Education. Vocational Education was the term used to describe the educational program targeted at preparing students for employment in various industries, before the Perkins Act of 2006 changed the term to Career and Technical Education (Scott & Sarkees-Wircenski, 2004).

Summary

Recent legislation at both the state and federal levels have increased the focus on students graduating college and career ready. To ensure alignment of state and federal priorities, there is an increase in Texas public school accountability and K-12 leaders targeted at maximizing CCMR graduates. As outlined in Chapter 1, 35% of Texas public high school graduates are not graduating college, career, or military ready and over 70% of students are not meeting career readiness criteria outlined by the TEA (2018a). With the increased focus of college and career readiness for Texas public schools, the purpose of this quantitative archival study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of college, career, and military readiness (CCMR) student outcomes as defined by the TEA. Understanding how the percentage of CTE enrollment predicts the percentage of CCMR graduates may assist K-12 public school leaders in increasing the percentage of CCMR graduates.

This study includes five chapters. The first chapter presented the statement of the problem, the purpose of the study, research questions, and defined key terms that will be used throughout this study. In Chapter 2, a review of CTE literature and conceptual framework is presented. The research design, methodology, and procedures are outlined in detail in Chapter 3.

Chapter 4 provides an analysis of the results. Findings, implications, and recommendations for future research are explored in Chapter 5.

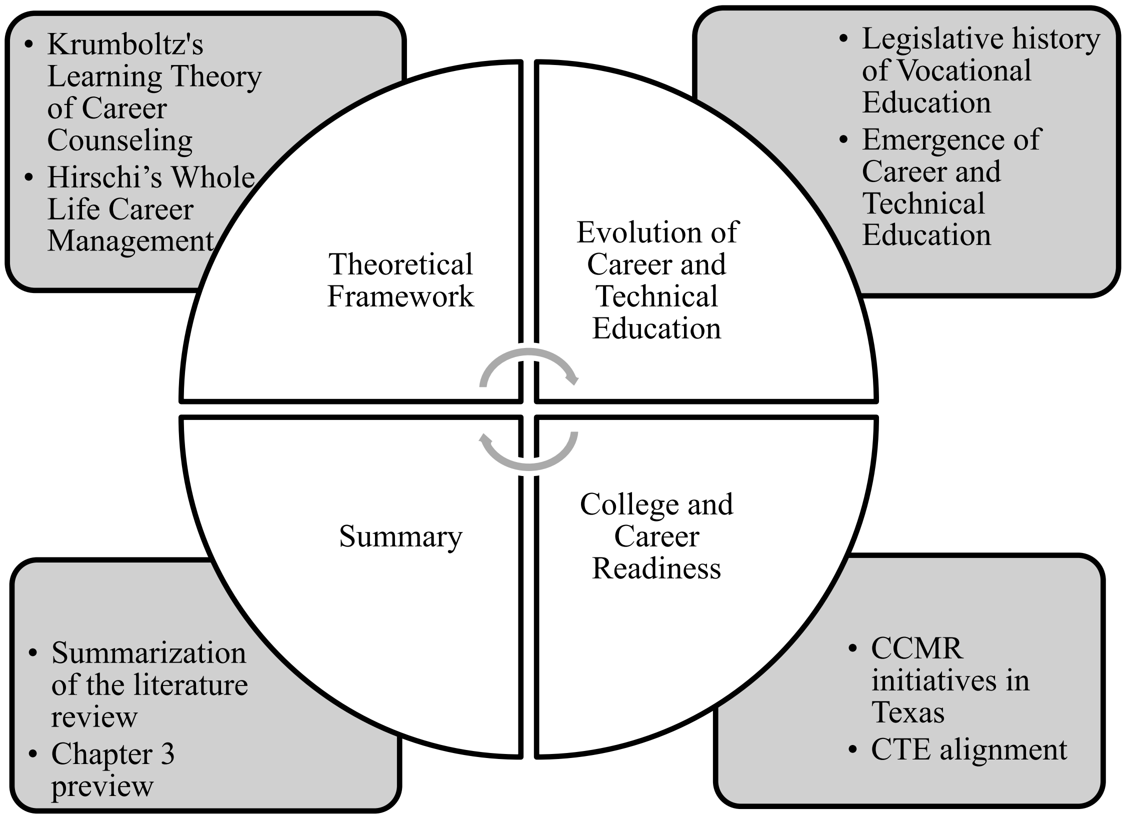
Chapter 2: Literature Review

The problem in Texas public-schools is that only about half of high school students are graduating with the identifier of a college and career ready student. Despite legislation and programs such as Career and Technical Education (CTE), college, career, and military readiness (CCMR) student outcomes are not being achieved. Despite a near 90% high school graduation rate, only 54% of students are graduating prepared for college and career (TEA, 2018b). The purpose of this quantitative archival research study was to determine how CTE enrollment predicts CCMR student outcomes as defined by the TEA. Identifying an association in Texas public high schools between CCMR graduates and CTE student enrollment could allow K-12 leaders to identify effective CTE program management to improve CCMR student outcomes in their respective school district.

The following review of the literature outlines the theoretical framework for this study, the history of vocational education in the United States, modern day CTE programming, and the college and career readiness initiative in Texas public schools. History of vocational education, legislation, and funding will be topics that establish a foundation for CTE. A review of the literature will assist in understanding opportunities offered to public-school students and on-going college and career readiness initiatives in Texas aimed at increasing the percentage of college and career readiness graduates. An illustration of the main topics discussed in the review of the literature is located Figure 1.

Figure 1

Main Topics of the Review of the Literature



In conducting this research, the following databases were used: OneSearch for Abilene Christian University, Digital Commons at Abilene Christian University, Google Scholar, and EBSCO. In addition, I used the Margarett and Herman Brown Library services to read and collect peer-reviewed journal articles for the literature review. The EBSCOhost interface was used to collect peer-reviewed articles. Terms that were used to find the peer-reviewed articles included but were not limited to "career and technical education," "college and career readiness," "workforce education," and "postsecondary education." To narrow the search to recent and relevant peer-reviewed articles, the date feature on the interface was utilized and ranged from 2015 to 2020, the last five years. Some articles used for the review of the literature were suggested from members of my dissertation committee. Furthermore, websites specific to CTE programming were used, such as the Association for Career and Technical Education and the Association for Career and Technical Education Research.

Theoretical Framework

This study relies on two theoretical frameworks to understand the role K-12 public schools play in increasing college and career ready graduates, specifically as it relates to career counseling. The framework for this study is built on Krumboltz's learning theory of career counseling and Hirschi's whole-life career management: a counseling intervention framework. The importance and relevance of these two theoretical frameworks to this study is explored in this section.

Dating back to the start of the 20th century when vocational education was gaining significant traction in K-12 education, attention in schools began to focus on maximizing student preparation for future career pursuits (Gysbers, 2001). Now, the purpose of CTE is to provide a comprehensive sequence of courses in a particular program of study to promote career readiness among students and maximize the likelihood students will be successful in the workforce (Brand et al., 2013; Conley, 2010; Saeger, 2017). As a result, this study is guided by Krumboltz's learning theory of career counseling (LTCC). LTCC is derived from a general social learning theory of behavior and promotes the idea that individuals are active, intelligent, problem solving agents and that factors such as environmental conditions, genetic endowment, planned and unplanned events, and learning experiences all interact to produce a particular career path for an individual (Bandura, 1977; Krumboltz & Worthington, 1999). Although the LTCC is similar to the trait and factor theory which states it is possible to measure both talents and attributes required for an occupation, there are distinct differences. Krumboltz (1996) is critical of the trait and factor counseling theory because of the disregard of an individual’s emotions, views, and the lack of action or implementation of choice.

In an attempt to address the deficiencies of the trait-and-factor counseling model, LTCC focuses on personal characteristics, beliefs, values, the learning of skills, and work habits that will in turn provide satisfaction to an individual’s life in an evolving work environment. Krumboltz and Worthington (1999) outlined four specific needs for students directly related to the vocational development in the evolving world of work: (1) young workers need to expand their capabilities and interests, rather than base decisions only on existing characteristics; (2) students should prepare for changing work tasks, and not assume that occupations will remain stable; (3) students should be empowered to take action, not merely to decide on a future occupation; and (4) career counselors should play a major role in dealing with all career problems, not just occupational selection. The LTCC encourages counselors to stimulate new learning by using assessment instruments, increases the use of educational interventions, associate counselor success with student learning outcomes, and eliminates the distinction between personal and career counseling (Krumboltz, 1996).

As CTE programming strengthens to meet the nation-wide college and career readiness initiative in K-12 public schools, the guidance of LTCC could facilitate growth in CCMR outcomes and the nation’s economy using the four specific needs outlined in LTCC. As accountability increases for public schools to maximize the number of college and career ready graduates, creating a platform for students to explore themselves, interests, strengths, and areas for growth are increasingly important. Allowing students to explore and expand their capabilities and interests may assist the student in making future career decisions that may not be a current viable option based on the student’s existing characteristics. Furthermore, research indicates that a student's leadership style can predict the likelihood a student will be college ready (Villarreal et al., 2018). Unfortunately, in a study conducted with college freshmen, results indicated counselors needed to improve on working with students on identifying their strengths and abilities (Sackett et al., 2018). Comprehensive counseling programs include assisting students find their professional identity, which often can be done through strengths and leadership assessments and inventories (TEA, 2018c).

A major component of postsecondary readiness is being able to demonstrate flexibility in learning and work, as outlined in the LTCC. K-12 educational experiences must encourage flexibility and innovation to produce graduates that are prepared for evolving work tasks. Through CTE education, students often feel empowered about the possibilities of their future, especially students that are receiving special education services, economically disadvantaged students, and minority students (Conley, 2010; DeFeo, 2015; Dougherty et al., 2018). Unfortunately, a recent study found that students receiving special services are a group of students that are least likely to participate in CTE programming, along with students planning to enroll in a bachelor's degree program (Xing et al., 2019). Students in advanced CTE coursework often gain work-based learning experiences that allow them to experience day-to-day occupational tasks associated with their specific career interest.

Furthermore, as outlined in the fourth need, a career counselor's role must be broader than occupational selection. As school district personnel seek to increase rates of college and career ready graduates, evaluating the role of college and career counselors may be critical to a district's ability to prepare students for postsecondary readiness. School counselors are often the experts in the school building on academic advising, career counseling, college admission requirements, and financial aid information. Hirschi (2020) created a counseling intervention framework for whole-life career management which consists of four stages. The four stages of the framework include (1) clarifying goals across work and nonwork roles, (2) mapping resources and barriers related to goal attainment, (3) developing action strategies for goal attainment, and (4) monitoring and adapting goal pursuits. School counselors are perhaps the most critical professionals in a school building for ensuring that students develop a meaningful plan for postsecondary success. They are often charged in helping students navigate through postsecondary option by creating strategic college and career readiness initiatives for students (Dahir & Stone, 2012).

According to the College Board National Office for School Counselor Advocacy, there are eight components to college and career readiness guidance counseling. The eight components are meant for K-12 implementation to maximize equity and results: (1) college aspirations, (2) academic planning for college and career readiness, (3) enrichment and extracurricular engagement, (4) college and career exploration and selection processes, (5) college and career assessments, (6) college affordability planning, (7) college and career admission processes, and (8) transition from high school graduation to college enrollment (College Board, 2010). If the eight components are implemented in school counseling with the appropriate context, cultural competence, multilevel interventions, and data support, college and career readiness should be achievable for all students (College Board, 2010).

Krumboltz's learning theory of career counseling and Hirschi's whole-life career management framework serve as the foundation of this study. The study's research questions are posed to determine association of career and technical education enrollment with college and career readiness student outcomes. As administrators in Texas public schools become more focused than ever in an ensuring high school graduates are college and career ready, components of the two frameworks can assist in maximizing student outcomes. Since schools are staffed with counselors, college advisors, and career advisors, the two frameworks can serve as a guide for school educators and other school leaders to achieve the eight components outlined in the College Board National Office for School Counselors college and career readiness criteria. Additionally, the frameworks may aid in increasing college and career readiness as outlined in the Texas public school's accountability system, which is discussed in greater detail later in this chapter.

Evolution of Career and Technical Education

The concept of CTE can be traced back to colonial America, from the 1780s to the 1820s when American political leaders were promoting agricultural reform and domestic manufacturing to ensure social and political stability, national progress, and prosperity (Sturges, 2015). Thomas Jefferson, an author of the Declaration of Independence and the third United States president, was one of the first politicians to support career education before the term "career education" was ever coined. After his presidency, Thomas Jefferson earned his income by committing himself to architectural design, wood working, and by selling rice, crops of cotton, and tobacco from his plantation (McDonald, 1976; Sturges, 2015).

Vocational Education (1862-1962)

Vocational education was the term used throughout the 20th century, before the Perkins Act of 2006 introduced the modern term CTE (Stipanovic et al., 2012). The prioritization of vocational education became most evident in the United States when legislation allowed for federal funding to support vocational education. Initially, the primary purpose of vocational education was to prepare students for the industrial and agricultural workforce (Barlow, 1976). Before the turn of the 20th century, land-grant colleges received federal funding from the First

Morrill Act of 1862 to teach agricultural and mechanical arts (Dortch, 2014). The Second Morrill Act of 1890, the Hatch Act, and the Adams Act of 1906 furthered the support for agricultural education. By 1914, the need of vocational education in high school curriculum was being advocated by the Commission on National Aid to Vocational Education who argued that vocational education had many benefits to students including:

- meeting the individual needs of students for a meaningful curriculum,
- providing opportunity for all students to prepare for life and work,
- helping foster a better teaching-learning process-learning by doing, and
- introducing the idea of utility into education. (Scott & Sarkees-Wircenski, 2004, p. 151)

Consequently, for the first time in American history, the Smith-Hughes Act of 1917 allotted federal funding for non-college bound students to peruse vocational education. Due to the fear that federal funding would be used for nonvocational education purposes, initial legislation required academic and vocational education to be separate studies. The legislation required that all states create a state board for vocational education to develop plans to implement the provisions outlined in federal law, which had to be approved by the Federal Board of Vocational Education (Friedel, 2011). Some states allowed for their existing state board of education to serve as the board of vocational education, while other states created two separate boards. The separation of academic and vocational education ultimately created numerous challenges throughout the 20th century and the early 21st century in reuniting academic and career education (Friedel, 2011; Stipanovic et al., 2012). The Smith Hughes Act provided federal funding to pay for vocational education teacher salaries to teach subjects in trade and industry, agriculture, and home economics (Friedel, 2011).

The decades following the implementation of the Smith-Hughes Act of 1917 brought significant increases in vocational education student enrollment. Agriculture course enrollment was 31,000 in 1920, which increased to over 548,000 students by 1940. The agricultural student organization, Future Farmers of American (FFA), was established in 1928, which promoted growth in agricultural course enrollment (Scott & Sarkees-Wircenski, 2004). At its inception, the Smith-Hughes Act of 1917 provided $1.7 million in funding for vocational education, but by 1925-1926, that amount had increased to $7.2 million.

Vocational Education (1963-1979)

The Vocational Education Act of 1963, which was amended in 1968 and again in 1976, began to mold vocational education more closely to what we know it to be today. The Vocational Education Act continued federal funding for vocational education and shifted the focus from maintaining strong vocational programs, to building vocational programs that support students with socioeconomic, academic and other handicaps preventing them from being successful in a regular vocational education program (Scott & Sarkees-Wircenski, 2004). Amendments to the Vocational Education Act of 1963 expanded the allowable uses of federal funds to include:

- students in high school and postsecondary education;
- students that had dropped out of high school or completed high school requirements;
- retraining for people in the labor market;
- individuals facing socioeconomic, academic, or other obstacles;
- individuals considered mentally disabled or deaf;
- construction for vocational facilities and schools;
- vocational guidance; and
- training services to include program evaluation and teacher education (Gordon, 2008).

Efforts to ensure equity in vocational education were expanded with The Educational Amendment of 1976, which required that sex bias and discrimination, and gender-role stereotyping be eliminated when developing and implementing a vocational education program. Additionally, the amendments required that states hire a sex equity coordinator, develop a local vocational advisory committee, and the development of a public awareness program (Friedel, 2011).

Vocational Education (1980-2006)

In the 1980s, vocational education continued to be a national priority under President Ronald Regan's administration. The National Commission on Excellence in Education, established by Secretary of Education T.H. Bell in 1981, sought to examine the quality of the American education system. The National Commission on Excellence in Education identified educational programs that fostered student success in college, assessed the quality of teaching and student learning at the various levels of education in the United States, and ultimately compared educational institutions in the United States against other developed nations (The National Commission on Excellence in Education, 1983). Unfortunately, results of the report indicated that the United States was producing insufficient student outcomes in literacy, technical skills, and training to meet the needs of the 21st century in both K-12 and higher education institutions. A *Nation at Risk* (1983) was released, outlining gaps in the American education system. Data from the report provided clear areas for improvement in K-12 schools, specifically related to college readiness and achievement.

One of the most influential statutes for vocational education has been a series of amendments to the Carl D. Perkins Act. The Carl D. Perkins Act of 1984, an amendment to the Vocational Education Act of 1963, intended to provide vocational education to all students, including those with disabilities, added further stipulations on how vocational education funds could be used in public schools, and attempted to meet the needs of the economy (Friedel, 2011; Gordon, 2003). The Carl D. Perkins Act of 1984, and the subsequent amendments to the act, remains the primary federal funding source for the CTE programming. The Vocational Education Act of 1963 continues to positively influence student achievement results of CTE students receiving special education services. Dougherty et al. (2018) found that special education students enrolled in CTE courses have a higher probability of graduating and of earning an industry certification.

Johnston and Packer (1987) published *Workforce 2000: Work and Workers for the 21st Century*. The report highlighted four key economic trends shaping the American labor force and policy issues that needed to be addressed to allow for a prosperous economy by the end of the 20th century. Six challenges that were needing immediate attention included "stimulating balanced world growth, accelerating productivity increases in service industries, maintaining the dynamism of an aging workforce, integrating Black and Hispanic workers fully into the economy, and improving the education and skills of all workers" (Johnston & Packer, 1987, p. 131).

Another significant report was released the following year unveiling postsecondary concerns. The W. T. Grant Foundation (1988) published *The Forgotten Half*, a report that revealed that less than 50% of Americans were pursuing 4-year colleges and that less than two-thirds of those who attended college earned a college degree. A major finding was that the labor market for adults not earning a college degree was not conducive to a healthy democracy. Both reports emphasized the importance of aligning curriculum to the workplace and education, and career and college readiness among high school graduates (Johnston & Packer, 1987; W.T. Grant Foundation, 1988).

United States legislator's understanding that public schools were struggling to adequately prepare students for careers and the country's dismal position in the global marketplace, was the inspiration for the Carl D. Perkins Vocational and Applied Technology Act of 1990 (Perkins II; Finch, 1999). The primary purpose of Perkins II was to maximize knowledge, skills, and abilities for career-oriented work (Gordon, 2003). Perkins II is one of the most influential pieces of vocational education legislation because of the attention it created on the importance of academic and career education (Hayward & Benson, 1993). Perkins II was not intended to develop and implement new vocational education programming; instead, the goal was to strengthen the workforce and to remain globally competitive (Scott & Sarkees-Wircenski, 2004; Threeton, 2007).

In the 1990s, additional legislation provided funding for vocational education and encouraged innovation in preparing students for the workplace. Tech Prep, an innovation that combined a student's last two years of high school and their first two years of postsecondary education, allowed for students to participate in a sequence of vocational education courses that led the student to earning a certificate or associate degree (Bragg, 2001). The School-to-Work Opportunities Act of 1994 was created to encourage students to acquire knowledge, skills, and abilities to transition from school to work, similar to the modern-day college and career readiness model (Threeton, 2007). Primary aspects of the School-to-Work Act included providing work experiences for students, integration of academics in work-based learning, and career guidance. Unfortunately, these innovations did not immediately provide the intended student outcomes. At the end of the decade, the W. T. Grant Foundation published another study, *The Forgotten Half*

Revisited (1998), which confirmed the issue regarding non-college degreed adults and their workforce prospects had only worsened.

Simultaneously, legislators passed the Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998 (Perkins III). Perkins III officially repealed the Smith-Hughes Vocational Education Act and required a state performance accountability system that promoted technical performance, integration of academics in vocational education, and postsecondary education placement of students, encouraging strong connections between school and work (Scott & Sarkees-Wircenski, 2004; Threeton, 2007). Perkins III (1998) established the term *vocational and technical education* and defined it as:

> A sequence of courses that provides individuals with the academic and technical knowledge and skills the individuals needs to prepare for further education and for careers in current or emerging employment sectors; and include competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, of an individual. (p. 8)

Perkins III allowed greater flexibility in use of federal funds to support vocational and technical education, but also increased individual state accountability. States were required to report disaggregated student performance data on indicators including student academic and vocational/technical achievement; and placement, retention in and completion of postsecondary education or advanced training, program related employment or military enlistment, and technical education programs that lead to nontraditional training and employment (Friedel, 2011).

Career and Technical Education

The Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV), was signed into law by former President George W. Bush and aligned with the No Child Left Behind (NCLB) initiative of his administration. NCLB had a significant focus on standard-based high stakes testing, data-based decision making, standard-based curriculum, and an increase in school accountability all with the goal of closing student achievement gaps (Dahir & Stone, 2012). Perkins IV implemented the design and structure of modern-day career and technical education programming (CTE), specifically by placing emphasis on accountability for increasing academic and technical standards, and for the implementation of career clusters and pathways (Threeton, 2007). Perkins IV is the first piece of legislation to use the term CTE rather than vocational technical education. Perkins IV defined the term CTE as:

> Organized educational activities that offer a sequence of courses that provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions; provides technical skills proficiency, an industry-recognized credential, a certificate, or an associate degree; and may include prerequisite courses that meet the requirements of this subparagraph; and include competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of an industry, including entrepreneurship, of an individual. ("Carl D. Perkins," 2006, p. 1)

Perkins IV created career-focused programs of study, emphasized academic rigor, enhanced accountability measures, and articulated between secondary and postsecondary education (Brand et al., 2013). Career clusters were created to organize programs of study (Dortch, 2014). The U.S. Department of Education created a National Career Cluster Framework consisting of 16 career clusters including (U.S. Department of Education, 2006): Agriculture, Food and Natural Resources; Architecture and Construction; Arts, Audio/Video Technology and Communication; Business, Management, and Administration; Education and Training; Finance; Government and Public Administration; Health Science; Hospitality and Tourism; Human Services; Information Technology; Law, Public Safety, Corrections, and Security; Manufacturing; Marketing, Sales, and Services, Science, Technology Engineering, and Mathematics (STEM); and Transportation, Distribution and Logistics (U.S. Department of Education, 2006). Each career cluster has career pathways, which are sequences of academic and CTE courses, schools can implement in their CTE programs. In total, there are 79 career pathways associated with Perkins IV.

Perkins IV increased the focus on the integration of academic standards in state accountability systems, aligned with NCLB. Perkins IV targeted alignment of high school curriculum with postsecondary programs, student achievement through standards and assessments, and integration of academics and technical education (Brand et al., 2013; "Carl D. Perkins," 2006; Friedel, 2011). Legislators were concerned that with the increased responsibility of maintaining data systems for enhanced accountability measures, that states and other eligible recipients would opt out of Perkins funding. Consequently, federal law explicitly stated that if a state were to opt out of being a recipient of the funding without submitting a state plan detailing on how career education will be provided, that state would be ineligible to receive any federal funds administered by the United States Department of Education (Friedel, 2011).

As a result of the Obama administration seeking to improve upon NCLB, the United States Department of Education, Office of Planning, Evaluation, and Policy Development, released the Blueprint for Reform, the reauthorization of the Elementary and Secondary Education Act (U.S. Department of Education, 2010). There are four main components to the Blueprint for Reform: (1) ensuring all students are college and career ready, regardless of their income, race, ethnic or language background, or disability; (2) maximizing highly effective teachers and leaders in every school by recognizing, rewarding, and encouraging excellence; (3) ensure equity exists for all students by meeting the needs of diverse learners; and (4) raise the bar and reward excellence by collaboratively making comprehensive plans that change policies, challenge practices, and improve students outcomes (U.S. Department of Education, 2010). The Blueprint for Reform directed the focus for public education toward college and career readiness.

After the release of the Blueprint for Reform, the Harvard Graduate School of Education published *Pathways to Prosperity* in 2011 which concluded that a strong need existed for developing career-focused pathways at the high school level that lead to a student attending a two or four-year college for their respective career interest (Symonds et al., 2011). It was determined that to remain competitive, the United States would need 20 million eligible workers with postsecondary credentials, including bachelor’s degrees, industry certifications or postsecondary credentials, and associate’s degrees by 2025 (Carnevale & Rose, 2011). Consequently, efforts to strengthen CTE in the 2010s decade are evident by additional legislation expanding funding and public-school requirements targeted at making students college and career ready.

Being college and career ready mean mastering academic standards, soft or employability skills, and technical skills (Stone & Lewis, 2012). Conley (2010) defined a student as college and career ready when the student is able to “enroll and succeed – without remediation – in a credit-bearing course at a postsecondary institution that offers a baccalaureate degree… or in a high-quality certificate program that enables students to enter a career pathway with potential future advancements” (p. 21). A student graduating from high school college-ready, without having to enroll in remedial courses in college, is more likely to complete a college degree and is more likely to find employment (Perna & Jones, 2013; Pulliam & Bartek, 2017). A student demonstrating career readiness is a student graduating from high school with an industry-based certification and is more prepared to enter the workforce successfully because of their credential. In 2015, Every Student Succeeds Act (ESSA) was signed into law by former President Barack Obama, replacing NCLB. Proponents of ESSA, in comparison to NCLB, believed that the new legislation would better prepare students for college and future careers (Alder-Greene, 2019). However, ESSA did not require changes to Perkins IV as alignment and shared vision existed between the two pieces of legislation.

The history of the United States public education legislation indicates a focus on CTE for over two centuries. However, one can argue that the focus on CTE is greater than ever before, especially with increased accountability. As federal legislation focuses on postsecondary readiness for high school graduates, Texas has utilized their state accountability system to ensure quality CTE programming and to maximize college and career readiness among Texas high school graduates.

CTE in Schools Today

In 2018, the Strengthening Career and Technical Education for the 21st Century Act (Perkins V), was signed into law by President Donald Trump. Key changes in Perkins V included new program quality indicators, added emphasis on programs of study, and added a

Comprehensive Local Needs Assessment (CLNA) requirement (TEA, 2019g). According to the United States Assistant Secretary for Career, Technical, and Adult Education Scott Stump, most recent data indicate that only eight million of America's 15 million students participate in CTE and only 20% of CTE students concentrate in a CTE program of study or pathway (Stump, 2019).

The United States Chamber of Commerce Foundation conducted an analysis of workforce statistics and concluded that across all occupations, there were 5% more job openings than workers (U.S. Chamber of Commerce Foundation, 2018). Additionally, 13% more job openings existed than skilled workers for occupations such as welder, administrative assistants, and computer support specialists. However, the most significant shortage in skilled workers was in the health care industry where 1.1 million jobs are unfilled because of a lack of qualified workers (U.S. Chamber of Commerce Foundation, 2018).

The National Center for Education Statistics (2017) conducted a survey to gain current nationally representative data on CTE programs. Nationwide, 98% of public-school districts are offering CTE programming with over two-thirds of the public-school district aligning most of their program offerings as career pathways aligned with postsecondary programs (Gray et al., 2018). Students earning dual credit—both high school and college credit—was an apparent priority for school districts across the nation. Gray et al. (2018) found over 75% of the school district's CTE programs offered students the ability to earn dual credit, and 61% provided dual credit in core content areas.

Despite the decades of legislation and financial support for CTE, barriers still exist in today's CTE programming, including CTE teacher recruitment and retention and the lack of college and career-ready student outcomes. Through the year 2026, 7,700 new CTE teaching job vacancies will need to be filled, posing a challenge for school districts during a growing national teacher shortage (United States Bureau of Labor Statistics, 2018; U.S. Department of Education Office of Postsecondary Education, 2017). In Texas, House Bill 1842, in part, amended Texas Education Code (TEC) to allow for Districts of Innovation. If a school district meets performance requirements and follows procedures to adopt a District of Innovation Plan as outlined in statute, a Texas school district may use its innovation plan for exemptions to the state's teaching certification requirements (TEA, 2015b). To be eligible, a district must have a letter-grade of a "C" or higher, have a board of trustees' resolution or a signed petition from a majority of the district-level advisory committee, conduct a public hearing, and within 30 days of the public hearing take action on whether or not to move forward with establishing an innovation plan committee (TEA, 2015a). The exemption provides a school district the ability to hire qualified industry professionals to fill vacancies in CTE programs so long as the industry professional has, at minimum, a bachelor's degree.

College and career-ready student outcomes for CTE students continues to be a significant focus in education. Educational leaders are turning to CTE to increase college and career readiness for secondary students and "with a strong backing of federal funding, CTE is in a position to be the solution of preparing all students for college and career-readiness through further development of comprehensive curriculum aligned with core academics, employability skills, and technical, job specific skills" (Saeger, 2017, p. 6). Plasman et al. (2017) found the more credits a student earned in a specific career cluster in high school, the more likely they were to major within the respective career cluster, most significantly in the career clusters of agriculture, STEM, business, communications, and trade. The Texas Workforce Investment Council (2018) found that students participating in CTE had higher achievement rates on state assessments. For example, in 2017 high school students participating in CTE had a passing rate of 95% on the State of Texas Assessment of Academic Readiness (STAAR) exam in Algebra I and 93% on STAAR English II. All-student rates were 83% and 66% respectively (Texas Workforce Investment Council, 2018). Furthermore, CTE students have a lower likelihood of dropping out and higher probability of graduating high school on time compared to non-CTE students (Gottfried & Plasman, 2018).

The Texas high school graduation plans align with the research of Plasman et al. (2017) by encouraging students to earn more CTE credit to gain an endorsement in the student's graduation plan. As a result of House Bill 5 in 2013, and beginning with the 2014-2015 school year, students graduating under the Foundation High School Plan (FHSP) must complete four classes in math, English, and science, and three classes in social studies (TEA, 2013). Additionally, students are required to earn an endorsement in STEM, business and industry, public service, arts and humanities, or multidisciplinary by preferably completing "a coherent sequence of courses for four or more credits in CTE that consists of at least two courses in the same career cluster including at least one advanced CTE course" (TEA, 2014b, p. 24). Despite the state's graduation requirements and active encouragement of CTE student enrollment, only 54% of students in Texas are graduating CCMR. The percentage of graduates meeting CCMR standards indicates improvement is needed in ensuring all students are graduating college, career, or military ready. With an increased focus on CCMR for K-12 students, CTE is at the forefront of the attention of educational leaders (Goldstein, 2017). However, further research is needed to determine if CTE student enrollment predicts CCMR outcomes.

College and Career Readiness in Texas

Texas' first accountability system for public schools was established in 1993 and remained in place until the 2001-2002 school year. As the state's standardized test changed from the Texas Assessment of Academic Skills (TAAS) to the Texas Assessment of Knowledge and Skills (TAKS), as did the state's accountability system. The first and second state accountability systems primarily focused on student outcomes in the academic core content areas. The second accountability system required districts to meet criteria on up to 25 separate assessment measures and up to 10 dropout and completion measures (TEA, 2015a). The second accountability system was in place until 2011. In 2012 the state's standardized assessment changed to the State of Texas Assessments of Academic Readiness (STAAR) and the accountability system was changed to create a greater focus on postsecondary readiness. After the passing of House Bill 5, new indicators were added to the state's third accountability system to include college-ready graduates and a postsecondary readiness measure (TEA, 2013). In 2015, additional indicators were added to account for students that earned credit for at least two advanced CTE courses or were enrolled in a coherent sequence of CTE courses. Furthermore, postsecondary goals were explicitly established in the accountability manual. However, out of the four goals stated, only one goal was not core content or academically driven. The fourth goal referenced rewarding excellence based on "other" indicators but failed to mention career education.

College, Career, and Military Prep

In more recent years, Texas public education has emphasized the importance of both college and career readiness in recent years. The Texas Education Agency has created a college, career, and military prep division that focuses on providing school districts support, guidance, and resources for advanced academics, the Armed Services Vocation Aptitude Battery

(ASVAB), CTE, pathway initiatives, STEM, and the Texas College and Career Readiness School Models (TXCCRSM) network. The TXCCRSM is comprised of 371 campuses that have implemented one or more of the TXCCRSM programs (TEA, 2020). Programs in the CCRSM network include Early College High Schools (ECHS), Texas Science, Technology, Engineering and Math (T-STEM), Pathways in Technology Early College High Schools (P-TECH), and Industry Cluster Innovative Academies (ICIA; TEA, 2020b).

One of the most familiar programs in the TXCCRSM is the ECHS. In 2002, the Bill & Melinda Gates Foundation started the Early College High School Initiative (ECHSI). The primary purpose of the ECHSI was to assist economically disadvantaged, first-generation high school students in earning their high school diploma and their associate's degree simultaneously. The ECHS in Texas public schools today served 65,000 students in 182 ECHS campuses during the 2019-2020 school year (TEA, 2020a). Texas ECHS's are designed to:

- Target at-risk and economically disadvantaged students;
- Provide dual credit at no cost;
- Offer accelerated courses
- Provide students with highly personalized attention;
- Provide academic and social support services to maximize student success;
- And partner with Texas higher education institutions to reduce access barriers. (TEA, 2020a)

Texas Legislation

In 2019, Texas legislatures restructured public school finance for the state, making unprecedented changes with the passing of House Bill 3 (TEA, 2019e). Although changes were made to the state's existing financial structure, which resulted in a minimum of a three percent increase to all school district budget's across Texas, additional funding for CTE programming and CCMR was introduced as an incentive to exceeding college, career, military readiness expectations. The 2019-2020 school year marked the first-time school districts were able to earn CTE weighted funding for high school credit CTE courses offered to students at the middle school level. Before House Bill 3, a school district could offer CTE courses for high school credit at the middle school level but would not receive weighted funding for those students (TEA, 2019e). Texas public schools are funded 35% more for each CTE student enrolled in a high school credit course than a non-CTE student. School districts are required by Texas Education Code to spend a minimum of 55% of the total weighted CTE funding earned by the district on direct expenditures related to the CTE program. Direct costs may include CTE instructional materials, resources, technology, salaries, travel, professional development, and funds to support CTSO participation. Indirect costs may include student transportation, facilities acquisition and construction, and general administration.

Additionally, House Bill 3 introduced a College, Career, Military Readiness Outcomes Bonus for school districts exceeding a threshold of CCMR students outcomes established by the state. For a school district to receive the outcomes bonus for a student's achievement, the student had to exceed the state's minimum CCMR standard. For example, a student may become CCMR by meeting one of the following criteria prior to high school graduation (TEA, 2018b):

- meeting Texas Success Initiative (TSI) criteria in ELA/reading and mathematics;
- earn a score of 3 or higher on an Advance Placement (AP) exam or 4 or higher on an International Baccalaureate (IB) exam;
- earn dual course credits, completing at least three credit hours in ELA or mathematics, or nine credit hours in any subject;

- enlist in the Armed Forces;
- earn an industry-based certification;
- earn an associate degree; or
- Graduate with completed Individualized Education Program (IEP) and workforce readiness;
- Complete an OnRamps dual enrollment course;
- Graduates under an advanced degree plan and be identified as a current special education student; or
- earn a Level I or Level II certificate in any workforce education area.

Although a student may be considered CCMR by meeting just one of the criteria outlined above, a student meeting one of these criteria alone would not secure a school district's bonus funding. Bonus funding is awarded to school districts when a student meets any of the following three criteria: meeting the TSI score on the SAT/ACT/TISA exam and earned an associate degree prior to graduation or enrolled in college by the fall immediately after graduation; meeting the TSI score on the SAT/ACT/TSIA and earned an industry-based certification; earned a passing score on the Armed Services Vocational Aptitude Battery (ASVAB) and enlisted in the U.S. Armed Forces (TEA, 2019d). The bonus funding provides an incentive to Texas public schools to exceed minimum college and career readiness standards.

The state's increase in funding for both CTE and CCMR student outcomes illustrates the state's prioritization of college and career readiness for Texas public-school graduates. K-12 leaders are seeking effective strategies aimed at increasing CCMR outcomes. CTE programming can assist in improving college and career readiness among students, especially as it relates to industry-based certifications, level I and II certificates, and reinforcing core academic knowledge and skills (Saeger, 2017). Unfortunately, recent studies indicate that not all students in a CTE program are adequately prepared for future pursuits. Approximately 39% of students at a technical high school claimed to know “little” or “nothing” about careers related to their CTE course, and a staggering 72% of students enrolled at traditional comprehensive high schools knew “little” or “nothing” about careers related to their CTE course (DeFeo, 2015). Other factors, besides CTE, influence CCMR. However, it is not clear if CTE student enrollment predicts CCMR outcomes.

The findings of a study in south-central Texas, directly related to student experiences in CTE programming, indicate that students had varying levels of perceived preparedness for higher education or careers (Holman et al., 2017). It was determined that 12^{th} grade students earning an endorsement in public services felt significantly more prepared in the areas of curriculum, facilities, and teacher knowledge than students earning an endorsement in business and industry, primarily because of the popularity and number of industry-based certifications related to the public services endorsement and the extensive teaching credentials outlined in Texas Administrative Code for public services teachers. The challenge for K-12 leaders is to implement effective CTE programming, eliminating varied student perceptions of CTE student’s level of preparedness for college and career and to use CTE programming as a tool to increase CCMR in all students. However, even if students are prepared for college, students graduating from higher education institutions are often faced with dim prospects when entering the workforce (Perry & Wallace, 2012). Too often, this a result of students earning a degree in a field that is not in high demand or high wage. Consequently, Texas restructured their CTE program by redesigning the programs of study in 2020.

Programs of Study

The Texas Education Agency's College, Career and Military Preparation Division engaged with higher education institutions, the workforce, and secondary education to determine courses, industry-based certifications, and work-based learning experiences that should be offered to high school students that will maximize preparation for in-demand, high-skill, high-wage careers in Texas. The restructure of the programs of study ensures alignment with the new federal legislation, Strengthening CTE for the 21st Century Act (Perkins V) and will be implemented in Texas public schools during the 2020-2021 school year. The Texas Education agency outlined numerous benefits to the restructure of the programs of studies for the Texas CTE programs. One of the benefits is that the restructure occurred at the conclusion of a gap analysis between the job skills and course standards to create alignment and to meet the diverse needs of the Texas economy by increasing workforce opportunities for students. Each program of study includes occupations that meet criteria specific to projected job growth, annual employment openings, and median wage (TEA, 2019g). Although the programs of study are prescribed for Texas public schools to ensure consistency and alignment, districts are allowed flexibility to request regional programs of study if the program of study that is being request is supported by local workforce data. Furthermore, the restructure also furthered the expansion of STEM related career exploration (TEA, 2019f).

The TEA added a brand-new career cluster, energy, to maximize student exposure, knowledge, and skill in the high-demand, high-wage industry for the state. Within each career cluster, programs of study were articulated and courses within each program of study were sequenced to ultimately lead to students having the opportunity to earn an industry-based certification. Table 1 outlines each career cluster and programs of study approved by the TEA for implementation during the 2020-2021 school year.

Table 1

Texas CTE Career Clusters and Programs of Study

Career Clusters	Programs of Study
Agriculture, Food, and Natural Resources	• Agribusiness • Animal Science • Applied Agricultural Engineering • Environment and Natural Resources • Food Science and Technology • Plant Science
Architecture and Construction	• Architectural Design • Construction Management and Inspection • Carpentry • Electrical • HVAC and Sheet Metal • Masonry • Plumbing and Pipefitting
Arts, Audio Video Technology, and Communications	• Design and Multimedia Arts • Digital Communications
Business, Marketing, and Finance	• Accounting and Financial Services • Business Management • Entrepreneurship • Marketing and Sales
Education and Training	• Early Learning • Teaching and Training
Energy	• Oil and Gas Exploration and Production • Refining and Chemical Processes
Health Science	• Exercise Science and Wellness • Health Informatics • Healthcare Diagnostics • Healthcare Therapeutic • Nursing Science • Medical Therapy
Hospitality and Tourism	• Culinary Arts • Lodging and Resort Management • Travel, Tourism, and Attractions
Human Services	• Family and Community Services • Health and Wellness
Information Technology	• Information Technology Support and Services • Networking Systems

Career Clusters	Programs of Study
	• Web Development
Law and Public Services	• Emergency Services • Government and Public Administration • Law Enforcement • Legal Studies
Manufacturing	• Advanced Manufacturing and Machinery Mechanics • Manufacturing Technology • Welding
Science, Technology, Engineering, and Math	• Biomedical Science • Cybersecurity • Engineering • Programming and Software Development • Renewable Energy
Transportation, Distribution, and Logistics	• Automotive • Aviation Maintenance • Diesel and Heavy Equipment • Distribution and Logistics

Note. Adapted from *Texas College and Career Readiness School m=Models (CCRSM),* by Texas Education Agency, 2020b, (https://tea.texas.gov/academics/college-career-and-military-prep/texas-college-and-career-readiness-school-models-ccrsm). Copyright 2020 by Texas Education Agency. In the public domain.

School districts in Texas are not required to offer all of the career clusters or programs of study. However, all Texas public schools that offer CTE programming may only offer these approved career clusters and programs of study. The decision on what career clusters and corresponding programs of study to offer to students is up to each individual school district. If a district wishes to offer a program of study that is not approved by the TEA based on their regional workforce needs, the school district must seek approval prior to implementation.

The restructure of programs of study for Texas public schools ensure alignments between the needs of the state's economy and career preparation for high school students. Each program of study is aligned to industry-based certification opportunities that will allow students to be a competitive member of the Texas workforce. The new programs of study, combined with the state's accountability system and funding for CCMR, fosters college and career readiness among Texas high school graduates. However, it is still unclear how CTE enrollment predicts CCMR outcomes.

Summary

The foundation of this study is based on Krumboltz's learning theory of career counseling and Hirschi's whole-life career management framework. The study's research questions are posed to determine if CTE enrollment can predict CCMR outcomes. Although CTE programs may help students achieve CCMR status, research indicates students in CTE are unsure of the career opportunities within their respective programs of study (DeFeo, 2015). The components of the two theoretical frameworks introduced in Chapter 2 are relevant to achieving college and career readiness student outcomes

For over a century, numerous legislations have been written and vocational education has evolved into what is now known as career and technical education. The United States has established many initiatives targeting the improvement of CTE to adequately prepare students for future pursuits, whether it be college or career. Every recent presidential administration has provided clarity and legislative support surrounding producing college and career ready student outcomes. The current administration has reauthorized federal funding, Perkins V, to ensure continued funding toward CTE programs nation-wide which increasing accountability for school districts through a required comprehensive local needs assessment.

Texas public schools have evolved in their focus on producing both college and career ready students upon graduation. In recent years, the state's accountability system for Texas public schools has reflected the importance of college and career ready students. However, 35% of Texas graduates are not meeting CCMR criteria. As a result, legislation regarding Texas public school finance has created incentives for school districts that are exceeding expectations in producing college and career student outcomes with the hope of increasing CCMR graduates state-wide.

Furthermore, Texas has restructured their CTE career clusters and programs of study to create deeper alignment of high-demand, high wage workforce needs. It is critical to understand the association, if any, between CTE enrollment and school district's CCMR ratings earned on Texas' public-school accountability report. The study, outlined in Chapter 3, sought to determine if a school's CTE program, in terms of enrollment, can predict the percentage of high school students graduating CCMR.

Chapter 3: Research Methods and Design

The purpose of this quantitative archival research study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of college, career, and military readiness (CCMR) student outcomes as defined by the Texas Education Agency (TEA). The following questions were answered in this research study:

RQ1: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas?

$H1_A$: The percentage of students enrolled in CTE is a statistically significant predictor of CCMR graduates in Texas.

$H1_0$: The percentage of students enrolled in CTE is not a statistically significant predictor of CCMR graduates in Texas.

RQ2: How does the percentage of CTE students enrolled predict the percentage of college-ready graduates?

$H2_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of college-ready graduates.

$H2_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of college-ready graduates.

RQ3: How does the percentage of CTE students enrolled predict the percentage of career or military ready graduates?

$H3_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of career or military graduates.

$H3_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of career or military ready graduates.

This chapter details the research design and methodology, population and samples, instruments, operationalization of variables, data collection and analysis procedures, researcher role, ethical considerations, assumptions, limitations, and delimitations.

Research Design and Methodology

A quantitative research design was used for this study. A quantitative research design was most appropriate because the data utilized in this study was quantitative. This research study was not qualitative because the state utilizes numerical data to report enrollment and student achievement data. Simple linear regression was the statistical analysis used in this study. A simple linear regression was the most appropriate statistical analysis method because this study attempted to determine whether the independent variable, percentage of CTE enrollment, predicts the dependent variables including the percentage of CCMR, college readiness, and career or military readiness. The goal of the research study was to determine how the percentage of CTE enrollment predicts the percentage of CCMR graduates, college readiness, and career or military readiness at 41 high schools in Texas.

The research paradigm for this quantitative study was postpositivism. Postpositivism scientifically strives to explore a phenomenon and emphasizes the proper understanding of the perspectives and direction of any research study from multi-dimensions and methods (Leavy, 2017; Panhwar et al., 2017). However, postpositivist research, unlike positivist research, is based on the belief that the absolute truth cannot be found (Phillips & Burbules, 2000). Thus, postpositivism was the research paradigm most appropriate for this research study.

Population and Sample

The target population for this study was Texas public high schools. The sample in this study included 41 Texas public high schools. Homogeneous sampling was used for this study to ensure that all high schools had similar characteristics. Homogeneous sampling, a purposive sampling technique, aims to create a sample who units share the same characteristics (Laerd Dissertation, 2015). The TEA developed groups of 41 high schools in the 2018 Campus Comparison Group Document listed in Appendix A. The purpose of the TEA Campus Comparison Group Report is to allow K-12 Texas public school stakeholders to compare achievement data against like-schools for a fair comparison on accountability ratings. The high school campuses were from various independent school districts across the state but were considered similar in terms of several factors: number of students, the percentage of economically disadvantaged students, the percentage of English learners, mobility rate, the percentage of early college high school students, and the percentage of special education students (TEA, 2018a). This particular comparison group was selected because they are the largest high schools in the state of Texas. The average number of students served for each demographic indicator among the 41 campuses were calculated (Table 2).

Table 2

Demographic Overall Averages for TEA Campus Comparison Group

	Number of Students	Percent Economically Disadvantaged (%)	Percent English Learners (%)	Mobility Rate (%)	Percent Early College High School (%)	Percent Special Education (%)
Average	3,336	19.1	3.7	9.0	0	7.3

The 41 high schools listed on the TEA Campus Comparison Group Document for the 2017-2018 school year was the sample for this study. The study sought to determine whether the percentage of CTE students enrolled at each of the high schools predicts their percentage of CCMR graduates. G*Power v. 3.1 software was used to determine the power of the sample size.

Twenty-nine was the minimum sample size given a bivariate normal model correlation statistical test, with an alpha of 0.05, power of 80%, and testing against a null hypothesis of zero correlation. Given that 41 high school campuses were used in this study, as outlined in the comparison group document, the sample size for this study was sufficient.

Instruments

The primary instrument used in this study was the TEA database, which is accessible to the general public and allowed for archived data to be the source of data for this study. The three archived data sources obtained for this study from the TEA database are the 2018 TEA Campus Comparison Group Document, the 2017-2018 Texas Academic Performance Report (TAPR) and the 2018-2019 College, Career, and Military Readiness (CCMR) Report. The reports ranged from the year 2017 to 2019 because of the delay in the Local Education Agency (LEA) reporting. For example, the 2018-2019 CCMR rating reflected CCMR results for the 2017-2018 graduates. Consequently, the 2017-2018 TAPR was needed to obtain the number of CTE students enrolled during the 2017-2018 school year for each campus. The 2018 TEA Campus Comparison Group was used to match the year of the graduating cohort.

The data were originally collected from each LEA through the Texas Student Data System (TSDS) Public Education Information Management System (PEIMS). Each public school and open-enrollment charter in Texas are required to submit data as outlined in the Student Attendance Accounting Handbook written by TEA. An LEA may not change or alter any of the rules or regulations specified in the handbook (TEA, 2019b). The data obtained in the PEIMS submission are used for state and federal accountability, student enrollment, student attendance, funding, and enrollment in programs including special education, CTE, bilingual/English as a second language, and prekindergarten.

The degree to which evidence supports any inferences made based on data a researcher collects using a particular instrument is referred to as validity (Fraenkel et al., 2019). It is the inferences made using the data, not the instrument itself, that are validated. Since independent variables are not manipulated in a casual-comparative research design, internal validity cannot be guaranteed (Schenker & Rumrill, 2004). Consequently, it could not be guaranteed that CTE enrollment changes the dependent variables. Instead, if a relationship between the independent and dependent variables were found, a question of why the relationship existed was posed. The consistency of scores obtained from one administration to another is referred to as reliability (Fraenkel et al., 2019). There was a high level of reliability in this study as a researcher could take a TSDS PEIMS submission data set from same school year, and the same schools listed in the comparison group, and be able to find the same relationship exists, if any, between CTE enrollment and the percentage of CCMR graduates. Issues concerning reliability were not expected. However, the data collected are input by individual schools with the assumption that schools have input their data accurately.

Operationalization of Variables

For this correlational study, each research question used two unmanipulated variables obtained through archived data to determine whether CTE enrollment, the independent variable, can predict the dependent variables. The dependent variables included the percentage of CCMR graduates, percentage of college-ready graduates, and percentage of career or military ready graduates.

CTE enrollment. CTE enrollment refers to the percent of students enrolled in a CTE course at a specific campus as indicated in the TAPR. The level of measurement for this variable is ratio. The scores range from 0 to 100, 0 being the lowest score and 100 being the highest score possible.

CCMR graduates. These graduates are students who graduated from a high school campus that demonstrated college, career, or military readiness in any of the CCMR indicators as outlined by TEA. The level of measurement for this variable is ratio. The scores range from 0 to 100, 0 being the lowest score and 100 being the highest score possible.

College-ready. Students that graduate college-ready are students that meet TSI criteria in ELA/Reading and mathematics, meet criteria on AP or IB examination, earn an associate degree, complete an OnRamps dual enrollment course. The level of measurement for this variable is ratio. The scores range from 0 to 100, 0 being the lowest score and 100 being the highest score possible.

Career or military ready. Students that graduate career ready are students that pass an approved industry-based certification, graduate with completed Individualized Education Plan (IEP) and workforce readiness, enlist in the United States Armed Forces, graduate under an advanced degree plan and are identified as a current special education student, or graduates with a level I or level II certificate (TEA, 2019d). The level of measurement for this ration is ratio. The scores range from 0 to 100, 0 being the lowest score and 100 being the highest score possible.

Quantitative Data Collection and Analysis

After approval by the Abilene Christian University Institutional Review Board (IRB), the data collection process was implemented. This correlational study used archival data rather than collecting new data. O’Dwyer and Bernauer (2013) defined existing data as when variables are not manipulated, and the data have already been collected. All data used in this study are publicly available data located on the Texas Education Agency database.

Data Collection

The 2018 TEA Campus Comparison Report for Allen High School, the largest high school in Texas, was used to ensure schools were being compared against 40 other schools that were similar in population and demographics. All of the Texas public high schools on the list were used, which totaled to 41 campuses. Thereafter, the data from each campus were extracted from the 2018-2019 Texas Academic Performance Report (TAPR). Each campus had a TAPR with the campus' unique data. The percentage of CTE students enrolled, CCMR graduates, college- ready graduates, and career or military ready graduates were located in the TAPR.

Statistical Method

The data were analyzed with the IBM's SPSS, Inc. Version 26. A simple linear regression is the analysis strategy that was used to test each null hypothesis and investigate if the percentage of CTE enrollment at a respective campus predicts any of the variables listed in the research questions. A simple linear regression is most appropriate for this study because it indicates whether a significant relationship exists between two variables, informs on how much the variation in the dependent variable is explained in the independent variable, helps understand the direction of a relationship between the variables, and predicts values of the dependent variable based on the value of the independent variables (Draper & Smith, 1998; Weisberg, 2014).

Using the variable view tab, the variables were inputted into SPSS using abbreviations for each variable including CTE, CCMR, CR, and CMR. Using the data tab, the corresponding data for each campus were inputted into SPSS. Assumptions regarding linear regression were tested to ensure the data were appropriate for this analysis strategy. The following assumptions tested included: a linear relationship exists between the dependent and independent variables; independent of observations; there are no significant outliers; the data showed homoscedasticity; and the residuals of the regression line are approximately normally distributed (Laerd Statistics, 2015). Using SPSS, three linear regressions were conducted with the percentage of CTE enrollment being the independent variable and CCMR, college-readiness, and career or military readiness being the dependent variables.

Statistical Analysis

The Model Summary table in SPSS were utilized to explain the percent of the variance CTE accounts for CCMR, college readiness, and career and military readiness. The adjusted *R* square (R^2) column were used to determine the percent of the variance to ensure positive bias had been corrected. Because there is only one variable in a simple linear regression, R is the absolute Person correlation coefficient and measures the strength of a relationship. The ANOVA table were utilized to determine the level of significance for each linear regression. If $p > .05$, a statistically significant relationship did not exist. However, if $p < .05$, statically significant relationship did exist. To predict whether or not CTE enrollment influences other variable outcomes, the regression equation used was, dependent variable = $b_0 + (b_1 \times$ independent variable) where b_0 is the intercept and b_1 is the slope coefficient.

Researcher Role

I serve as the Director of College and Career Readiness at one of the 41 high school campuses in this study. However, I did not serve any of the 41 high school campuses at any capacity during the 2017-2018 school year. As Director of College and Career Readiness, I have no vested interest in the outcome of this study.

Ethical Considerations

This study earned the approval of the Abilene Christian University's Instructional Review Board before data collection. Confidentiality was the primary ethical consideration for this study. Because this study used publicly accessible archived data provided by the TEA, confidentiality, and compliance with the Family Educational Rights and Privacy Act (FERPA) was highly likely, but not guaranteed. This study did not require student interaction or the collection of student-specific data.

Assumptions

An assumption is any information that may be taken for granted, is not tested or checked (Fraenkel et al., 2019). The assumption was made in this study that the TSDS PEIMS data submitted by each LEA was accurate and was in accordance with the rules and regulations specified in the Student Attendance Accounting Handbook for Texas public schools. Another assumption made in this study was that each LEA implemented their CTE program with fidelity, using both federal and state guidance for program implementation.

Limitations

Limitations influence the generalizability of a study and represent factors a researcher cannot control (Simon, 2011). A limitation of this study was the mobility rate of each campus during the 2017-2018 school year. The average mobility rate in 2018 among the 41 high schools in this study was 9% (TEA, 2018a). Mobility could have increased the potential inaccurately reporting a student's achievement in one of the CCMR indicators. Another limitation of this study was the overall CTE program quality, which might have varied from campus to campus based on factors, such as teacher professional development and community and industry partnerships. Additionally, the sample contained only 41 high schools, and it is likely the findings do not generalize to all high schools in the state of Texas. Further, the state of Texas has unique statewide laws and regulations affecting its public schools, causing the findings not to generalize to other states that operate their public school based on their unique laws and regulations.

Delimitations

Simon (2011) stated that delimitations are characteristics that define the boundaries and limit the scope of a study. This study sought to determine whether the percentage of CTE enrollment predicts the percentage of CCMR graduates at 41 high schools that were most similar in size and demographics, grouped by the TEA. This study did not include all high schools in Texas.

Summary

The purpose of this quantitative archival study was to determine how the percentage of CTE enrollment predicts the percentage of CCMR student outcomes as defined by the TEA. This quantitative study involved using archived data to obtain the percentage of CTE enrollment, the percentage of CCMR graduates, and all other variables in the research questions for each high school. Linear regression was the statistical analysis used to answer the research questions to determine if the percentage of CTE enrollment predicts the percentage of CCMR graduates at 41 Texas public high schools, which formed the sample in this study.

Chapter 4: Results

In 2018, Texas had a 4-year longitudinal high school graduation rate of 90% (TEA, 2018a). A 4-year longitudinal graduation rate refers to the percentage of Texas public high school graduates that are graduating within 4 years. However, only 65% of graduates are College, Career, and Military Ready (CCMR; TEA, 2018b). The specific problem studied in this study was that a low percentage of students in Texas, in comparison to the state's graduation rate, graduated with a CCMR distinction. The purpose of this quantitative archival study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of CCMR in student outcomes as defined by the TEA. Linear regression was the statistical analysis used to answer the research questions to determine if the percentage of CTE enrollment predicts the percentage of CCMR graduates at 41 Texas public high schools, which formed the sample in this study. The following questions were answered in this research study:

RQ1: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas?

RQ2: How does the percentage of CTE students enrolled predict the percentage of college-ready (CR) graduates?

RQ3: How does the percentage of CTE students enrolled predict the percentage of career or military ready (CMR) graduates?

This chapter provides the representative statistics and measures of central tendency, dispersion, and normality for the sample of 41 high schools, the results for the tests of the statistical assumptions of simple linear regression, as well as the results for each of the three research questions in this study.

Descriptions of the Sample of 41 Schools

Homogeneous sampling was used for this study to ensure that all high schools have similar characteristics. Homogeneous sampling, a purposive sampling technique, aims to create a sample who units share the same characteristics (Laerd Statistics, 2015). The TEA creates a Campus Comparison Group Report annually. Each of the campuses listed in the report are similar in the following demographic areas: student population, percentage economically disadvantaged students, mobility rate percentage, and percentage of special education students. The purpose of the Campus Comparison Group Report is to allow K-12 Texas public school stakeholders to compare achievement data against like-schools for a fair comparison on accountability ratings. Table 3 provides the contextual description of the high schools that shows their ranges of enrollments regarding their percentages of students who are economically disadvantaged, English learners, mobile (i.e., move between schools within a school year), and special education eligible. These variables represent measures used by the TEA to form the comparison groups of 41 schools. The sample was selected because the campuses are among the largest Texas public high schools, in terms of total student enrollment. The 2018 TEA Campus Comparison Report established the sample for this study and is listed in Appendix A.

Table 3

Descriptive Statistics of Each of the 41 High Schools in the Sample

School	Student Enrollment	Economically Disadvantage %	English Learners %	Mobility %	Special Education %
1	4,884	12.6	2.4	6.0	8.9
2	3,451	25.2	2.8	9.7	7.0
3	2,867	10.4	1.3	6.1	8.2
4	2,715	15.4	2.9	8.9	9.3
5	2,759	13.0	1.2	10.0	8.2
6	3,092	16.8	4.6	9.3	4.4
7	4,400	24.9	3.3	12.1	6.2
8	4,331	5.3	3.6	6.3	4.4
9	3,505	8.0	2.7	5.9	5.2
10	3,525	33.7	3.8	8.7	6.8
11	3,114	14.8	2.1	6.1	5.3
12	3,546	18.9	1.7	6.3	6.7
13	4,075	41.3	5.3	11.5	10.4
14	3,773	40.6	14.8	18.3	8.6
15	3,773	30.6	7.0	18.5	7.7
16	2,707	18.7	5.0	6.9	5.2
17	3,624	24.8	1.8	10.2	7.5
18	3,142	24.1	6.0	7.1	6.1
19	3,398	29.7	4.3	13.1	10.3
20	3,525	10.3	4.8	6.0	4.9
21	3,939	23.2	5.2	9.5	6.9
22	3,375	6.9	2.2	5.2	5.9
23	2,994	4.9	1.9	6.1	4.5
24	3,237	20.2	5.5	8.2	8.8
25	3,614	28.7	3.6	12.3	9.1
26	3,665	29.6	5.0	12.2	8.7

School	Student Enrollment	Economically Disadvantage %	English Learners %	Mobility %	Special Education %
27	3,921	27.7	4.2	11.5	8.1
28	3,079	9.5	2.6	7.3	7.1
29	3,616	3.2	1.4	6.4	7.9
30	3,583	19.3	5.8	10.3	8.0
31	3,271	6.0	0.8	7.4	9.1
32	3,823	16.6	3.6	7.2	6.9
33	2,957	32.7	5.2	11.0	9.1
34	3,075	15.5	2.1	9.3	6.6
35	3,513	12.1	1.9	7.2	6.3
36	3,327	19.7	2.4	8.5	8.6
37	3,048	25.7	2.5	9.8	10.1
38	3,025	26.5	4.1	8.5	7.8
39	2,971	5.5	1.0	7.1	6.3
40	3,358	12.5	3.3	9.0	7.2
41	2,742	1.9	4.3	6.4	5.0

For the purpose of this study, the specific achievement data analyzed include percentage of high school graduates who were CCMR, CR, and CMR. Additionally, the percentage of each campuses' CTE enrollment was extracted from another TEA archived report and has independence in its measurement characteristics or definition from the three dependent variables listed above in the Texas Academic Performance Report (TAPR). Table 4 presents the statistics used for measuring the central tendency (mean [*M*]) and dispersion (standard deviation [*SD*], range, and minimum and maximum) of each of the independent and dependent variables. The ranges provided an evidence of dispersion in the variables' percentage values between the 41 high schools. For example, CTE enrollment percentages among the 41 high schools ranged 56%, from 33% to 89%. Meanwhile, the mean percentage of CTE enrollment was 65.3% (*SD* =

13.5%). Similar ranges are seen for the three dependent variables. However, the range for CMR was the narrowest as 29%, with a low of 8.0% and a high of 37.0%; this variable had the least amount of deviation from the mean of 21.5% (*SD* = 8.2%). CCMR had the highest mean at 77.0%, and CR which did not include the military aspect of readiness had a lower mean value at 68.9%.

Table 4

Measures of Central Tendency and Dispersion for the Four Variables

Variable	Minimum	Maximum	Range	*M*	*SD*
CTE Enrollment %	33.0	89.0	56.0	65.3	13.5
CCMR %	54.0	96.0	42.0	77.4	9.0
College Ready %	35.0	95.0	60.0	68.9	12.8
Career/Military Ready %	8.0	37.0	29.0	21.5	8.2

Tests of the Assumptions

Prior to performing the linear regression, the statistical assumptions detailed in Chapter 3 were tested. The following are the assumptions that need to be met before engaging in simple regression modeling: (a) there is one dependent variable measured at the continuous level, (b) one independent variable measured at the continuous level, (c) independent of observations, (d) a linear relationship exists between the dependent and independent variables, (e) there are no significant outliers, (f) the data showed homoscedasticity, and (g) the residuals of the regression line are approximately normally distributed (Laerd Statistics, 2015). The first and second assumptions were met by the respective researcher questions' dependent variables (e.g., school district percentage of CCMR, CR, and CMR for its students) and independent variable (e.g., school district CTE enrollment percentage) represented continuous ratio variables where the minimum could be 0.0% and the maximum could be 100.0%.

The third assumption of independence of observations was met because the three research questions represented three independent regression models and the measurements for the models involved the dependent variable as enrollment in a specific academic program (i.e., CTE) while the dependent variables measured outcomes of enrollment in CTE that were reported independently by school districts, regardless of the academic programs in which their students had enrolled. The assumptions of a linear relationship and homoscedasticity existing between the dependent and independent variables with homoscedasticity was tested with scatterplots of the residual values for the data. The assumption of outliers was tested using the residual standardized values derived during the calculations used for the scatterplots of the residuals. The normal distribution of the residuals (i.e., *z* scores) were tested by generating a normal P-P plot. All assumptions were tested prior to evaluating any of the regression analyses. Those results for all variables appear in the following subsections.

Linearity and Homoscedasticity

The assumptions of a linear relationship between the pairs of variables were tested to determine that a simple linear regression was the most appropriate statistical analysis for each of the research questions. A linear relationship existed between the dependent and independent variables as observed in the scatterplots of the pairs of variables based on the residuals, representing standardized values for the variables' relationships in each scatterplot (Patton, 2016). The expected appearance of the scatterplot of residuals for each pairing of the predictor variable with a dependent variable would be a wide range of values that appear like a shotgun pellets hitting a target (Patton, 2016).

Additionally, the scatterplots of the residuals for the predictor and dependent variables were developed to make note of any violations of homoscedasticity between the predictor variable of CTE enrollment and the dependent variables of CCMR, CR, and CMR. For the assumption to be met, the scatterplots were expected not to display any indications of outliers that were 3.3 standard deviations in either direction away from the means (Patton, 2016). The plots did not show any unreasonable deviation from the expected shapes, and the homoscedasticity assumption was met (Laerd Statistics, 2015; Patton, 2016). Figures 2, 3, and 4 represent the scatterplots used for confirming the assumptions of linearity and homoscedasticity were met.

Figure 2

Scatterplot of Residuals Between CTE and CCMR Variables

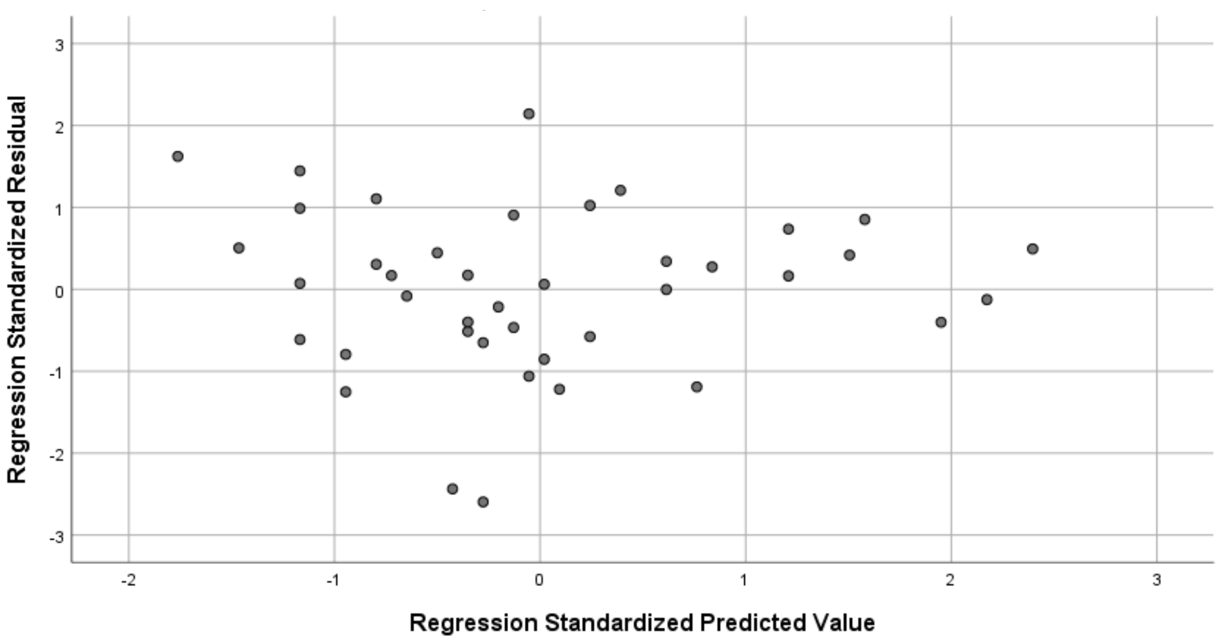


Figure 3

Scatterplot of Residuals for CTE Predictor and CR Dependent Variables

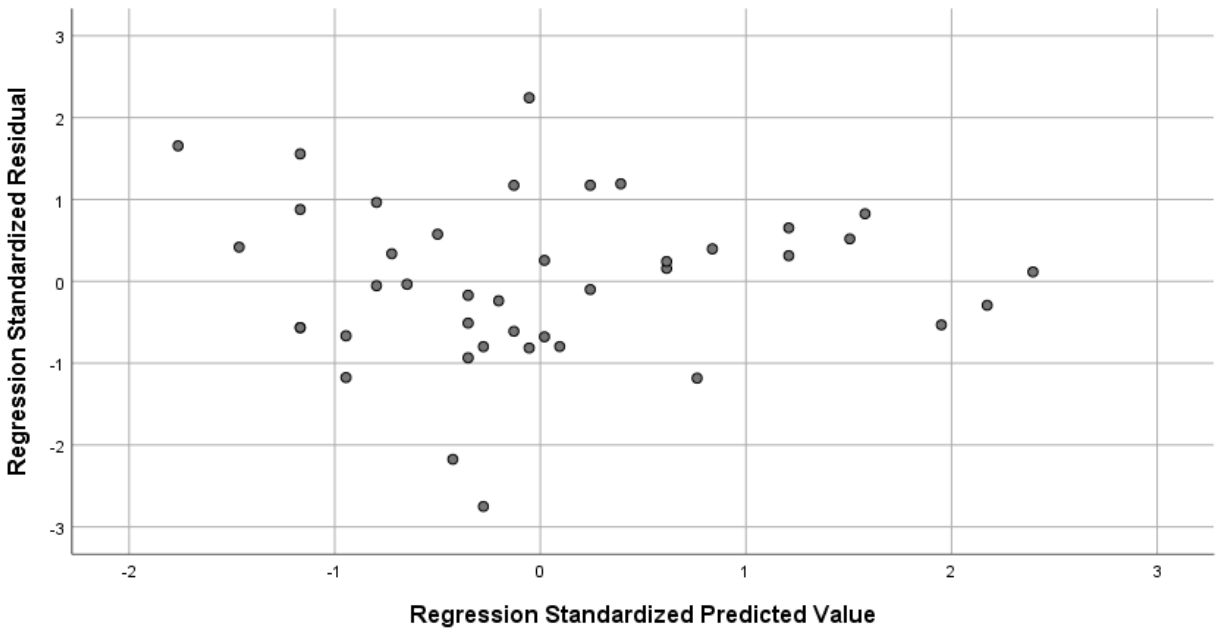
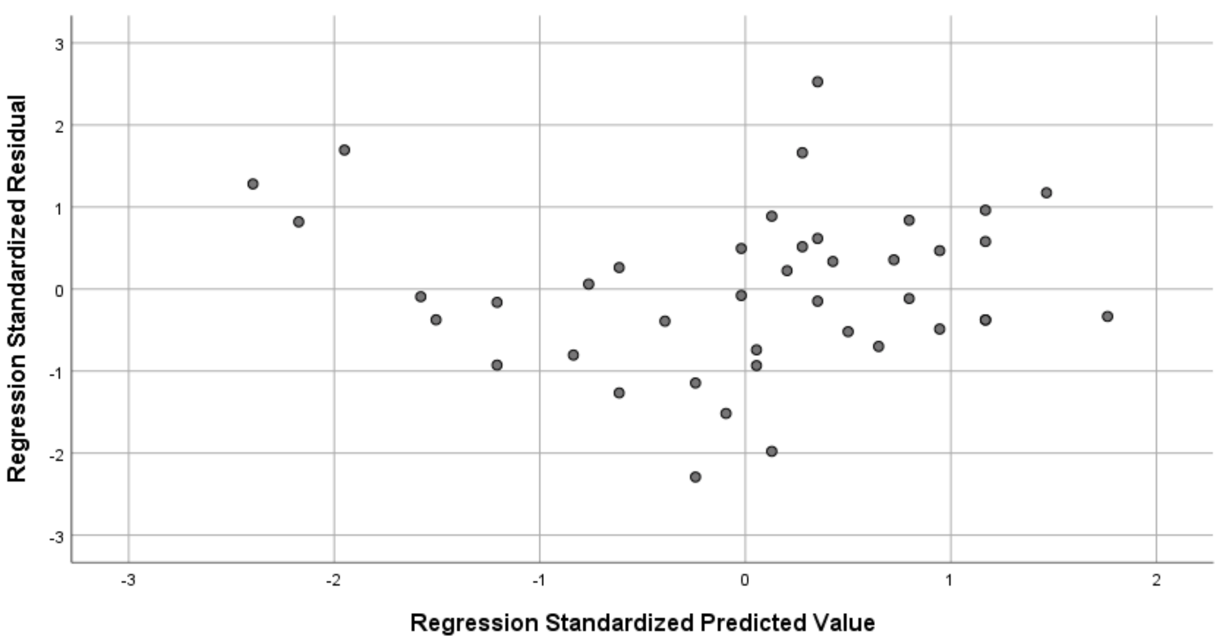


Figure 4

Scatterplot of Residuals for CTE Predictor and CMR Dependent Variables



Significant Outliers

The scatterplots of the residual scores for the variables did not indicate that any values were larger than 3.3 or smaller than -3.3, which was the threshold range for considering values not to be outliers (Pallant, 2020; Tabachnick & Fidell, 2019). Additionally, the Mahalanobis Distance values for each of the data points for the four variables were calculated and tested as probability values with the chi square statistic using a probability threshold of .001 as indicative of violating the assumption of no outliers. Table 5 confirms there were no outliers because the probabilities ranged no greater than .01 to .98, and all those values were greater than the alpha threshold of .001 (Pallant, 2020; Tabachnick & Fidell, 2019). All 41 high schools were retained in the sample during the regression analyses used to answer the research questions.

Table 5

Mahalanobis Distance Probability Variables Described in Testing for Outliers

	Probabilities (α)			
Variable	Minimum	Maximum	*M*	*SD*
CCMR	.02	.98	.5177	.30833
CR	.02	.98	.5177	.30833
CMR	.02	.98	.5177	.30833
CTE	.01	.96	.5035	.28206

Normality of Variables' Distributions

The normality for all four variables was tested by the skewness statistic measuring the centrality of the distribution curve and the kurtosis statistic measuring the height of the distributional curve. The skewness and kurtosis represented normal distributions for each of the four interval variables. The skewness and kurtosis values are very close to an absolute value of 1.0 which is a requirement for normality of distribution type; values approaching 2.0 suggest a lack of normality, but no values approached 2.0 (Tabachnick & Fidell, 2019). Table 6 shows the values.

Table 6

Measures of Normal Distribution for the Variables Regarding the Sample

Variable	Skewness	Kurtosis
CTE Enrollment %	-.66	-.01
CCMR %	-.56	.47
College Ready %	-.42	.14
Career/Military Ready %	.75	-.07

Normal P-P plots were also performed for CTE versus the three dependent variables. Those plots verified the normality of the relationships between the independent variable CTE as paired with each of the three dependent variables (Patton, 2016). When the points on the plot are on or close to the diagonal line, then the normality assumption is retained. The plots in Figures 4, 5, and 6 contains points that appeared reasonably close to the diagonal line to support the normality assumption (Patton, 2016).

Figure 5

Normal P-P Plot for CTE Predictor and CCMR Dependent Variables

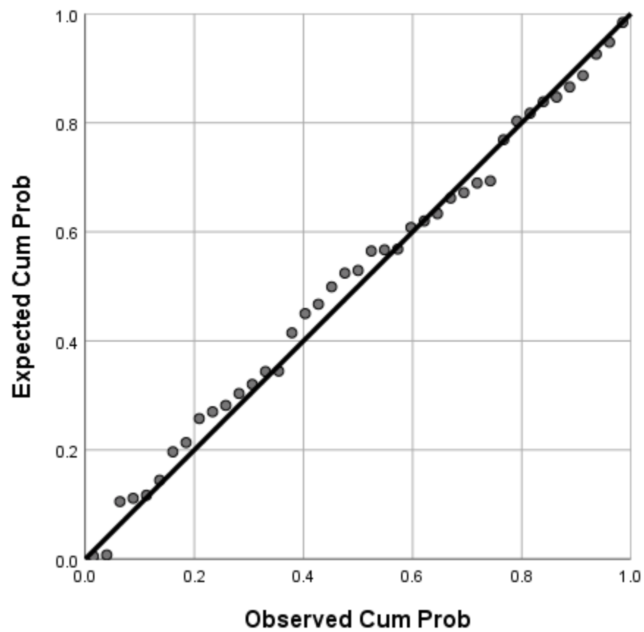


Figure 6

Normal P-P Plot for CTE Predictor and CR Dependent Variables

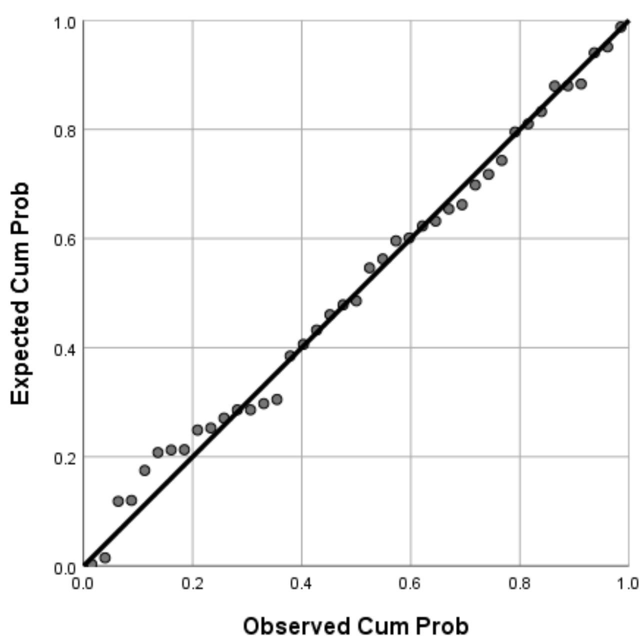
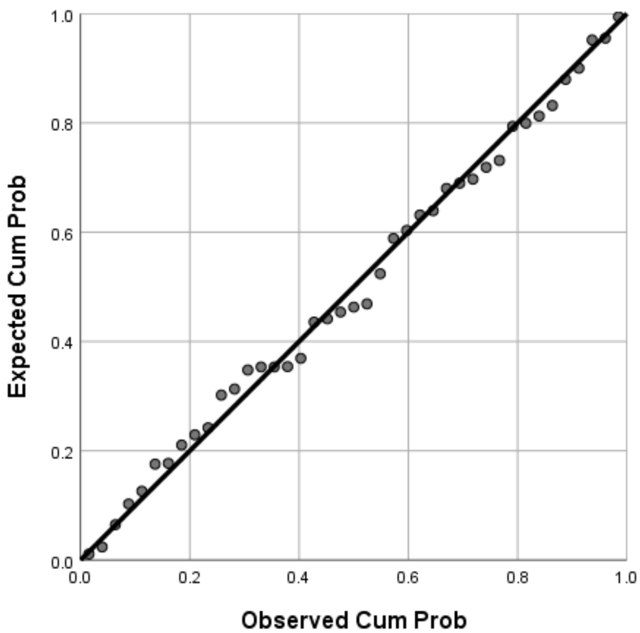


Figure 7

Normal P-P Plot for CTE Predictor and CMR Dependent Variables



Results for the Research Questions

Once the assumptions were met, the simple linear regression models were performed. Each model is presented according to the research question it answers in the follow subsections.

Results for Research Question 1

This research question was: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas? To answer this research question, the null hypothesis was tested using linear regression. The alternative and null hypotheses were:

$H1_A$: The percentage of students enrolled in CTE is a statistically significant predictor of the percentage of CCMR graduates in Texas.

$H1_0$: The percentage of students enrolled in CTE is not a statistically significant predictor of the percentage of CCMR graduates in Texas.

The regression model did not reveal statistical significance with *F* (1, 39) = 3.578, *p* = .066, even though the *R* coefficient depicted that the relationship between CTE predictor variable and the CCMR dependent variable as 0.29, suggesting a medium effect size (Cohen, 1988). Higher CTE enrollment percentages did not predict higher percentages of CCMR. Table 7 contain the regression model's results.

Table 7

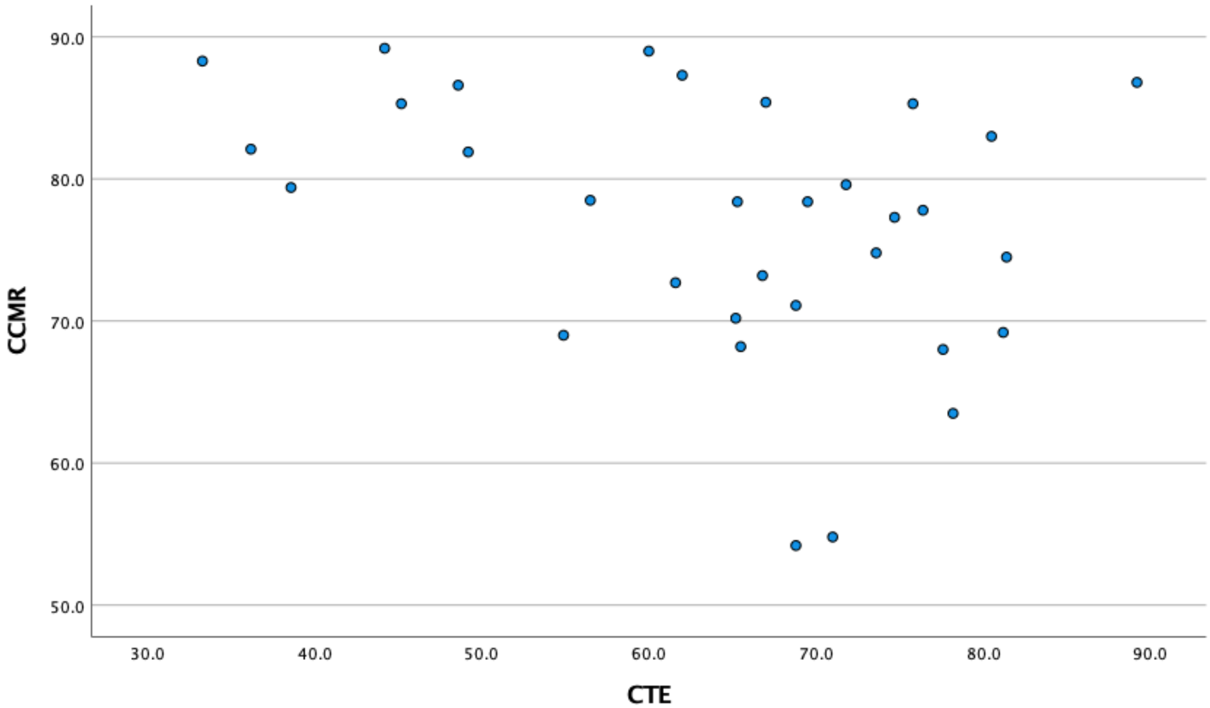
ANOVA Results for CTE Predicting Percentage of CCMR Graduates

	ANOVA				
	Sum of Squares	*df*	Mean Square	*F*	*p*
Regression	.027	1	.027	3.578	.066[b]
Residual	.298	39	.008		
Total	.325	40			

The null hypothesis was retained (i.e., not rejected). The percentage of students enrolled in CTE was not a statistically significant predictor of percentage of CCMR graduates in Texas high schools. CCMR was the overarching variables that included all measured readiness variables for students graduating from high school in Texas. College readiness and career and military readiness were also measured as separate variables by the state of Texas for its high school graduates. Research Question 2 was conducted to explore the relationship between CTE enrollment and CR outcomes for the 41 campuses.

Figure 8

Scatterplot for CTE Predicting CCMR Graduates



Results for Research Question 2

This research question was: How does the percentage of CTE students enrolled predict the percentage of CR graduates? To answer this research question, the null hypothesis was tested using linear regression and if the null hypothesis was rejected, the alternative hypothesis was accepted. The alternative and null hypotheses were:

$H2_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of CR graduates.

$H2_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of CR graduates.

The regression model revealed with F (1, 39) = .01, p = .007 (Table 8). The R coefficient depicted that the relationship between CTE predictor variable and the college readiness dependent variable was 0.416, accounting for 17.3% of the variance accounted for by the prediction of CR by CTE (Patton, 2016). The *R* coefficient also represented a medium effect size (Cohen, 1988). However, the predictor variable CTE demonstrated a negative relationship with the CR variable. *B* was -0.395 (Table 9). Consequently, schools with high percentages of CTE enrollment were less likely to achieve a high percentage of college ready graduates.

Table 8

ANOVA Results for CTE Predicting Percentage of CR Graduates

	ANOVA				
	Sum of Squares	*df*	Mean Square	*F*	*p*
Regression	.113	1	.113	8.172	.007
Residual	.541	39	.014		
Total	.655	40			

Table 9

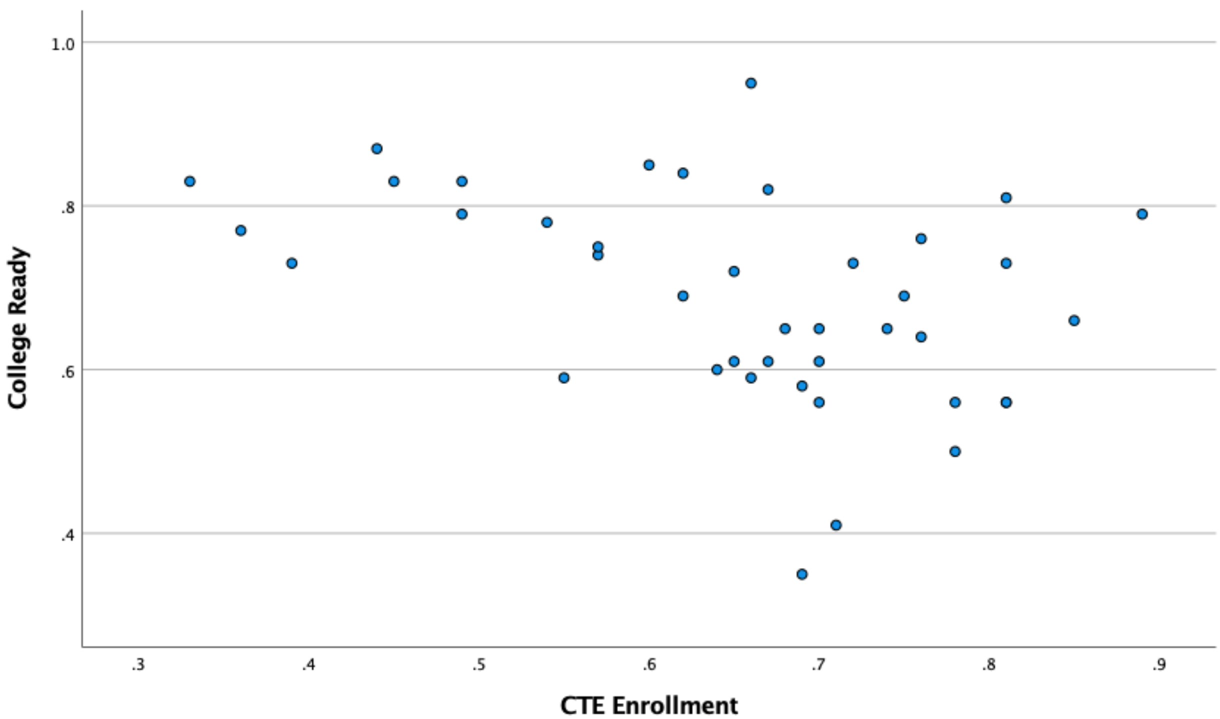
Variables Included for CTE Enrollment Predicting CR Graduates

	Coefficients				
	Unstandardized		Standardized		
	B	*SE*	β	*t*	*p*
(Constant)	.947	.092		10.278	< .0001
CTE	-.395	.138	-.416	-2.859	.007

The regression model was statistically significant, and the predictor variable (CTE) made a statistically significant contribution to the model for the dependent variable (CR). Therefore, the null hypothesis was rejected. The alternative hypothesis was accepted as follows: The percentage of students enrolled in CTE is a statistically significant predictor of the percentage of CR graduates in Texas high schools. Research Question 3 explored the relationship between CTE enrollment and career and military readiness.

Figure 9

Scatterplot for CTE Predicting College-Ready Graduates



Results for Research Question 3

This research question was: How does the percentage of CTE students enrolled predict the percentage of career or military ready graduates? To answer this research question, the null hypothesis was tested using linear regression. The alternative and null hypotheses were:

$H3_A$: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of CMR graduates.

$H3_0$: The percentage of CTE students enrolled is not a statistically significant predictor of the percentage of CMR graduates.

The regression model revealed with F (1, 39) = .003, $p < .0001$ (Table 10). The R coefficient depicted that the relationship between CTE predictor variable and the college readiness dependent variable was 0.776, accounting for 60.2% of the variance accounted for by the prediction of CMR by CTE (Patton, 2016). The *R* coefficient also represented a large effect size (Cohen, 1988). The predictor variable of percentage of enrollment in CTE demonstrated a positive relationship with the percentage of CMR graduates variable with a *B* of 0.472 (Table 11).

Table 10

ANOVA Results for CTE predicting of CMR

	ANOVA				
	Sum of Squares	*df*	Mean Square	*F*	*p*
Regression	.162	1	.162	59.109	< .0001
Residual	.107	39	.003		
Total	.269	40			

Table 11

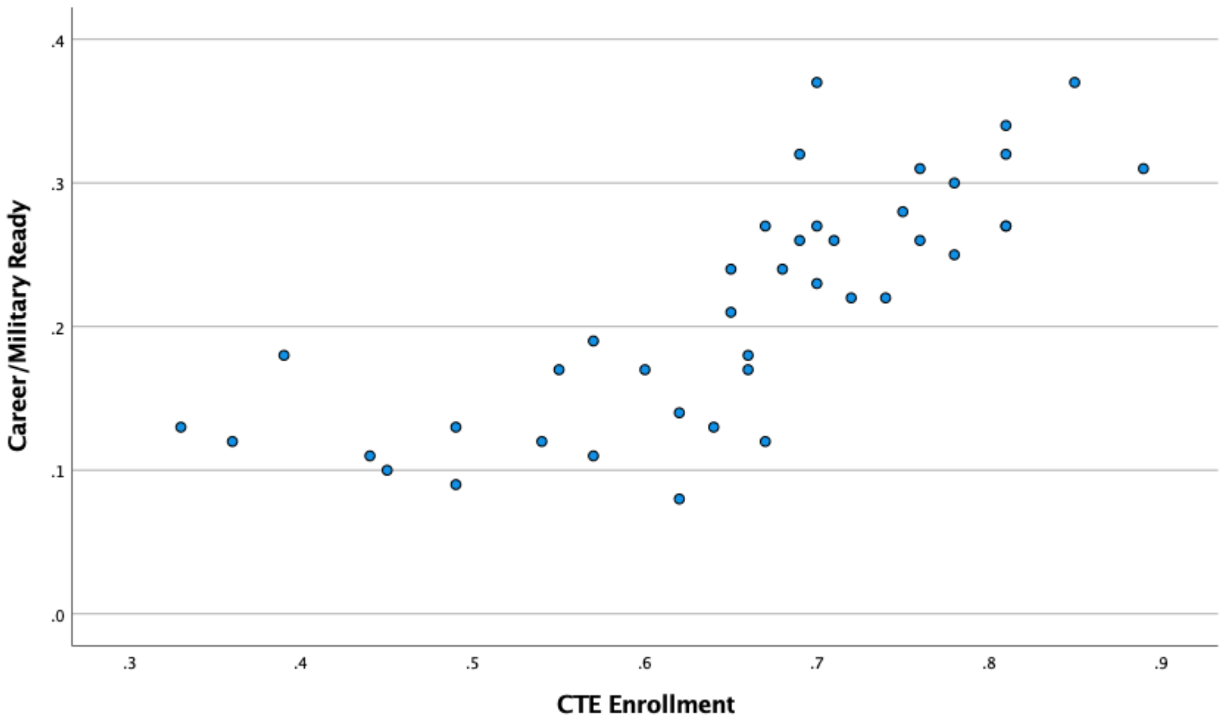
Variables Included for CTE Enrollment Predicting CR Graduates

	Coefficients				
	Unstandardized		Standardized		
	B	*SE*	β	*t*	*p*
(Constant)	-.093	.041		-2.272	.029
CTE	.472	.061	.776	7.688	.000

The regression model was statistically significant, and the predictor variable (CTE) made a statistically significant contribution to the model for the dependent variable (CMR). Therefore, the null hypothesis was rejected. The alternative hypothesis was accepted as follows: The percentage of CTE students enrolled is a statistically significant predictor of the percentage of CMR graduates. The results suggest students in CTE are more likely to achieve career/military readiness.

Figure 10

Scatterplot for CTE Predicting Career or Military Ready Graduates



Summary of the Chapter

The purpose of this quantitative archival study was to determine how the percentage of CTE enrollment predicts the percentage of CCMR, CR, and CMR graduates as defined by the TEA. This study indicated that percentage of CTE enrollment is a statistically significant predictor of the percentages of CR and CMR graduates from Texas high schools but not of the percentage of CCMR graduates of Texas high schools. The percentage of CTE enrollment was a negative predictor for CR, but the percentage of CTE enrollment was a positive predictor of the percentage of CMR graduates in the sample of 41 Texas high schools.

Chapter 5 includes a summary of the research and discussion about the implications of the research. There will also be a discussion of the research findings and recommendations for further research, and conclusion. Chapter 5 also includes the limitation of the research.

Chapter 5: Discussion, Conclusions, and Implications

The purpose of this quantitative archival study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of college, career, and military readiness (CCMR) student outcomes as defined by the TEA. As of 2018, only 65% of high school graduates are meeting CCMR criteria as outlined by TEA. The three research questions in this study aimed at providing K-12 leadership information on how CTE programming can be used to improve CCMR outcomes for high school graduates.

The research questions that guided this study focused on determining the relationship between CTE enrollment and CCMR outcomes among graduates at a sample of 41 Texas public high schools. The research questions included:

RQ1: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas?

RQ2: How does the percentage of CTE students enrolled predict the percentage of college-ready graduates?

RQ3: How does the percentage of CTE students enrolled predict the percentage of career or military ready graduates?

To answer the three research questions, three simple linear regressions were conducted. The three models' summaries were utilized to explain the percentages of variance accounted for by CTE as a predictor of each of the three dependent variables of CCMR, college readiness, and career and military readiness.

Discussion of Findings

Findings from this study indicated that the percentage of CTE enrollment was not a significant predictor of the percentage of CCMR graduates which is made up of both college ready and career/military ready graduates. The percentage of CTE enrollment was a negative predictor of the percentage of college ready graduates. Furthermore, the percentage of CTE enrollment was a positive predictor of the percentage of career/military ready graduates.

Findings for Research Question 1

The first research question examined how the percentage of CTE enrollment predicted the percentage of CCMR among high school graduates in the sample of 41 high schools. The research question was analyzed using a simple linear regression. Based on the literature review and the state's recent focus on CTE programming for ensuring high school graduates have college and career readiness (Plasman et al., 2017), it was hypothesized that the percentage of students enrolled in CTE would be a statistically significant predictor of CCMR in high school graduates. However, the finding indicates that the percentage of CTE enrollment is not a statistically significantly predictor of the percentage of CCMR graduates. Higher CTE enrollment percentages did not predict higher percentages of CCMR. It is important to note that that the first analysis of CCMR encompasses both college ready graduates and career/military graduates. The second and third analyses consider college ready graduation and career/military ready graduates separately.

This finding that the percentage of CTE enrollment has a negative association with CCMR graduates is not consistent with the literature. The literature indicated that through CTE, educational leaders have the tools and resources to provide maximum opportunities for students to be college and career ready and to be successful in today's workforce (Saeger, 2017). Goldstein (2017) stated that with the increased focus on CCMR for K-12 students, CTE is at the forefront of attention of educational leaders. Due to the increased focus, legislation continues to be written to promote growth in CTE programming participation for the purpose of increasing college and career readiness outcomes for high school graduates (Alder-Greene, 2019; TEA, 2019e; Ujifusa, 2018). The finding of the first research question indicates that an increase in CTE enrollment alone will not result in an increased percentage of CCMR among public high school graduates.

It is important to note that since the graduating class of 2018, which was the cohort used in this study, TEA made significant changes to CTE career clusters and programs of study has outlined in Chapter 2 (TEA, 2019e). Additionally, federal legislation, specifically Perkins V, has also been implemented since the graduating class of 2018. Perkins V requires all school districts receiving federal funds to regularly conduct a comprehensive local needs assessment to identify areas for improving CTE student achievement and programming. Improving the percentage of CCMR graduates cannot be done solely by increasing the percentage of CTE students enrolled in a program.

Findings for Research Question 2

The second research question examined how the percentage of CTE enrollment predicted college ready graduates in Texas. The research question was analyzed using a simple linear regression. Based on the literature review it was hypothesized that the percentage of students enrolled in CTE would be a statistically significant predictor of CCMR graduates in Texas.

In this study, the percentage of CTE enrollment had a negative association with the percentage of college readiness outcomes. The finding for the second research question is not consistent with the literature. Although 75% of school district's CTE programs offered students the ability to earn both high school and college credit simultaneously (Gray et al., 2018), a negative association exists between the percentage of CTE enrollment and college readiness. Although CTE programs of study embed opportunities for students to earn college credit, the finding did not indicate a positive association between the percentage of CTE enrollment and college readiness.

Educational leaders have emphasized the importance CCMR and CTE for public schools because high school students who graduate with college readiness are more likely to complete a college degree (Perna & Jones, 2013). Consequently, in recent years, legislators charged schools to use CTE to increase academic rigor, integrate academic and technical education, and align high school curriculum with postsecondary programs (Brand et al., 2013; "Carl. D. Perkin," 2006; Friedel, 2011). However, the finding of the second research question indicates that an increased percentage of CTE enrollment predicts a decrease in percentage of college readiness among graduates at a Texas public high school.

Findings for Research Question 3

The third research question examined how the percentage of CTE enrollment predicted career and military ready graduates in Texas. The research question was analyzed using a simple linear regression. Based on the literature review it was hypothesized that the percentage of students enrolled in CTE would be a statistically significant predictor of CCMR graduates in Texas.

The finding of the third research question is consistent with the state-wide go. The percentage of CTE enrollment is a positive predictor of the percentage of career/military readiness. In 2019, TEA restructured CTE career clusters and programs of study. The purpose of the restructure was to align CTE programs of study with high demand and high wage employment opportunities to ensure high school graduates are prepared for careers (TEA, 2019e). Furthermore, TEA has expanded the list of industry-based certifications students can earn while enrolled in a CTE. The industry-based certification allows students to earn official credentials for the skills they have acquired in a CTE program of study and are an indicator of career/military readiness in the state's current accountability system. The expanded list reinforces career readiness among high school graduates because a student graduating from high school with an industry-based certification is more prepared to enter the workforce successfully because of their credential (Perna & Jones, 2013; Pulliam & Bartek, 2017).

Limitations

There were several limitations to this study, some of which were mentioned in Chapter 3. Limitations influence the generalizability of a study and represent factors a researcher cannot control (Simon, 2011). A limitation of this study was the mobility rate of each campus during the 2017-2018 school year. The average mobility rate in 2018 among the sample in this study was 9% (TEA, 2018a). Mobility could have increased the potential of inaccurately reporting a student's achievement in one of the CCMR indicators. Another limitation of this study was the overall CTE program quality, which might have varied from campus to campus based on factors, such as teacher professional development and community and industry partnerships. Additionally, the sample contained only 41 high schools, of which were among the largest high schools in term of total student enrollment, and it is likely the findings do not generalize to all high schools in the state of Texas. Further, the state of Texas has unique statewide laws and regulations affecting its public schools, causing the findings not to generalize to other states that operate their public school based on their unique laws and regulations.

Limitations also exist within the design of this study. This study was a quantitative study and did not utilize qualitative data. This study does not take into account CTE student's perception of college and career readiness. Another limitation is that the percentage of CTE enrollment was the only predictor variable in this study. It is possible other variables may predict

CCMR student outcomes. This study did not take into consideration other student achievement data from the sample including a campus' respective graduation rate. Furthermore, the sample included school across the state of Texas, primarily in urban areas. The results of this study could vary if the sample included schools in rural areas.

Implications

The findings of the study indicate that the percentage of CTE enrollment negatively predict the percentage of CCMR and college ready graduates, but positively predict the percentage of career/military ready graduates. The first implication this study has is that school leaders need to review programs targeted for supporting college and career readiness, and not solely focus on maximizing CTE enrollment.

The second implication this study has is that school leaders must seek to understand what aspect of CTE programming is causing the percentage of CTE enrollment to negatively predict the percentage of CCMR and college ready graduates. This study implies a disconnect between college readiness and career/military readiness. Understanding where the disconnect is occurring may allow for improved college and career readiness outcomes for schools with a high percentage of CTE enrollment.

The third implication this study has is that school leaders seeking to produce a higher percentage of career/military ready graduates should foster growth in the percentage of CTE enrollment on their respective campus. The recent restructure of CTE programs of study aligned each program of study with industry-based certification opportunities for CTE students (TEA, 2019e). If a campus increases the percentage of students earning an industry-based certification, their respective percentage of career/military ready graduates will increase.

The final implication is that legislatures should likely review how the current accountability system for Texas public schools are accounting for college and career readiness. It is possible that the results for the first research question were not statistically significant because the CCMR encompasses both college readiness and career/military readiness, which were both significant. Rather than having one summative score, CCMR, perhaps a college readiness and career/military readiness standard would be most helpful in getting a true understanding of a high school graduate's postsecondary readiness.

Recommendations

Recommendations for Practical Application

The first recommendation for practical application is to add supports for CTE programming. School leaders could implement a comprehensive school counseling program. This is a recommendation because of the finding of research question one: How does the percentage of students enrolled in CTE predict the percentage of CCMR graduates in Texas? The finding indicated the percentage of CTE enrollment negatively predicts the percentage of CCMR graduates.

Perry and Wallace (2012) found that even if students are prepared for college to gain postsecondary credentials, they are often faced with dim prospects when entering the workforce due to earning a degree in a field that is not in high demand or high wage. Although CTE programs are designed to prepare students for careers, research indicates some students in CTE are unsure of the career opportunities within their respective programs of study (DeFeo, 2015). The results of such research indicate the importance of the theoretical framework that ground this study, Krumboltz's learning theory of career counseling (LTCC) and Hirschi's whole-life career management.

LTCC focuses on personal characteristics, beliefs, values, the learning of skills, and work habits that will in turn provide satisfaction to an individual's life in an evolving work environment. Four specific needs are outlined in LTCC. The fourth specific need states that career counselors should play a major role in dealing with all career problems. Hirschi (2020) created a counseling intervention framework for whole-life career management which consists of four stages. The four stages of the framework include (1) clarifying goals across work and nonwork roles, (2) mapping resources and barriers related to goal attainment, (3) developing action strategies for goal attainment, and (4) monitoring and adapting goal pursuits.

School counselors are perhaps the most critical professionals in a school building for ensuring that students develop a meaningful plan for postsecondary success. They are often charged in helping students navigate through postsecondary option by creating strategic college and career readiness initiatives for students (Dahir & Stone, 2012). Regardless of the quality of CTE programming, programs of study, or available funding, successful postsecondary planning and readiness cannot be achieved without the implementation of a comprehensive counseling program. The two theories that grounded this study can also assist schools in not only getting students connected with CTE coursework they are interested in, but also ensuring that their career of choice will lead to whole-life satisfaction by utilizing a battery of interest and strengths inventories, and approaching the work of counseling through the whole-child, rather than purely academia.

The second recommendation for practical application is that school leaders implement opportunities throughout the school year for core academic content teachers and CTE teachers to meet to discuss specific academic gaps and to collaborate on how CTE teachers can help close those identified gaps. This is a recommendation because of the finding of research question two:

How does the percentage of CTE students enrolled predict the percentage of college-ready graduates? The finding indicated that the percentage of CTE enrollment negatively predicts the percentage of college ready graduates.

CTE is in a position to be the solution of preparing all students for college and career-readiness through further development of comprehensive curriculum aligned with core academics, employability skills, and technical, job specific skills" (Saeger, 2017, p. 6). The finding in research question two indicate that the higher the percentage of CTE students enrolled at a campus, the lower the percentage of college ready students. This finding may be an indication that the academic integration of core academics needs improvement in CTE classes. The implementation of cross-content teacher planning may provide the necessary improvements needed.

Recommendation for Future Research

While the results of this research study may be used to identify whether the percentage of CTE enrollment predicts the percentage of CCMR graduates, the results cannot be generalized. For school leadership to better understand how CTE enrollment predicts CCMR outcomes, further research is needed.

The first recommendation for future research is to conduct this research study with a larger sample size. The sample size for this study was 41 Texas public high schools. All of the high schools were similar in size and demographics and represent the largest high schools in Texas, in terms of enrollment. To generalize the results of how CTE predicts CCMR outcomes, the study would need to be conducted state-wide to include all Texas public high school campuses. A future study could utilize data other than quantitative data collected through the state's accountability reports. This study used percentages, but a future study could use real numbers. Furthermore, variables other than the percentage of CTE enrollment could be included a future study to determine how other variables can predict the percentage of CCMR graduates. A study of this scope would allow for a more generalization of results and a better understanding of variables that positively predict the percentage of CCMR graduates.

The second recommendation for future research is to conduct a qualitative study on student's perception of their college and career readiness after the implementation of the new Programs of Study in Texas and Perkins V. Approximately 39% of students at a technical high school claimed to know "little" or "nothing" about careers related to their CTE course, and a staggering 72% of students enrolled at traditional comprehensive high schools knew "little" or "nothing" about careers related to their CTE course (DeFeo, 2015). Conducting a similar study after the recent CTE changes, could indicate to school leaders whether or not the changes are qualitatively effective.

The third recommendation for future research is to conduct this same research study in other states. Texas has unique statewide laws and regulations affecting its public schools, causing the findings not to generalize to other states that operate their public school based on their unique laws and regulations. Results from this recommended study could be meaningful to school leaders by providing insight on what state's policies and programming, if any, are proving to be most effective.

Conclusions

The purpose of this quantitative archival study was to determine how the percentage of career and technical education (CTE) enrollment predicts the percentage of college, career, and military readiness (CCMR) student outcomes as defined by the Texas Education Agency (TEA). The study's findings indicated that as CTE enrollment increases, CCMR decreases and as CTE enrollment increases, college readiness decreases. However, as CTE enrollment increases, career and military readiness increases. The results can be used to understand areas for improvement in CTE programming and to give K-12 leaders an idea of where efforts to increase college and career readiness should be focused. The results of this study indicate the importance of a comprehensive counseling program in Texas public schools and high quality CTE programming.

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Appendix A: 2018 Campus Comparison Group

2018 Campus Comparison Group
ALLEN H S (043901001) - ALLEN ISD
Campus Type: High School
Sorted by District Name

	Campus Name	District Name	Grade Span	Number of Students	% Econ Disadv	% EL	Mobility Rate	% Early College HS	% Special Ed
	ALLEN H S (043901001)	**ALLEN ISD**	**09-12**	**4,884**	**12.6**	**2.4**	**6.0**	**0.0**	**8.9**
1	MARTIN H S (220901005)	ARLINGTON ISD	09-12	3,451	25.2	2.8	9.7	0.0	7.0
2	BOWIE H S (227901013)	AUSTIN ISD	09-12	2,867	10.4	1.3	6.1	0.0	8.2
3	CLEAR SPRINGS H S (084910009)	CLEAR CREEK ISD	09-12	2,715	15.4	2.9	8.0	0.0	9.3
4	SMITHSON VALLEY H S (046902002)	COMAL ISD	09-12	2,759	13.0	1.2	10.0	0.2	8.2
5	COLLEGE PARK H S (170902014)	CONROE ISD	09-12	3,092	16.8	4.6	9.3	0.0	4.4
6	OAK RIDGE H S (170902005)	CONROE ISD	09-12	4,400	24.9	3.3	12.1	0.0	6.2
7	THE WOODLANDS H S (170902003)	CONROE ISD	09-12	4,331	5.3	3.6	6.3	0.0	4.4
8	COPPELL H S (057922001)	COPPELL ISD	09-12	3,505	8.0	2.7	5.9	0.0	5.2
9	CY-FAIR H S (101907002)	CYPRESS-FAIRBANKS ISD	09-12	3,525	33.7	3.8	8.7	0.0	6.8
10	CYPRESS RANCH H S (101907012)	CYPRESS-FAIRBANKS ISD	09-12	3,114	14.8	2.1	6.1	0.0	5.3
11	CYPRESS WOODS H S (101907011)	CYPRESS-FAIRBANKS ISD	09-12	3,546	18.9	1.7	6.3	0.0	6.7
12	DEER PARK HS (101908001)	DEER PARK ISD	09-12	4,075	41.3	5.3	11.5	0.0	10.4
13	ODESSA H S (068901002)	ECTOR COUNTY ISD	09-12	3,773	40.6	14.8	18.3	0.0	8.6
14	PERMIAN H S (068901003)	ECTOR COUNTY ISD	09-12	3,773	30.6	7.0	18.5	0.0	7.7
15	RIDGE POINT H S (079907016)	FORT BEND ISD	09-12	2,707	18.7	5.0	6.9	0.0	5.2
16	ATASCOCITA H S (101913008)	HUMBLE ISD	09-12	3,624	24.8	1.8	10.2	0.0	7.5
17	CINCO RANCH H S (101914007)	KATY ISD	09-12	3,142	24.1	6.0	7.1	0.0	6.1
18	KATY H S (101914001)	KATY ISD	09-12	3,398	29.7	4.3	13.1	0.0	10.3
19	SEVEN LAKES H S (101914010)	KATY ISD	09-12	3,525	10.3	4.8	6.0	0.0	4.9
20	TAYLOR H S (101914002)	KATY ISD	09-12	2,939	23.2	5.2	9.5	0.0	6.9
21	TOMPKINS H S (101914012)	KATY ISD	09-12	3,375	6.9	2.2	5.2	0.0	5.9
22	KELLER H S (220907001)	KELLER ISD	09-12	2,994	4.9	1.9	6.1	0.0	4.5
23	TIMBER CREEK H S (220907005)	KELLER ISD	09-12	3,237	20.2	5.5	8.2	0.0	8.8
24	KLEIN COLLINS H S (101915004)	KLEIN ISD	09-12	3,614	28.7	3.6	12.3	0.0	9.1
25	KLEIN H S (101915001)	KLEIN ISD	09-12	3,665	29.6	5.0	12.2	0.0	8.7
26	KLEIN OAK H S (101915003)	KLEIN ISD	09-12	3,921	27.7	4.2	11.5	0.0	8.1
27	LAKE TRAVIS H S (227913001)	LAKE TRAVIS ISD	09-12	3,079	9.5	2.6	7.3	0.0	7.1
28	FLOWER MOUND H S (061902010)	LEWISVILLE ISD	09-12	3,616	3.2	1.4	6.4	0.0	7.9
29	HEBRON H S (061902008)	LEWISVILLE ISD	09-12	3,583	19.3	5.8	10.3	0.0	8.0
30	MARCUS H S (061902002)	LEWISVILLE ISD	09-12	3,271	6.0	0.8	7.4	0.0	9.1
31	MCKINNEY BOYD H S (043907007)	MCKINNEY ISD	09-12	2,823	16.6	3.6	7.2	0.0	6.9
32	MCKINNEY H S (043907002)	MCKINNEY ISD	09-12	2,957	32.7	5.2	11.0	0.0	9.1
33	JOHNSON H S (015910014)	NORTH EAST ISD	09-12	3,075	15.5	2.1	9.3	0.0	6.6
34	REAGAN H S (015910007)	NORTH EAST ISD	09-12	3,513	12.1	1.9	7.2	0.0	6.3
35	O'CONNOR H S (015915016)	NORTHSIDE ISD	09-12	3,327	19.7	2.4	8.5	0.0	8.6
36	PEARLAND H S (020908001)	PEARLAND ISD	09-12	3,048	25.7	2.5	9.8	0.0	10.1
37	PLANO EAST SR H S (043910006)	PLANO ISD	09-12	3,025	26.5	4.1	8.5	0.0	7.8
38	PROSPER H S (043912001)	PROSPER ISD	09-12	2,971	5.5	1.0	7.1	0.0	6.3
39	ROUND ROCK H S (246909001)	ROUND ROCK ISD	09-12	3,358	12.5	3.3	9.0	0.0	7.2
40	WESTWOOD H S (246909003)	ROUND ROCK ISD	09-12	2,742	11.9	4.3	6.4	0.0	5.0
	Comparison Group Average			**3,336**	**19.1**	**3.7**	**9.0**	**0.0**	**7.3**

Appendix B: IRB Approval Letter

ABILENE CHRISTIAN UNIVERSITY
Educating Students for Christian Service and Leadership Throughout the World

Office of Research and Sponsored Programs
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103
325-674-2885

October 13, 2020

Daniel Soliz
Department of Education
Abilene Christian University

Dear Daniel,

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled "Does Career and Technical Education Enrollment Predict College and Career Readiness?",

(IRB# 20-165)is exempt from review under Federal Policy for the Protection of Human Subjects as:

☐ Non-research, and
☑ Non-human research

Based on:
* The research does not involve obtaining information about living individuals [45 CFR 46.102(f)].

If at any time the details of this project change, please resubmit to the IRB so the committee can determine whether or not the exempt status is still applicable.

I wish you well with your work.

Sincerely,

Megan Roth

Megan Roth, Ph.D.
Director of Research and Sponsored Programs