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## The Effects of Career and Technical Education Classes and Traditional Academic Classes on High School Academic Achievement, ACT Scores, and Graduation Rates

Tony L. Horton

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The effects of career and technical education classes and traditional academic classes on high school academic achievement, ACT scores, and graduation rates

By

Tony L. Horton

A Dissertation  
Submitted to the Faculty of  
Mississippi State University  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy  
in Elementary, Middle, and Secondary Education Administration  
in the Department of Educational Leadership

Mississippi State, Mississippi

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2019

The effects of career and technical education classes and traditional academic classes on high school academic achievement, ACT scores, and graduation rates

By

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Candidate for Degree of Doctor of Philosophy

The purpose of this study was to investigate the effects of completing career and technical education classes (CTE) during high school. In particular, the study sought to determine whether there were differences in academic scores of students who took CTE classes and those who took traditional high school classes. More specifically, the goals of the study were to determine if there were statistically significant differences in mean scores on the English II exam, Algebra I exam, ACT assessment, and college-going rates between those students who participated in CTE classes and those who took traditional high school classes.

A quantitative research design was selected for conducting the research study. The one-way analysis of variance (ANOVA) was used as the primary statistical computation for the data analysis. The ANOVA results for differences in mean scores of the ACT assessment for students who took CTE classes and students who took traditional classes were not found statistically significant. The ANOVA results for differences in mean scores of the Algebra I exam and English II exam for students who took CTE classes and students who took traditional classes were found statistically significant. The students who took CTE classes scored slightly higher on the Algebra I and English II exams than students who took traditional classes. A Chi-squared test

of independence was utilized to examine the college-going rate of students who took CTE classes and students who took traditional classes. There were no statistically significant differences between the mean scores for students who took CTE classes and traditional classes and students who took traditional classes in terms of participation in college after high school.

## DEDICATION

This research study is dedicated to my heavenly Father, Jesus Christ. He alone deserves the credit for giving me patience, determination, and dedication to accomplish this awesome work. To my wife and son, Sherron S. and Kagan L. Horton, you have inspired me by your love, diligence, and inspiration. Thank you for your sacrifice, patience, and understanding.

This dissertation is also dedicated to my parents, Ronald and Ella Mae Horton, and my brother, TaNeal (Bud) Horton. Thank you for always pushing, supporting, and believing in me. To my grandparents, Charlie B. and Ora Mae Harris, thank you for teaching, training, and supporting me. Thanks to my late grandmother, Annie P. Horton (Granny), for keeping me fed during summer months! To my late great-grandmother Mildred Harris, thanks for the training and exemplifying toughness and never complaining. To the greatest pastor, Superintendent Glenn L. Huggins, thanks for praying, supporting, encouraging, believing, teaching, and preaching to our family. To my church family at Trinity Outreach Church, Tupelo, MS, thank you for praying, supporting, and believing in me.

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## CHAPTER I

### INTRODUCTION

The national dialogue on high school change has concentrated on the role of career and technical education (CTE) in preparing students to succeed after high school and in the workforce (Duncan & Zients, 2014; Visher & Stern, 2015). In addition, educators are depending on initiatives such as career academies that link CTE, extensive and rigorous classes, and hands-on experiences to increase students' competence levels of education for their future (Visher & Stern, 2015). Numerous research studies indicated that CTE initiatives provide avenues into programs after high school and focus on connecting degrees and credentials to jobs in the workforce (Visher & Stern, 2015). CTE can provide rigorous academic classes and hands-on employment skills that students need for success (Hoachlander & Steinhauser, 2015; Visher & Stern, 2015).

Visher and Stern (2015) suggested that educators continue to search diligently to explore strategies and initiatives that link CTE and academic and employment skills for students to be successful. Other researchers noted that finding strategies has been difficult because of a lack of resources and a lack of evidence (Stern, Dayton, & Raby 2010). Nonetheless, many of these strategies including career academies, programs of study, career pathways, and the integration of CTE with academic courses have shown positive effects (Stern et al., 2010).

While student achievement remains a dilemma, studies show that CTE students are achieving at a higher level than in the past 12 years (Bottoms & Presson, 2000). Schools have

raised the rigor in the curriculum and instructional standards in CTE classes (Bottoms & Presson, 2000; Duncan, 2011). *The High Schools that Work Initiative* is one example of how working closely with states, districts, and schools to incorporate strategies has helped improve academic and technical education achievement (Bottoms & Presson, 2000; Hanover Research, 2014a).

### **Statement of the Problem**

Education in the United States faces a dilemma in regards to students completing and performing at the high school and postsecondary levels. According to Hyslop and Imperatore (2013), students are not prepared after they complete high school, or they are dropping out before they graduate. CTE integrates academic skills into a real-world context (Jacob, 2017). Jacob (2017) suggested CTE motivates students to stay in school more frequently and become more engaged (Dicksteen, 2012; Parmley & Smith, 2016). While completion of high school represents a major accomplishment in an individual's schooling and advancement, minority groups have only a 50% chance of completing high school with a diploma (Dicksteen, 2012). Further, Dicksteen (2012) suggested student graduation is jeopardized when students live in high poverty.

According to the United States Department of Education's National Center for Education Statistics, in 2012, students between the ages of 16 and 21 who lived in households classified as high poverty were not enrolled in school and had not earned a high school diploma or General Education Development (GED) certificate (Dicksteen, 2012). In addition, 7% of students ages 16 through 19 (1.2 million students) were not enrolled in school or working in 2017 (Kids Count, 2018). Students who enroll in postsecondary education are more likely to need assistance and are at high-risk of dropping out of school (Hyslop & Imperatore, 2013; Jerald, 2006). In addition, factors such as high unemployment increase in financial demands, and family responsibilities

encumber learning (Hyslop & Imperatore, 2013). According to Dicksteen (2012), the United States dropout rate was 8%, with African American and Hispanics dropping out at higher rates than their Caucasian classmates. Charter, virtual, and alternative schools accounted for more than half of the high schools in the United States that graduate 67% or less of their students in four years (Gewertz, 2016). Specifically, data showed charter, virtual, and alternative schools accounted for 52% of students who did not graduate from high school within four years and vocational and special education schools made up 7% of students who did not graduate high school (Gewertz, 2016). Regular high schools made up 41% of the schools that did not pass the 67% graduation rate in the 2013-2014 school year (Atwel, Balfanz, Bridgeland, & DePaoli, 2016). Research studies reported students who graduate from high school on time had more career opportunities and were more likely to continue on to postsecondary education (Annie E. Casey Foundation, 2017; Crosby & Moncarz, 2006). In the 2014 and 2015 school year, 17% of students did not graduate from high school on time, with more than 20% of those being minority students (Annie E. Casey Foundation, 2017; Atwel et al., 2016). In addition, according to the National Center for Education Statistics (2018), 16% of students in the United States did not graduate within four years with a regular high school diploma. In 2016, 18% of students living in Mississippi did not graduate within four years with a regular high school diploma (National Center for Education Statistics, 2018).

Academic achievement among high school students has continued to be a major concern for those who graduate and apply for college admission (American College Testing, 2017). For example, in 2017, the American College Test (ACT), used to determine admission of students into colleges or universities, had a national average composite score of 21 (ACT, 2017).

Mississippi ranked well below the national average in 2017 with an average score of 18.6 (ACT, 2017).

College-going rate refers to the yearly percentage of high school completers who enroll in 2-4 year colleges immediately following high school (National Center for Education Statistics, 2018). According to the National Center for Education Statistics (2018), of the 3.1 million high school completers in 2016, 70% enrolled in college by October. The enrollment gap narrowed between low and high-income students by 14% from 2000 to 2016. The enrollment gap between low and middle-income students was 12% in 2000. The overall college-enrollment rate increased by only seven percentage points from 2000 to 2016 (National Center for Education Statistics, 2018; Wong, 2016).

### **Purpose of the Study**

The purpose of this study was to investigate the effects of completing CTE classes during high school. In particular, the study sought to determine whether there were differences in academic scores of students who took CTE classes and those who took traditional classes. More specifically, the first goal of the study was to determine if there were differences in mean scores on the English II exam between those students who took CTE classes and those who took traditional high school classes. The second goal of the study was to investigate whether there were differences in mean scores on the Algebra 1 exam between those students who took CTE classes and those who took traditional high school classes. The third goal of the study was to investigate whether there were differences in mean scores on the ACT assessment between those students who took CTE classes and those who took traditional high school classes. Lastly, the study investigated if there were differences in the college-going rate of students who took CTE classes and those who took traditional high school classes.



## **Research Questions**

The following research questions guided the study. The study focused on the effects of CTE classes.

1. Are there statistically significant differences in mean scores on the English II exam among those students who took CTE classes and those who took traditional high school classes?
2. Are there statistically significant differences in mean scores on the Algebra I exam among those students who took CTE classes and those who took traditional high school classes?
3. Are there statistically significant differences in mean scores on the ACT among those students who took CTE classes and those who took traditional high school classes?
4. Are there statistically significant differences in the college-going rates after completing high school among those students who took CTE classes and those who took traditional high school classes?

## **Significance of the Study**

This study is significant in that the results of the study may be used to help district leaders (i.e., superintendents, principals, coordinators, and teachers) in making decisions related to offering CTE classes. The findings from the study add to the literature on CTE and selected student outcomes.

## **Delimitations**

The criteria for participants in this study included students who took CTE classes and those students who took traditional academic classes for two years in a selected high school during the academic years of 2015-2016 and 2016-2017. One group consisted of students who took traditional classes and the other group consisted of those students who took at least one CTE class. The dependent variables included English II exam scores, Algebra I exam scores, and ACT scores. The college-going rates were used for those students who took CTE classes and traditional classes during the 2015-2016 and 2016-2017 academic years and entered college during the 2016-17 and 2017-18 academic years.

## **Definitions**

The following definitions are presented for further explanation. The terms are used throughout the study.

1. The English II exam measures a student's knowledge of vocabulary, reading ability, comprehension, writing, and grammar (Mississippi Department of Education, 2018).
2. The Algebra I exam measures a student's knowledge of and skill in the mathematics framework (Mississippi Department of Education, 2018).
3. The ACT is a standardized assessment for high school achievement and college admissions. Skills tested are in English, math, reading, and science (Mississippi Department of Education, 2018).
4. College-going rate refers to the yearly percentage of high school completers who enroll in 2 or 4 year college immediately following high school (National Education for Students Statistics, 2018).

5. CTE classes refer to the make-up of educational programs that specialize in skilled trades, applied sciences, modern technologies, and career preparation (Association for Career and Technical Education, 2014).
6. Career academies represent tested models for improving achievement in preparing students for college and careers (Stern, Dayton, & Raby, 2010).
7. Traditional academic classes generally stress basic educational methods with teachers expecting mastery of core subjects of math, reading, writing, science, and social studies (Huson, 2016).

### **Conceptual Framework**

The following provides an illustration of the conceptual framework of the study.

Components of the study included two groups of students: students who completed CTE classes and students who completed traditional high school classes. Three outcome variables (English II exam scores, Algebra I exam scores, and ACT scores) were used to determine if there were differences in the mean scores between the two groups of students. In addition, college-going rates were compared for the two groups (see Figure 1).

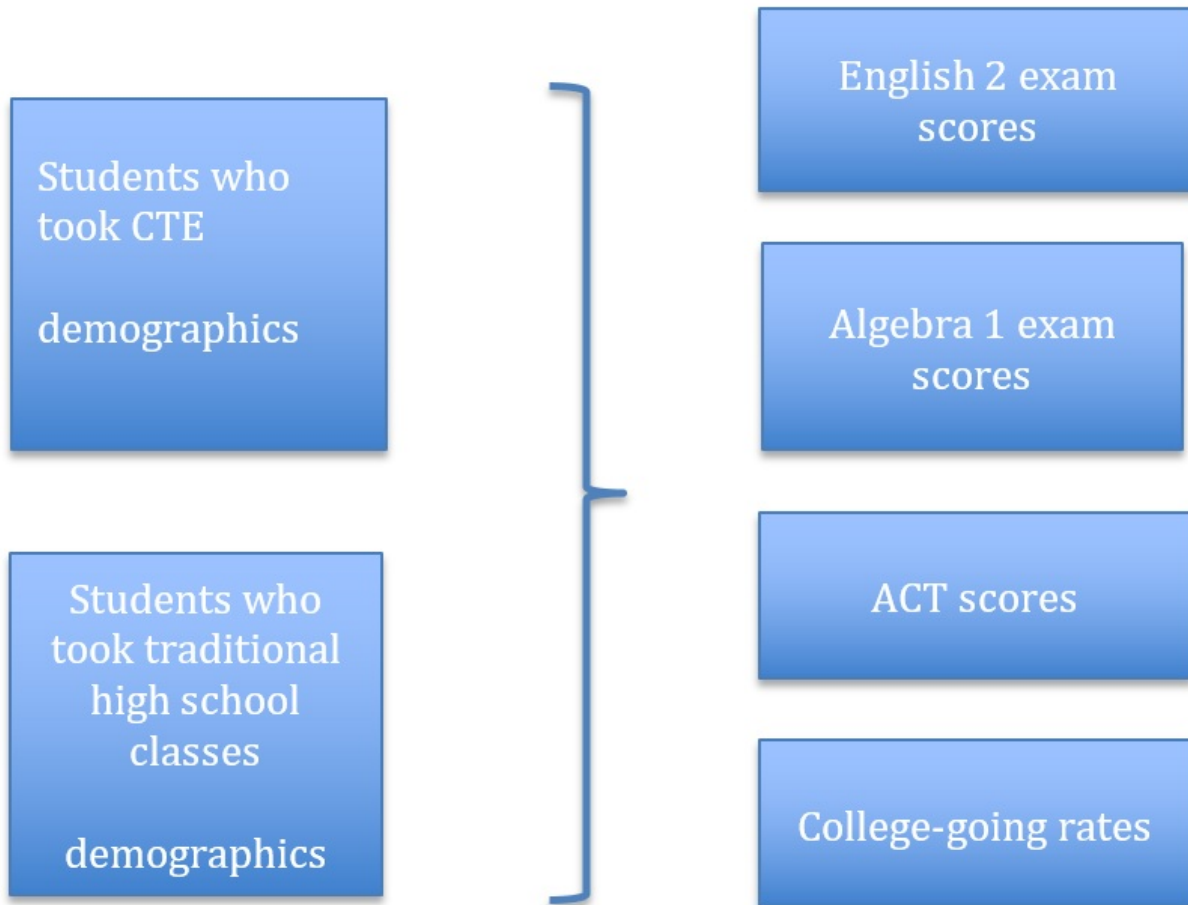


Figure 1. Conceptual framework of the Study.

### Theoretical Framework

Experiential learning theory is the ideal framework to help explain the performance of students who took CTE classes for this study. Experiential learning is a learning cycle driven by integrating action, experience, reflection, and concept (Katula & Threnhauser, 1999; Kolb & Kolb, 2017). Experiential learning theory is learning through experiences and reflective observation (Kolb & Kolb, 2017). According to Katula and Threnhauser (1999), experiential learning is a process experienced beyond the traditional classroom. This process is utilized to add value to the personal and intellectual growth of the student (Katula & Threnhauser, 1999).

CTE involves experiential learning and the student's approach to learning with the intention to learn and with an understanding of actively participating (Cherry, 2019). Experiential learning involves combining hands-on experience with academic studies (Cherry, 2019). Researchers suggested experiential learning takes a learn-by-doing approach that engages the student directly in the subject, work, or service (Katula & Threnhauser, 1999; Kolb & Kolb, 2005).

### **Research Design**

A quantitative research design utilizing existing data sets was used for the study. This quantitative research method includes specific elements to be examined and the procedures to be used (Sproull, 1995). Quantitative research is the most practical method for testing hypotheses and examines the relationships among variables (Amelink, Borrego, & Douglas, 2009; Creswell, 2014; Sproull, 1995). Quantitative research involves numbers and research-based questions are used in the form of various instruments, data collection, and analyzed statistics (Amelink et al., 2009; Creswell, 2014). Data were collected and analyzed to determine if there were any differences in CTE and traditional high school students' scores on the ACT assessment, English II test, and Algebra I test, and college-going rates.

### **Organization of the Study**

The study was organized into five chapters. The first chapter provided an introduction of the study. The chapter included (a) statement of the problem, (b) the purpose of the study, (c) research questions, (d) the significance of the study, (e) delimitations, (f) definitions of terms, (g) a conceptual framework for the study, (h) a theoretical framework of the study, and (i) an overview of the research design and methodology.

Chapter II includes a review of the related literature focusing on (a) the history and goals of CTE, (b) raising the academic achievement level, (c) comparing CTE and traditional classes, (d) the integration of CTE and academic classes, (e) college-going rates, (f) ACT achievement, and (g) career readiness.

Chapter III contains a discussion of the research design and methodology used in the study. The study consisted of a quantitative research design. Included in this chapter are descriptions of the background information, setting, participants, data collection procedures, and data analysis used to determine the research findings and conclusions.

Chapter IV contains an analysis of the data collected for the study and presents the results of the study. Quantitative research findings are presented in terms of statistical significance.

Chapter V contains the summary, discussions, conclusions, and general recommendations for the study. Recommendations for future study are also provided.

## CHAPTER II

### REVIEW OF LITERATURE

This chapter provides a review of the literature related to CTE classes and high school achievement. The first section begins with the history and goals of CTE, the origin of CTE, and two components of CTE: career academics and career pathways. The second section discusses raising the achievement level. The next section discusses comparing CTE classes and traditional classes. The final section focuses on the integration of CTE and academic classes, college-going rates, and career readiness.

#### **History and Goals of Career and Technical Education**

Congress passed the Vocational Education Act of 1963 in an effort to “strengthen and improve the quality of vocational education and to expand the vocational education opportunities in the nation” (Vocational Education Act, 1964, p. 1). On February 23, 1917, the Smith-Hughes National Vocational Education Act was signed into law launching the federal investment in CTE (Lynch, 2014). CTE funds increased for states authorized by student population rather than the program of choice for the student (Lynch, 2014). In 1984, vocational education was renamed after Carl D. Perkins and offered to “persons of all ages in all communities” (Lynch, 2014, p. 40). Carl D. Perkins, a United States congressman, was motivated to help improve the education for students not inclined or planning to attend a 4-year institution. Perkins gained much respect from the Republican and Democratic parties (Smith, 2010). The Carl D. Perkins Act of 1984 established the foundation for CTE legislation and paved the way for improving education for all

students (Lynch, 2000). The business community, American industry, and political organizations pledged support for the federal funding of CTE, authorized by the Carl D. Perkins Act, with three key objectives: the alignment of career and technical programs to the labor market, collaboration between secondary and postsecondary institutions, and an increase of student participation in hands-on learning opportunities (Lynch, 2014). The Carl D. Perkins Act provided federal funds to support CTE (Stipanovic, Lewis, & Stringfield, 2012). The Carl D. Perkins Act embraced accountability along with secondary and post secondary alignment, academic integration, and business partnerships (Lynch, 2014). CTE was intended to combine rigorous academics and career courses preparing students for postsecondary education (Visher & Stern, 2015). The main goal or theme of CTE was to prepare students for the workforce (Berger et al., 2013; Visher & Stern, 2015). Adults may participate in career training to acquire, maintain, and upgrade their workforce skills (National Center for Education Statistics, 2018).

Out of approximately 18,000 public high schools, more than 90% offered some CTE course (Neild, Boccanfuso, & Byrnes, 2013). Carl Perkins funds were dedicated to increasing the quality of CTE programs of study and were critical to ensuring programs were prepared to meet the changing needs of students and teachers (National Center for Education Statistics, 2018). By receiving Perkins funding, schools had to provide at least one program of study that included relevant CTE content and academic content alignment (Stipanovic et al., 2012).

### **Career Academies**

Career academies are organizations that link students with peers, teachers, and local partnerships that promote academic success (Holzer, Linn, & Monthey, 2013). Career academies consist of three key components: a small learning community, a college-prep curriculum along with a career theme, and an advisory board that helps build relationships with employers,



colleges, and the community (Holzer et al., 2013). Career academies played a significant role in the success of CTE program offerings. Career academies represent a design strategy of CTE courses offered within a thematic setting (Stern et al., 2010), and with a combination of 70 years of development and study, were found to provide results for students during and after high school (Stern et al., 2010). Career academies refer to a small learning cohort community within a high school. Students are able to complete academic requirements within the regular school day (Kemple & Willner, 2008). Career academies were known to be the most reliable and best-proven component of high school change to prepare students for college and careers (Stern et al., 2012).

For approximately 40 years, career academies served high schools as an organized approach to help young people face the demands of high school and postsecondary education (Stern et al., 2012). Career academies typically serve from 150 to 200 students in grades 9-12, and are explained by three unique structures:

1. Career academies are designed to provide support to individualized learning environments
2. Career academies provide a combination of career and technical curricula around a career theme to teach and enhance learning
3. Career academies create affiliations with local employers to provide career knowledge and work affiliate opportunities for students (Kemple & Willner, 2008).

Neild et al. (2013) suggested students apply to attend career academies. Those students who chose to attend career academies rather than their local high schools increased the odds of completing 10th and 11th grades and graduating from the 12th grade (Neild et al., 2013). Other

students who were assigned to attend a career academy through the process of a “lottery” received great benefits as well (Neild et al., 2013). A higher percentage of students who attend CTE schools graduated from high school on time in comparison to those who did not attend career academies (Neild et al., 2013).

### **Career Pathways**

According to Hull (2015), a career pathway is a “coherent, articulated sequence of rigorous academic and career/technical courses, commencing in the ninth grade and leading to an associate degree, baccalaureate degree and beyond, an industry-recognized certificate, and/or licensure” (p. 15). The challenge for the United States is to create a pathways system for students to make a successful transition from secondary education to work (Schwartz, 2014). Career pathways are corridors that students follow starting with secondary education and continuing through postsecondary education (Visher & Stern, 2015). These pathway programs are underlined with four key principles: serving high school students, including a CTE class, giving attention to preparing students for college and a career, and involving all students, regardless of their history of academic achievement (Visher & Stern, 2015). Schwartz (2014) suggested the core basis of the pathways initiative is that all students need to be prepared for careers and extended learning.

### **Raising the Academic Achievement Level**

High-quality CTE attracts the best academic students, provides a rigorous and challenging curriculum, and provides opportunities for students of all socioeconomic backgrounds and for both males and females in urban and rural settings (Holzer et al., 2013). CTE adapts its focus to an integration of college and career readiness for all secondary school

graduates emphasizing the acquisition of basic academic skills and concepts, particularly mathematics (Bozick, 2013). Bozick (2013) conducted a study of transcripts of a national sample of more than 7,000 public school students who were sophomores in 2002, comparing students who had taken CTE classes and regular academic classes with similar students who did not take any CTE classes. Findings showed learning gains in math as measured by state test scores administered at the end of 10th grade and at the end of 12th grade for both groups. Students who took CTE classes and regular academic classes had similar learning gains to those who had taken academic classes (Bozick, 2013).

A number of students leave high school and attempt to enter the workforce immediately (Radcliffe & Bos, 2013). In a study by Radcliffe and Bos (2013), almost one-third of eighth grade students had a career goal and planned to enter postsecondary training or the workforce after graduation. However, only one-third of eighth grade students achieved math, reading, writing, and science proficiency (Radcliffe & Bos, 2013). Due to low National Assessment of Educational Progress (NAEP) scores and a national average of over one million annual student dropouts, there exists a serious concern for whether students will be ready for college or a career (Radcliffe & Bos, 2013).

Bottoms and Presson (2000) observed important factors to consider while assessing the effects of CTE classes on student achievement. Data were collected in 23 states that used the initiative *High Schools That Work* (HSTW). HSTW recognizes several components in raising student achievement (Bottoms & Presson, 2000). These components include students mastering a rigorous curriculum, local and state education agencies enhancing graduation prerequisites, senior students taking math and science courses, teachers engaging students more and setting high standards, students receiving career guidance from counselors, and career education

students being held accountable for high standards in technical advancement (Bottoms & Presson, 2000). Using the achievement model of HSTW, Bottoms and Presson (2000) suggested that in order for students to reach the goal of achieving reading “proficiency”, they should seek and utilize journals, guides, and periodicals; use several resources to aid in drawing conclusions; and be able to understand limited information. To increase proficiency in mathematics, Bottoms and Presson (2000) suggested students have an understanding of concepts, be able to apply multiple steps in solving problems, and be able to justify reasoning in problem-solving situations.

The common core state standards require students be able to apply math skills in real-world challenges (Meeder & Suddreth, 2012). CTE programs’ structures reveal the connection to high school math common core expectations (Meeder & Suddreth, 2012). According to Meeder and Suddreth (2012), this concept was coined as Math-in-CTE, which allows CTE teachers to better align their instruction with academic learning in order to help students use higher-order skills when problem solving. Meeder and Suddreth (2012) reported CTE teachers teach students to develop a deeper level of reading comprehension within their technical disciplines. For the goal of proficiency in science, students can apply skills and justifications to scientific and technical data tables, make inferences about the final products, and evaluate and interpret scientific texts (Bottoms & Presson, 2000).

### **CTE, Student Achievement, and Leadership**

Strong leadership is a strategy to improve student achievement in CTE (Clark, Dayton, Stern, Tidyman, & Weisberg, 2007). First, the leader must possess the qualities of faithfulness, dedication, collaboration, and must have effective communication skills (Clark et al., 2007). Second, site support from career counselors is required to make site scheduling possible (Clark et

al., 2007). Third, board and district personnel must work with the lead teachers to ensure proper funding, equipment, and time are utilized (Clark et al., 2007). Last, teachers must be willing to adapt and be flexible.

### **Comparing CTE and Traditional Classes**

Programs of study make a significant impact on student's academic and technical achievement (Bottoms & Presson, 2000). Castellano et al. (2014) conduct a study that presented findings about 9th and 10th grade CTE students and academic achievement in programs of study. The conceptual framework was based upon increasing student engagement, student achievement, and high school transition status into the labor market (Castellano et al., 2014).

Castellano et al. (2014) suggested there were important gains in CTE programs that had implemented the math component. The Castellano et al. study (2014) tested the CTE position in regards to student engagement and student achievement. The researchers' study rested on two questions: (1) to what level does participating in programs of study lead to improving student academics and technical results as parallel to the control group, and (2) by joining programs of study, were student experiences in CTE any different from the traditional high school students' experiences? The researchers found that students who took CTE classes experienced increased success in mathematics and reading comprehension.

### **Programs of Study**

Programs of study mix rigorous academic and technical ideas that allow students to earn postsecondary credits while they are attending high school (Castellano et al., 2014). Programs of study include chances for students to gain relevant, real-world experiences.

The goals of programs of study include increasing student enrollment and equipping students with training by using different strategies and initiatives (Castellano et al., 2014). The goals of programs of study can be achieved by implementing rigor in teaching and engagement and combining relevant examples with experiences (Castellano et al., 2014).

A study conducted by Castellano et al. (2014) found two school districts that offered students' programs of study. Variables in the study included characteristics such as gender, race, previous student achievement, students' participation in the free lunch program, limited English proficiency, and individualized education plans (Castellano et al., 2014). The researchers concluded 9th and 10th grade students were influenced by programs of study. With regards to the impact of programs of study, there was no significant difference between students in programs of study and control groups by the end of the 9th grade; however, at the end of the 10th grade, the programs of study had the greater impact on students (Castellano et al., 2014). According to Castellano et al. (2014), research suggested there seems to be a positive correlation between programs of study and student achievement. Castellano et al. (2014) also suggested in future years more students will be taking programs of study courses because of a large percentage of students taking CTE courses within their high school course selections.

### **Preventing Dropout**

Educators are facing a dilemma with students being ill prepared to further their education and careers (Hyslop & Imperatore, 2013). Student dropout has become a significant issue in education (Hyslop & Imperatore, 2013). To alter student dropout, CTE provides programs giving students relevant career experiences (e.g., in the fields of health, culinary arts, engineering and electrical repair) as well as connecting students to their futures (Hyslop & Imperatore, 2013). Gottfried et al., (2016) reported three elements by which CTE may affect high school dropout

and college-going rates. CTE develops critical thinking skills, educational engagement, and real-world relevance.

The occurrence of student dropout receives an enormous amount of attention (Plank, DeLuca, & Estacion, 2008). Research studies suggested that student traits and social environments are to be taken into consideration in understanding dropout (Plank et al., 2008). School curricula and school environments play an integral role in the outcome and placement of students (Plank et al., 2008). A combination of high school classes can have a substantial influence on students' outcomes (Plank et al., 2008). Preparing students for college and the labor market have a direct influence, and thus combining academics and student performance will increase student success in high school and outside of high school (Clark et al., 2007). A combination of academic courses and CTE courses in high schools can keep students' ability to make choices open and meaningful (Clark et al., 2007).

### **Integration of Career and Technical Education and Academic Classes**

CTE can motivate students to take academics more seriously and provide opportunities for students to participate in real-world situations (Holzer et al., 2013). A study by Stone et al. (2005) focused on students' individual CTE class content as a means of enhancing students' performance in a particular subject. Stone et al.'s (2005) study included a total of 134 CTE teachers with 60 teachers assigned to the experimental group and 74 teachers assigned to the control group. The CTE teachers collaborated with the mathematics teachers from their high schools. The teachers used five CTE programs, with the aid of a math teacher, to identify math content that was entrenched in the career and technical program. Lesson plans were developed to teach the math content. Students took a pre- and a post-test in math. Students were tested at the

end of the year, and the findings showed students taught by the CTE teachers scored meaningfully higher on TerraNova and Accuplacer math tests (Stone et al., 2005).

Clark et al. (2007) suggested academic learning teaches students the important ideas of college-prep classes and encourages students to apply knowledge and skills to relevant life situations. Career and technical studies allow students access into challenging high-level math, science, reading, and problem-solving skills (Clark et al., 2007). Leaning on the national reform model HSTW, Bottoms & Presson (2000) investigated three questions:

1. Has there been progress made in increasing student achievement?
2. What are the important factors or components in raising students' achievement?
3. What steps can the state take to help aid high schools to prepare students for career and technical programs? (p. 2)

Bottoms and Presson (2000) suggested progress was made in each state that participated in their study. The researchers found progress made, especially in mathematics and science. According to Hoachlander and Steinhauser (2015), success in a changing world of work requires increasing levels of proficiency with technical knowledge. Meeder and Suddreth (2012) reported CTE teachers get students to develop a deeper level of reading comprehension within their technical discipline. A decision to commit in connecting CTE classes to core academic classes was described as being vital to students' success in secondary and postsecondary outcomes (Hoachlander & Steinhauser, 2015).

Connections academy schools are tuition-free online schools for students in grade K-12 (Connections Academy, 2018). The goal of connections academy was to ensure students become productive and successful adults by combining both college preparation and real-world workforce skills development into one education program (Connections Academy, 2018).



According to the NAEP (1998), the success of CTE students increased, but there was a significant decrease in traditional math and science scores in schools. Bottoms & Presson (2000) asserted that students failed because they did not have teachers and counselors working individually to help establish long-term goals (Bottoms & Presson, 2000). Plank et al. (2008) investigated whether there were a correlation between CTE classes and academic classes. Research suggested exposing a student to a CTE curriculum and academic curriculum can strengthen a student's attachment to or motivation while in school.

### **College-Going Rates**

According to Conley (2012), "a student who is ready for college and career can qualify for and succeed in entry-level, credit-bearing college courses leading to a baccalaureate degree or certificate, or career pathway-oriented training programs without the need for remedial or developmental coursework" (p. 1). Plank et al. (2008) suggested CTE classes have a positive effect on students completing high school and entering into postsecondary education. However, Plank et al. (2008) suggested CTE classes have a negative effect on students because CTE classes may not have been taught at the proper rigor. CTE classes combined with academic classes makes a student's education worthwhile (Plank et al., 2008). Gottfried, Bozick, Rose, and Moore (2016) reported three elements by which CTE classes may affect high school completion/dropout and college-going rates; these are developing critical thinking skills, educational engagement, and real-world relevance.

### **ACT**

According to Noble and Sawyer (2013), as measured by the ACT, better-prepared students are more successful in college than less prepared students in both the short- and long

term. Studies focusing on college entrance exams and college placement exams have shown that students who score low on the ACT reading benchmark component had a 40% chance of taking a remediation course (Noble & Sawyer, 2013). Remediation courses serve as a bridge of preparation for students who were not prepared for postsecondary education; however, the majority of students who enrolled in college remediation classes tended not to seek a college degree (Alliance for Excellent Education, 2011).

In 2011-2012, the United States Department of Education reported one-third of first-year students enrolled in at least one remediation class. According to ACT (2013), only 26% of students who took the ACT met all four college-ready benchmarks. However, 31% of 2013 graduates did not meet any of the ACT college-readiness benchmarks. Students who take four years of rigorous English classes and three years of math, science, and social studies are more likely to graduate ready for credit-bearing first-year college courses without a remediation course (ACT, 2013).

### **College and Career Readiness**

According to Morningstar et al. (2018), focus shifted away from solely working toward high school graduation to promoting students' successful entry into postsecondary education and the workforce. Bryan et al. (2017) suggested no notable gaps exist among race/ethnicity, class, and gender in students aspiring to attend college, and high schools will need to adjust to the concept of preparing more of their graduates for college. Further, the researchers stated many students who aspire to attend postsecondary institutions are not receiving the tools and information to enroll (Bryan et al., 2017). Castellano et al. (2014) argued that college and career readiness became the federal emphasis of educational change. States and districts were required to implement initiatives like programs of study to address reading gaps and to prepare students

for postsecondary education (Castellano et al., 2014). Career-emphasized education that mixes integrated academics with engaging, rigorous, and career-ready skills are designed to help alleviate the effects of poverty and have a positive influence on postsecondary ambitions (Castellano et al., 2014).

### **Theoretical Framework**

The CTE experience can be aligned to the Experiential Learning Theory (Katula & Threnhauser, 1999 Kolb & Kolb, 2017). As the name indicates, experiential learning involves learning from experience (Cherry, 2018). Cherry (2018) suggested experiential learning takes a holistic approach and emphasizes how experiences, including environmental factors and emotions, influence the learning process. This type of learning involves the participant with an intention to learn with an understanding of actively participating (Cherry, 2018). In contrast, academic learning involves learning through studying of subjects and less hands-on experience, which is continued throughout the secondary level (Cherry, 2018). CTE promotes experiential learning because it involves students with hands-on experiences and academic studies as well (Cherry, 2018). CTE involves analysis and initiative, whereas, traditional academics involve more constructive and reproductive learning.

### **Chapter Summary**

Educators are facing a dilemma with students being ill prepared to further their education and careers; therefore, a significant number of student dropouts have occurred in secondary education (Hyslop & Imperatore, 2013). CTE is intended to bind rigorous academic and career classes that prepare students not only for work but also for postsecondary education (Visher & Stern, 2015). The main goal or theme of CTE is to prepare students for the workforce (Visher &

Stern, 2015). Career academies and career pathways are components to help prepare students for success in college and careers (Stern et al., 2012; Visher & Stern, 2015). The Carl D. Perkins Act provides schools with funding to offer at least one program of study, including relevant CTE content with academic content alignment (Stipanovic et al., 2012).

Numerous studies focused on investigations to determine whether there is an influence of CTE classes on high school students (Bottoms & Presson, 2000). In particular, Bottoms and Presson (2000) observed important factors to consider while assessing the effects of CTE classes on student achievement (Bottoms & Presson, 2000). Programs of study make a significant impact on students' academic and technical achievement (Bottoms & Presson, 2000). Programs of study mix rigorous academic and technical ideas, allowing students to earn postsecondary credits while they are attending high school (Castellano et al., 2014). Programs of study include chances for students to gain relevant real-world experiences.

Career-emphasized education that mixes integrated academics with engaging, rigorous, career-ready skills are designed to help alleviate the effects of poverty and have a positive influence on postsecondary ambitions (Castellano et al., 2014).

## CHAPTER III

### RESEARCH DESIGN AND METHODOLOGY

The purpose of this chapter is to present the research design and methodology used to investigate whether there were differences in the academic scores of students who took CTE classes and those who took only traditional academic classes. The major goal of this study was to investigate the effects of CTE classes on students' academic achievement using three assessments: English II exam, Algebra I exam, and the ACT score. This study also sought to determine if there were differences in college-going rates between the students who took CTE classes and the students who took only traditional classes.

The chapter begins with a description of the Institutional Review Board's (IRB) approval, a discussion of the selected research design and methodology, and a discussion of the setting. The chapter concludes with a description of the data collection and data analysis procedures.

#### **Institutional Review Board Approval**

Permission to conduct this study was requested from the Mississippi State University IRB for the protection of human subjects in research. The researcher requested and obtained approval from the IRB and collected data for all students in a selected high school in the state of Mississippi. A letter of permission to collect data from the superintendent was obtained for the selected school where the students were enrolled during the 2015-2016 and 2016-2017 school years. Two-year follow-up data were requested for those graduating in spring 2016 and 2017 to determine college-going rates (those who enrolled in college during 2016-17 and 2017-18).

## **Research Design**

A quantitative research design was selected for conducting the research study. Quantitative research examines the relationships among variables (Amelink et al., Creswell, 2014). Quantitative research involves numbers and research-based questions. Data were collected and analyzed to determine if there were any differences in test scores on the English II and Algebra I and the ACT assessment between students who took CTE classes and students who took traditional classes.

Data were collected and analyzed using the 2015-2016 and 2016-2017 English II exam scores, Algebra I exam scores, and ACT scores of students who took CTE classes and students who took traditional high school classes. The scores were analyzed to determine if there were any differences between the two groups. College-going rates were determined between the two groups using data for those who enrolled during the 2016-17 and 2017-18 academic years.

## **Setting**

This study was conducted using student data from a rural high school. The school is a Title I school. The school has 460 students with Ggrades 9 through 12. The school has 30 full-time teachers with a 16:1 ratio of students to teachers. To be considered a Title I school, the number of low-income students must be above 40%.

## **Participants**

This study included data from all students who took CTE classes and those who took traditional high school classes during the 2015-2016 ( $n = 70$ ) and 2016-2017 ( $n = 86$ ) school years. More specifically, existing data for English II exam scores ( $n = 156$ ), Algebra I exam

scores ( $n = 156$ ), ACT scores ( $n = 156$ ), and college going rates ( $n = 156$ ) were used to conduct the study.

### **Data Collection**

The researcher used existing data. The data were collected on students who took CTE classes and traditional classes during the 2015-2016 and 2016-2017 school years. Data for the English II exam, Algebra I exam, ACT scores, and college-going rates were retrieved from the guidance counselor and included on the spreadsheet. In addition, gender race, and socioeconomic status (SES) were collected for each student. Data were collected for 70 students from the 2015-2016 school year and 86 students from the 2016-2017 school year.

### **Data Analysis**

For research questions one through three, an Analysis of Variance (ANOVA) statistical computation was performed to determine if there were differences in the variables between students who took CTE classes and those who took traditional classes. An ANOVA requires having at least one independent variable and one dependent variable (Creswell, 2014), and compares the means of the variables through analyzing the collected data (Breitsohl, 2018). An ANOVA was chosen for questions one through three because the study consisted of the comparison of variables within a population. A Chi-squared test was chosen for question four. A Chi-squared test measures the relationship between two variables (Norusis, 2006). A Chi-squared test of independence was utilized to examine the college-going rate of students who took CTE classes and students who took traditional class.

## **Chapter Summary**

This study used an existing database from a rural high school in a Mississippi school district. A quantitative research method was used. The analysis of the data included descriptive statistics, ANOVA, and Chi-squared statistics. Participants for this study included students who took CTE classes and those who took traditional classes. Data were collected and analyzed to determine if there were differences in test scores on the English II and Algebra I state tests as well as the ACT assessment for students who took CTE classes and students who took only traditional classes. In addition, data were collected and analyze to determine if there were differences between the two groups for college-going rates.



## CHAPTER IV

### RESULTS

#### **Introduction**

This chapter provides an analysis of the data collected for the study and presents the results of the study. The purpose of this study was to investigate the effects of completing CTE classes during high school. In particular, the study sought to determine whether there were differences in academic scores of students who took CTE classes and those who took traditional classes. More specifically, the first goal of the study was to determine if there were differences in mean scores on the English II exam between those students who participated in CTE classes and those who took traditional high school classes. The second goal of the study was to investigate whether there were differences in mean scores on the Algebra 1 exam between those students who participated in CTE classes and those who took traditional high school classes. The third goal of the study was to investigate whether there were differences in mean scores on the ACT assessment among those students who participated in CTE classes and those who took traditional high school classes. Lastly, the study investigated if there were differences in the college-going rate of students who participated in CTE classes and those who took traditional high school classes.

#### **Demographics**

Table 1 provides a display of the demographics of the students used in the study. The data included students who were enrolled during the 2015-2016 and 2016-2017 school years.

The data show the total sample for class type: CTE classes, traditional classes, gender, and race/ethnicity. Data were also analyzed for the students in subsequent tables for English II exam scores, Algebra I exam scores, ACT scores, and college-going rates.

Table 1

*Demographics of Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Class Type</b>	<b>CTE Classes</b>	<b>Traditional Classes</b>	<b>Total</b>
	113 (72.4%)	43 (27.6%)	156 (100%)
<b>Gender</b>			
Male	61 (54%)	20 (46%)	
Female	52 (46%)	23 (54%)	
<b>Race</b>			
White	64 (56.6%)	29 (67.4%)	
Black	43 (38.1%)	13 (30.2%)	
Hispanic	6 (5.3%)	1 (2.3%)	

Table 1 provides the demographics for students who were enrolled in CTE classes ( $n = 113, 72.4\%$ ) and traditional classes ( $n = 43, 27.6\%$ ). Of those students who took CTE classes, there were more males ( $n = 61, 54\%$ ) than females ( $n = 52, 46\%$ ). Of those who took traditional classes, there were slightly more females ( $n = 23, 54\%$ ) than males ( $n = 20, 46\%$ ). The majority of the students who took CTE classes were White ( $n = 64, 56.6\%$ ). There were 43 Black students (38.1%) who took the CTE classes and 6 Hispanic students (5.3%). The data show the majority

of the students who took traditional classes were White ( $n = 29$ , 67.4%). There were 13 Black students (30.2%) and 1 Hispanic student (2.3%) who took traditional classes.

### Research Question 1

Are there statistically significant differences in mean scores on the English II exam among those students who participated in CTE classes and those who took traditional high school classes?

Table 2 provides a display of the mean scores and standard deviations of the English II exam scores for students who took CTE classes and students who took traditional classes. There were 113 students who took the CTE classes and 43 students who took the traditional classes.

Table 2

*Mean Scores and Standard Deviations for English II Exam Scores for Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b><i>N</i></b>	<b><i>M</i></b>	<b><i>SD</i></b>
CTE	113	720.70	53.866
Traditional	43	688.28	50.834

Table 2 provides a display of the mean scores and standard deviations of the English II exam scores for students who took CTE classes and those who took traditional classes. The English II mean score for students who took CTE classes was higher ( $M = 720.70$ ,  $SD = 53.866$ ) than the English II mean score for the students who took traditional classes ( $M = 688.28$ ,  $SD = 50.834$ ).

An ANOVA was conducted to determine if there were statistically significant differences in the mean scores on the English II exam for the students who took CTE classes and the students who took traditional classes. Table 3 provides a display of the ANOVA results for the English II exam scores for students who took CTE classes and students who took traditional classes.

Table 3

*ANOVA Results for English II Exam Scores for Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b>df</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>Sig.</b>
Between Groups	1	32737.803	32737.803	11.630	.001*
Within Groups	154	433502.421	2814.951		

\* $p \leq .05$

The ANOVA results for English II exam scores for students who took CTE classes and students who took traditional classes were found statistically significant:  $F(1,154) = 11.630, p = .001$ , demonstrating that there was a statistically significant difference in the mean scores on the English II exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes.

### **Research Question 2**

Are there statistically significant differences in mean scores on the Algebra I exam among students who took CTE classes and those who took traditional high school classes?

Table 4 provides a display of the mean scores and standard deviations of the Algebra I exam scores for students who took CTE classes and students who took traditional classes. There were 113 students who took the CTE classes and 43 students who took traditional classes.

Table 4

*Mean Scores and Standard Deviations for Algebra I Exam Scores for Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b><i>N</i></b>	<b><i>M</i></b>	<b><i>SD</i></b>
CTE	113	700.94	42.286
Traditional	43	684.60	39.224

Table 4 provides a display of the mean scores and standard deviations of the Algebra I exam scores for students who took CTE classes and those who took traditional classes. The Algebra I mean score for students who took CTE classes was higher ( $M = 700.94$ ,  $SD = 42.286$ ) than the Algebra I mean score for students who took traditional classes ( $M = 684.60$ ,  $SD = 39.224$ ).

An ANOVA was conducted to determine if there were statistically significant differences in the mean scores on the Algebra I exam for the students who took CTE classes and the students who took traditional classes. Table 5 provides a display of the ANOVA results for the Algebra I exam scores for students who took CTE classes and students who took traditional classes.

Table 5

*ANOVA Results for Algebra I Exam Scores for Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b><i>df</i></b>	<b><i>SS</i></b>	<b><i>MS</i></b>	<b><i>F</i></b>	<b><i>Sig.</i></b>
Between Groups	1	8309.514	8309.514	4.831	.029*
Within Groups	154	264882.845	1720.018		

\* $p < .05$

The ANOVA results for Algebra I exam scores for students who took CTE classes and students who took traditional classes were found statistically significant:  $F(1,154) = 4.831, p = .029$ , demonstrating that there was a significant difference in the mean scores on the Algebra I exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than the students who took traditional classes.

### **Research Question 3**

Are there statistically significant differences in mean scores on the ACT assessment among those students who participated in CTE classes and those who took traditional high school classes?

Table 6 provides a display of the mean scores and standard deviations of the ACT exam scores for students who took CTE classes and students who took traditional classes. There were 113 students who took the CTE classes and 43 students who took the traditional classes.

Table 6

*Mean Scores and Standard Deviations for ACT Exam Scores for Students Who Took CTE*

*Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b><i>N</i></b>	<b><i>M</i></b>	<b><i>SD</i></b>
CTE	113	19.12	3.623
Traditional	43	19.23	4.613

Table 6 provides a display of the means and standard deviations of the ACT exam scores for students who took CTE classes and those who took traditional classes. The ACT mean score for students who took traditional classes was slightly higher ( $M = 19.23$ ,  $SD = 4.613$ ) than the mean score for students who took CTE classes ( $M = 19.12$ ,  $SD = 3.623$ ).

An ANOVA was conducted to determine if there were statistically significant differences in the mean scores on the ACT assessment for students who took CTE classes and the students who took traditional classes. Table 7 provides a display of the ANOVA results for the ACT exam scores for students who took CTE classes and students who took classes.

Table 7

*ANOVA Results for ACT Exam Scores for Students Who Took CTE Classes and Students Who Took Traditional Classes*

<b>Source</b>	<b><i>df</i></b>	<b><i>SS</i></b>	<b><i>MS</i></b>	<b><i>F</i></b>	<b><i>Sig.</i></b>
Between Groups	1	.368	.368	.024	.877
Within Groups	154	2363.940	15.350		

$p < .05$

The ANOVA results for ACT scores for students who took CTE classes and students who took traditional classes were not statistically significant:  $F(1,154) = .024, p = .877$ . The ANOVA results indicate there was no significant difference in the mean scores on the ACT for students who took CTE classes and students who took traditional classes.

#### **Research Question 4**

Are there statistically significant differences in scores in the college-going rates after completing high school among those students who participated in CTE classes and those who took traditional high school classes? Students were considered to attend college if they were enrolled in college during 2016-17 and 2017-18 school year. Data were obtained from the high school database.

A chi-squared test of independence was utilized to examine the effect of college-going rate of students who took CTE classes and students who took traditional class only.

Table 8 provides a display of the mean scores for standard deviations of the college-going rates for students who took CTE classes and students who took traditional classes. There were 113 students who took the CTE classes and 43 students who took the traditional classes.



Table 8

*Chi-squared Test: College-Going Rate for CTE and Traditional Classes*

	<b>Value</b>	<b>Df</b>	<b>Sig.</b>
Pearson Chi Square	2.209	1	.137
Likelihood Ratio	2.393	1	.122
N of Valid Cases	156		

\*p < .05

The Chi-squared test results to determine if there was a difference in the college-going rate between students who took CTE classes and students who took traditional classes was not statistically significant. These results indicated there was no difference between the college-going rate of students who took CTE classes and students who took traditional classes ( $X^2 [1, N = 156] = 2.209, p = .137$ ) with a small effect size (.137).

### Chapter Summary

Chapter IV provides a summary of the findings for the study. Analysis of data included 113 students (72.4%) who took CTE classes and 43 students (27.6%) who took traditional classes. Of those students who took CTE classes, there were more males ( $n = 61, 54\%$ ) than females ( $n = 52, 46\%$ ). Of those who took traditional classes, there were slightly more females ( $n = 2, 54\%$ ), than males ( $n = 20, 46\%$ ). The majority of the students who took CTE classes were White ( $n = 64, 56.6\%$ ). There were 43 (8.1%) Black students who took the CTE classes as well as 6 (5.3%) Hispanic students. The data show the majority of the students who took traditional classes were White ( $n = 29, 67.4\%$ ). There were 13 (30.2%) Black students and 1 (2.3%) Hispanic student who took traditional classes

The ANOVA results for English II exam scores for students who took CTE classes and students who took traditional classes were found statistically significant:  $F(1,154) = 11.630, p = .001$ , demonstrating that there was a statistically significant difference in the mean scores on the English II exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes.

The ANOVA results for Algebra I exam scores for students who took CTE classes and students who took traditional classes were found statistically significant:  $F(1,154) = 4.831, p = .029$ , demonstrating that there was a significant difference in the mean scores on the Algebra I exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes.

The ANOVA results for ACT scores for students who took CTE classes and students who took traditional classes were not statistically significant:  $F(1,154) = .024, p = .877$ . The ANOVA results indicate there was no significant difference in the mean scores on the ACT for students who took CTE classes and students who took traditional classes.

The Chi-squared test results to determine if there was a difference in the college-going rate between students who took CTE classes and students who took traditional classes was not statistically significant. These results indicated there was no difference between the college-going rate of students who took CTE classes and students who took traditional classes ( $\chi^2 [1, N = 156] = 2.209, p = .137$ ) with a small effect size (.137).

## CHAPTER V

### SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The major goal of this study was to investigate the effects of CTE classes during high school. In particular, the study sought to determine whether there were differences in academic scores of students who took CTE classes and those who took traditional classes. More specifically, the first goal of the study was to determine if there were differences in mean scores on the English II exam between those students who took CTE classes and those who took traditional high school classes. The second goal of the study was to investigate whether there were differences in mean scores on the Algebra I exam between those students who took CTE classes and those who took traditional high school classes. The third goal of the study was to investigate whether there were differences in mean scores on the ACT assessment among those students who took CTE classes and those who took only traditional high school classes. Lastly, the study investigated if there were differences in the college-going rate of students who took CTE and those who took traditional high school classes.

This chapter presents a discussion and interpretation of the results of the study, the limitations of the study, and the implications of the study. This chapter also presents general recommendations for school administrators and recommendations for future research.

## Summary

The study included a quantitative research design using existing data and was grounded in the Experiential Learning Theory. Experiential learning is learning through experiences and reflective observation (Kolb & Kolb, 2017). Cherry (2018) suggests experiential learning takes an all-inclusive approach that emphasizes students' experiences, which include students' environment and emotions influencing the learning result. CTE involve students in the learning process by active engagement (Cherry, 2018). Researchers suggested experiential learning takes a learn-by-doing approach that engages the student directly in the subject, work, or service involved (Katula & Threnhauser, 1999; Kolb & Kolb 2005).

CTE is intended to combine rigorous academics and career courses that prepare students not only for work but also postsecondary education (Visher & Stern, 2015). The main goal or theme of CTE is centered around preparing students for the workforce (Visher& Stern, 2015).

Four research questions were developed to investigate the effects of completing career and technology classes during high school. The following research questions were used in the study:

1. Are there statistically significant differences in mean scores on the English II exam among those students who took CTE classes and those who took traditional high school classes?
2. Are there statistically significant differences in mean scores on the Algebra I exam among those students who took CTE classes and those who took traditional high school classes?

3. Are there statistically significant differences in mean scores on the ACT among those students who took CTE classes and those who took traditional high school classes?
4. Are there statistically significant differences in the college-going rates after completing high school among those students who took CTE classes and those who took traditional high school classes?

### **Conclusions**

There were 156 students included in the study for research questions: CTE students consisted of 61 males (54%), 52 females (46%), 64 White (56.6), 43 Black (38.1%), and 6 Hispanic (5.3%). Of those students who took traditional classes, 20 were male (46%), 23 female (54%), 29 White (67.4%), 13 Black (30.2%), and 1 Hispanic (2.3%).

For the first research question, the ANOVA results for English II exam scores for students who took CTE classes and students who took traditional classes were found to be statistically significant:  $F(1,154) = 11.630, p = .001$ .

Conclusion 1: There was a statistically significant difference in the mean scores on the English II exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes.

For the second research question, the ANOVA results for Algebra I exam scores for students who took CTE classes and students who took traditional classes were found to be statistically significant:  $F(1,154) = 4.831, p = .029$ .

Conclusion 2: There was a significant difference in the mean scores on the Algebra I exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes.

For the third research question, the ANOVA results for the ACT scores for students who took CTE classes and students who took traditional classes were not statistically significant:  $F(1,54) = .024, p = .877$ .

Conclusion 3: There was no statistically significant difference in the mean scores on the ACT for students who took CTE classes and students who took traditional classes.

For the fourth research question, the Chi-squared results for college-going rates for students who took CTE classes and students who took traditional classes were not found to be significant different:  $\chi^2(1, N = 156) = 2.209, p = .137$ .

Conclusion 4: There was no difference in the college-going rates between students who took CTE classes and students who took traditional classes.

## **Discussion**

According to the findings of the first research question, there was a statistically significant difference in the mean scores on the English II exam for students who took CTE classes and students who took traditional classes. The results do correspond with Meeder and Suddreth (2012) who found CTE teachers help students to develop a deeper level of comprehension; therefore, according to their findings, CTE students are expected to achieve higher on academic classwork.

For the second research question, there was a statistically significant difference in the mean scores on the Algebra I exam for students who took CTE classes and students who took traditional classes. Students who took CTE classes scored higher than students who took traditional classes. These findings were consistent with the study of Bozick (2013) who found students who took CTE classes had higher learning gains than those students who took traditional courses.

For the third and fourth research questions, there were no statistically significant differences in the scores on the ACT or the college-going rates for students who took CTE classes and students who took traditional classes. Plank et al. (2008) suggested CTE classes have a positive effect on students completing high school and entering postsecondary education. According to Noble and Sawyer (2013), as measured by the ACT, better-prepared students are more successful in college than less-prepared students, short- or long-term.

Plank et al. (2008) also suggested CTE courses had a negative effect on students because CTE classes may not have been taught at the proper rigor. A report from the Advisory Committee for the National Assessment of Vocational Education (2003) suggested combining CTE classes with academic classes make a student's education worthwhile (Plank et al., 2008). In 2011-2012, the United States Department of Education (2010) reported one-third of first-year college students enrolled in at least one remediation course. Some high school graduates lack the necessary skills they need to be successful in postsecondary education (ACT and Trust, 2004).

### **Limitations**

There are potential limitations that may have impacted the study. The results of this study may be generalized to the students within this school district. This study used existing data; therefore, data entry errors were one of the limitations of this study. The assessments for this study were computerized; therefore, technology malfunctions may have caused problems during the students' assessments.

### **General Recommendations for School Leaders**

The research from the study may be used by school leaders to help make data-driven decisions relating to implementing rigorous class offerings in CTE. Leaders may consider the

role of preparing students for postsecondary education, or general employment in the workforce. The study may be used to promote and implement additional CTE classes. CTE should meet academic rigor, be relevant to the learner and workforce, and continue to build relationships with academic educators, business and industry professionals, and the public.

### **Recommendations for Further Research**

The following recommendations for future research are offered to continue this study of CTE. Research should be conducted in other schools (districts), local and national.

1. Research should be conducted comparing CTE teachers' opinions with the opinions of traditional education teachers and administrators.
2. Research should be conducted to determine student achievement by analyzing information by gender and race for students who took CTE classes and for those students who took traditional classes.
3. A longitudinal study should be conducted for a controlled group of 9<sup>th</sup> grade students to determine academic achievement for students who took CTE classes and traditional classes and continued throughout the entrance of post secondary education.



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APPENDIX A  
INSTITUTIONAL REVIEW BOARD OF APPROVAL



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November 26, 2018

Frankie Williams, PhD, Educational Leadership, Christopher Armstrong; Leigh McMullan; Stephanie King

The Effects of Career and Technical Education Courses on High School Academic Achievement, ACT Scores, and Graduation Rates

IRB-18-507 Approval Date: November 26, 2018 Expiration Date: November 25, 2023

EXEMPTION DETERMINATION

The review of your research study referenced above has been completed. The HRPP had made an Exemption Determination as defined by 45 CFR 46.101(b)1, 4. Based on this determination, and in accordance with Federal Regulations, your research does not require further oversight by the HRPP.

Employing best practices for Exempt studies are strongly encouraged such as adherence to the ethical principles articulated in the Belmont Report, found at [www.hhs.gov/ohrp/regulations-and-policy/belmont-report/#](http://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/#) as well as the MSU HRPP Operations Manual, found at [www.orc.msstate.edu/humansubjects](http://www.orc.msstate.edu/humansubjects). Additionally, to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so.

Based on this determination, this study has been inactivated in our system. This means that recruitment, enrollment, data collection, and/or data analysis **CAN** continue, yet personnel and procedural amendments to this study are no longer required. **If at any point, however, the risk to participants increases, you must contact the HRPP immediately. If you are unsure if your proposed change would increase the risk, please call the HRPP office and they can guide you.**

If this research is for a thesis or dissertation, this notification is your official documentation that the HRPP has made this determination.

If you have any questions relating to the protection of human research participants, please contact the HRPP Office at [irb@research.msstate.edu](mailto:irb@research.msstate.edu). We wish you success in carrying out your research project.

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